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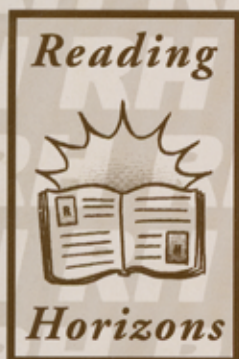
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Dorothy J. McGinnis Reading Center and Clinic
College of Education
Western Michigan University



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APOLOGIA

Dear Subscribers/Readers of *Reading Horizons*:

As loyal readers of *Reading Horizon*, you have noticed that our journal has been behind in publication due to circumstances beyond the staff of *Reading Horizons*' control. Budget cuts resulting in personnel loss over the past few years have caught the staff playing "catch-up," and as anyone knows who has tried to get caught up, it rarely happens. And so it is with our journal. Therefore, in order to keep our quarterly status with U.S. Postal Services, we are skipping forward to Volume 45. Therefore, this issue represents Volume 45, issue number one. Volume 44 will be skipped altogether, and your last issue was Volume 43, issue number 3. The same quality that has always been a part of *Reading Horizons* and its great articles on literacy and language arts education will be maintained. Your subscription rates will be forwarded a year and all will remain the same. We apologize for any inconvenience this may cause and wish you a great beginning to your 2004-2005 school year.

Sincerely,

Karen F. Thomas, Editor
Yolanda Mihalko, Editorial Assistant
September 2004



Reading Horizons
A Journal of Literacy and Language Arts

*Published by the College of Education
and
Dorothy J. McGinnis Reading Center and Clinic
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<i>Editor:</i>	Karen F. Thomas
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Reading Horizons

History and Mission of Reading Horizons: *Reading Horizons* began in 1960 as a local newsletter and has developed into an international journal serving major colleges, universities, and individual subscribers across the United States and Canada as well as a host of other countries. The journal serves as a forum for ideas from many schools of thought dedicated to building upon the knowledge base of literacy through research, theoretical essays, opinion pieces, policy studies, and syntheses of best practices. *Reading Horizons* seeks to bring together school professionals, literacy researchers, teacher educators, parents and community leaders as they work collaboratively to widen the horizons of literacy and the language arts.

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There is no more crucial or basic skill in all of education than reading

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The Greatest Literacy Challenges Facing Contemporary High School Teachers: Implications for Secondary Teacher Preparation

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Secondary teachers face significant challenges in their efforts to increase the literacy levels of adolescents. Encouraging teachers to speak out about these challenges and to recommend initiatives that may improve literacy practices for adolescents is vital for future reform efforts. This study examines the questions: "What are the greatest literacy challenges facing high school content area teachers?" and "What will help to diminish these challenges?" The data collection questionnaire was distributed to teachers in eight high schools throughout the greater Chicago area. A discussion of the findings suggests compelling directions for secondary teachers and teacher educators.

WHILE SEVERAL REFORMS in higher education teacher preparation have made a difference in more teachers being highly prepared and qualified (Smylie, Bay, & Tozer, 1999), preparing teachers to meet the literacy demands of secondary students still remains inadequate. Improving literacy learning in our nation's high schools needs serious elevation as an educational priority at all levels. The 2002 NAEP (National Association for Educational Progress) Report indicates that 36 percent of students in grade 12 performed at a proficient level, indicating that only a little over one-third of our nation's high school seniors can understand challenging material (Feller, 2003). This was a decline in performance from 1998 when the NAEP reported the percentage of seniors who performed at the proficient level as 40 percent (U.S. Department of Education, 1999). Additionally the 1998 report states that no more than 6 percent of the adolescents performed at the advanced level which demonstrates students' ability to analyze and extend the meaning of the materials they read. The NAEP data further show more than one-third of the students did not demonstrate competence at a basic level of literacy.

The International Reading Association has taken a substantial leadership role in elevating attention to middle school and secondary literacy issues by establishing the Commission on Adolescent Literacy in 1997 (Rycik & Irvin, 2001). The work of this Commission resulted in the published document, *Adolescent Literacy: A Position Statement* (Moore, Bean, Birdyshaw, & Rycik, 1999), which recommends principles for teachers to consider when supporting the literacy growth of secondary students. Still much more comprehensive work needs to be done as challenges still persist and "teachers, administrators, and staff developers have asked for more examples of practices that might renew and revitalize their efforts for middle and high school students" (Rycik & Irvin, 2001, p. 4).

Teaching has greatly increased in range and complexity over the last decade. Teachers now find themselves in highly pressured environments (Pincas, 2002). Faced with the reality of overcrowded classrooms, high stakes testing, and standards-based environments, using instructional practices that move students to higher levels of thinking through more "authentic" forms of learning are lost. Additional factors

that compound the situation are high student mobility, absenteeism, minimal student engagement, misbehavior, missing homework, cultural and linguistic diversity, special needs, and increasing numbers of students from poverty and single parent households (Alvermann, Hinchman, Moore, Phelps, & Waff, 1998). Regardless of the number or degree of challenges, teachers still remain accountable for fostering literacy growth among all students.

Efforts to improve literacy learning for secondary students must take seriously the realities and challenges persistent in today's high schools. Reform theorists who suggest "improvement can be made through a series of workshops, enhanced technology, sanctions and the like," (Smylie, Bay, & Tozer, 1999, p. 59) are naïve at best. A new paradigm requires comprehensive and systemic change. It also requires a serious re-orientation towards broad organizational, political, and economic presuppositions on which definition and acquisition of change must be based. Moreover, it involves a commitment to putting teachers at the forefront of the reform process. Valencia and Wixson (2000) argue that it is time for the voices of teachers to be heard. Without empowered professional voices, we lose the potential for constructing serious reform.

Emerging Directions

If students are to achieve high literacy standards, evidence strongly suggests that what teachers know and can do is one of the more important factors influencing student achievement. (Darling-Hammond, 1999, p. 228). Research also makes it clear that "if teachers are to negotiate the demands of new standards and new students, they must have access to a deeper base of knowledge and expertise than most teacher preparation programs now provide" (Darling-Hammond, 1999, p. 229).

While several studies have looked at reform in teacher preparation programs, Schwartz (1996) concluded that reform changes in teacher preparation have resulted in "little more than adjusting on the margins" (p. 3). Particularly troubling, in secondary teacher preparation, is the limited attention given to the challenges existing in schools in which future teachers must help students to achieve literacy, and the problems

of schooling in a broader social context. Moreover, in many states, secondary teacher preparation programs include a requirement of a content area reading course, whereas in other states there is no equivalent requirement. This has remained literally unchanged for years, even as secondary students continue to struggle with reading and writing throughout the high school curriculum.

The wide-spread standards movement has made some impact in requiring newly certified teachers to demonstrate competency on specific literacy knowledge and performance indicators. However, the depth of what is needed to teach content area literacy in secondary schools requires more than one course, and/or a few standards.

Connecting Two Distinct Communities

Education can no longer be seen as an exclusive function, and the traditional structures cannot remain isolated from social change. Faculties in colleges and universities and the practicing teachers in secondary schools have no choice but to adjust to new paradigms. While it is now more common to find partnerships and institutional collaborations between university faculty and secondary teachers, many of these need redefinition. In many partnerships, "practicing teachers have related there has not been a high level of reciprocity, as the universities are too dominant" (Campbell, 2002, p. 22).

Each entity must put into the equation improvement strategies that are meaningful to their respective organizations; that is, they need to identify areas where they truly need help from one another. Then institutionally and programmatically, they need to find ways to work together to make those intended improvements a reality (Howey & Zimpher, 1999, p. 299).

High school teachers and teacher educators alike are looking to move beyond yet another "good idea" to realize reconceptualization and transformation for secondary literacy education. This means engaging high school teachers in the process of secondary teacher preparation, determining what factors pose the greatest challenges to literacy development and using this knowledge as a cornerstone for improving

literacy practices in schools. Failure to confront these challenges effectively will undoubtedly compromise the ability of teachers to serve as effective agents of change.

Purpose

The purpose of this study was to identify the problems secondary teachers face that impede literacy learning in the classrooms and to yield information that may inform the preparation of future secondary teachers. Two broad questions emerged to guide this study:

- What are the greatest literacy challenges facing high school content area teachers?
- What will help to diminish these challenges for current and/or future high school teachers?

The Study

Participating Schools and Teachers

The schools that participated in this study included eight high schools, seven public and one private. The researchers purposely selected the schools to ensure ethnic diversity as well as urban and suburban representation. Six of the high schools represented grades 10-12 and two included grades 9-12. The school principals granted permission to graduate students enrolled in a Masters Degree Program in Reading to place the *High School Literacy Survey* in the school mailboxes of the teachers. A total of 450 questionnaires, including a cover letter and a stamped return envelope, were distributed to 9-12 teachers. Two hundred and two questionnaires were returned, realizing a return rate of 45 percent. There were no follow-up attempts to obtain a higher return rate.

Most respondents (71 percent) had advanced degrees beyond the B.A. or B.S.: among these were 68 percent with a M.A. and 3 percent with a Ph.D. Teachers from 18 different subject area fields responded to the survey. English (18 percent), mathematics (16 percent), and science (15 percent) teachers comprised the majority of participants. The remaining teachers represented the following subjects; art (3 percent),

business (4 percent), technology (4 percent), driver's education (1 percent), foreign language (6 percent), history (7 percent), library (1 percent), music (1 percent), physical education (3 percent), reading (1 percent), radio/television (1 percent), social studies (8 percent), special education (3 percent), theology (3 percent), and vocational education (4 percent). Teachers with more than 10 years of experience accounted for 63 percent of the sample, while 37 percent had 10 years or less.

Teachers working in suburban areas surrounding the greater Chicago area comprised the majority (67 percent) of the sample population, with the remaining 33 percent coming from urban schools. Forty-four percent described their schools as predominately diverse (> 50 percent), 32 percent considerably diverse (30-50 percent minority), 17 percent somewhat diverse (10-30 percent minority) and 7 percent primarily white (less than 10 percent minority).

The Questionnaire

We collected the data from a survey instrument, *High School Literacy Survey*, designed and constructed by us. The questionnaire requested two types of information:

- objective, relating to educational degrees, content field of study, years of teaching experience, diversity of school population
- subjective, relating to opinions and values in teaching and learning

The subjective portion of the survey was comprised of two broad questions. The first question asked teachers to identify 5 of the 20 factors that posed the greatest challenges in helping their students to attain literacy in their subject field. Respondents wrote the numeral 1 next to the statement representing their greatest challenge, the numeral 2 next to the statement representing their next greatest challenge, and so forth through the numeral 5. (See Appendix)

The twenty statements, defined as challenges, were derived from the literature on content area reading. An extensive review of the literature

resulted in identifying twenty challenges, however, these may not represent all possible factors and they may not represent factors that teachers would have included if they were to construct the questionnaire. A space was provided for teachers entitled "other" for their convenience in identifying additional factors that pose as challenges. Since no specific theory was identified to serve as a foundation for the selection of factors, they represent an eclectic representation. Additionally, the factors were not defined on the questionnaire, indicating that a singular definition cannot be assumed and that the factors may represent multiple meanings in the field. The second question invited the teachers to respond openly to the question, "What do you believe will help to diminish these challenges for current and/or future high school teachers?"

Findings

Percentages were used to report the data on the high school teachers' perceptions about the factors that challenge them most in helping their students to achieve literacy in their subject area.

Table 1.
Percentage Responses of Factors that Represent the Greatest Literacy Challenges

Factors	Percent					Total
	1	2	3	4	5	
Assessment of student learning	2	1	1	2	2	8
Classroom environment	1	2	-	1	2	6
Class size	4	4	6	8	5	27
Cultural and language diversity among students	-	1	-	1	-	2
Curriculum	-	1	2	1	3	7

Factors	Percent					Total
	1	2	3	4	5	
Helping students to construct meaning from text	3	6	6	7	7	29
Helping students interpret graphics in text	1	1	-	3	2	7
Helping students to learn and use critical thinking skills	16	8	12	11	12	59
Helping students to locate and organize information	1	5	5	4	3	18
Helping students to understand concepts and vocabulary	8	3	6	11	12	40
Homework issues	5	8	10	6	7	36
Integrating technology for teaching and learning	1	5	2	1	3	12
Selecting materials for teaching and learning	-	-	1	-	4	5
Organizing and managing the classroom for learning	1	2	-	2	3	8
State/district/school standards for students	1	1	1	1	2	6
Struggling readers	9	9	8	8	8	42
Student motivation/interest/attitudes	33	17	17	8	7	82
Students with special needs	1	5	5	5	3	19

Factors	Percent					Total
	1	2	3	4	5	
Students who lack study skills	11	13	13	13	7	57
Writing skills of students	2	8	5	7	8	30

(A ranking scale, with 1 meaning "greatest challenge," 2 "next greatest challenge," and so forth)

The top five challenges as reported in Table 1 were:

- student motivation, interests, and attitudes (33 percent)
- helping students to learn and use critical thinking skills (16 percent)
- students who lack study skills (11 percent)
- struggling readers (9 percent)
- helping students to understand concepts and vocabulary (8 percent).

The least perceived challenges were cultural and language diversity among students (2 percent) and selecting materials for teaching and learning (5 percent).

Examining the data of the largest responding groups of content area teachers, English, mathematics, and science, yielded similar findings. All three of these groups identified the same top two challenges as did the total group. The English, mathematics, and science teachers' third, fourth and fifth rankings were:

- English
 - (3) homework issues
 - (4) students who lack study skills
 - (5) writing skills of students
- Mathematics
 - (3) students who lack study skills

- (4) homework issues
- (5) helping students to locate and organize information
- Science:
 - (3) students who lack study skills
 - (4) helping students to understand concepts and vocabulary
 - (5) helping students to construct meaning from text

The teachers were also asked to respond to the following open-ended question, "What do you believe will help to diminish these challenges for current and/or future high school teachers?" Seventy-seven percent of the teachers wrote responses to this question. The responses were grouped by similar topics from which themes emerged. Table 2 reports the percentages of the most frequently occurring responses to the open-ended question.

Table 2.

Themes and Percentages of Responses for Confronting the Greatest Challenges

Most Frequent Responses by Theme	Percent
Better basic skills instruction in elementary schools	64
More parent responsibility and support	58
Mandatory inclusion of critical thinking questions on all assessments	39
Study skills classes for incoming students	33
Improve teacher preparation/more methods for secondary teachers	28
Greater respect and support from society	20
Practical/useful staff development	11

Most Frequent Responses by Theme	Percent
Teacher task forces making policy decisions instead of politicians and administrators	9
Complete restructuring of the current traditional education model	7
A center at each high school for struggling readers	1

The most common responses cited by the majority of teachers to confront the greatest challenges (Table 2) were better basic skills instruction in elementary schools (64 percent) and more parent responsibility and support (58 percent). Sample responses given by less than 50 percent of the teachers were mandatory inclusion of critical thinking questions on all assessments (39 percent), study skills classes for incoming students (33 percent), and improvement of teacher preparation with more methods for secondary teachers (28 percent).

Discussion

The results of this study provide insight for the continuing efforts to improve the literacy levels of secondary students. They are, however, neither exclusive nor exhaustive. They are offered with no claim for the universality or total generalizability, but they are offered as a common ground for thinking.

Student Motivation and Attitudes

High school teachers identified student motivation to read, write, and do other literacy-related activities as their greatest challenge. The teachers' written comments on questionnaires indicated that much of the class-assigned reading is often boring and not relevant to the student's own interests and experiences. They also stated that the students who will not read are as much at a disadvantage as those who cannot. Student

motivation was ranked the greatest challenge of all for the participating teachers.

The dilemma of identifying and implementing strategies to motivate adolescents is not new to literacy practice. The data from this study confirm what the research (Alexander & Filler, 1976; Au & Asam, 1996; Benware & Deci, 1984; Collins-Block, 1992; Guthrie & Alao, 1997; Schraw, Brunning, & Svoboda, 1995) has documented over time: that student motivation, interests, and attitudes are indeed authentic challenges. Teaching adolescents to become active, motivated, and self-regulated learners is a continuing issue in secondary schools. It is during the adolescent years when reading motivation and attitudes appear to worsen, especially for poor readers (McKenna, Kear, & Ellsworth, 1995). Serious attempts to advance literacy skills require interventions that address motivation and attitudes as much as interventions that assure cognitive changes in the learners (Verhoevan & Snow, 2001). This generally does not happen. Motivational constructs are usually not given significant vigilance in relation to student cognition and thinking, and at best, are given only passing and superficial attention.

A further problem is that standard reading texts and uniform curricula make life somewhat easier for teachers and administrators, but they make it very difficult for students to get involved with the material at the level that is right for them, and therefore to find intrinsic rewards in learning. In the classroom, the teacher is the key element in motivating students to learn. The responsibility is great and the ramifications even greater, yet many responding high school teachers stated they were not adequately prepared in their teacher preparation programs with the knowledge, skills, and instructional strategies to ignite the spirit of their students. These teachers indicated they want more ideas, support, and freedom within the school curriculum to take the lead, and more ways to experience first-hand, in-field, motivational issues in their teacher preparation programs.

Critical Thinking Skills

Teaching critical thinking skills was the second greatest challenge for teachers. Large numbers of teachers indicated they feel under-

prepared in pedagogical methods to help students conceptualize problems and solutions. Assisting adolescents to become proficient with these skills is a prodigious challenge for secondary teachers. The capacity for abstraction, for discovering patterns and meanings, generalizing, evaluating, and theorizing is the very essence of critical thinking and exploration.

For most students in the United States and throughout the world, formal education entails just the opposite kind of learning. Rather than construct meaning for themselves, meanings are imposed upon them. Frequently, students often accumulate a large number of facts along the way, yet these facts are not central to their education; they will live their adult lives in a world in which most facts learned years before (even including some historical ones) will have changed or have been reinterpreted. Whatever data they need will be available to them at the touch of a computer key.

If students are to learn critical thinking skills, teachers must teach them and engage their students in genuine problem solving discussion. Generally these skills are best, and likely only taught and assessed, through extended discourse. This is difficult to do in crowded classes where it is near to impossible to carry out extended discussions. The commitment to teaching these skills in all content areas means gaining support from the public. It also means that teachers must gain the knowledge and skills to do so through teacher preparation programs and inservice education, taking into account the real-life situations and parameters in today's classrooms.

Study Skills

Students who lack study skills ranked as the third greatest challenge to teachers. The importance of study skills has been documented over time in the professional literature (Flood & Lapp, 1995). What is known is that many people of all ages have difficulty reading and learning, largely because they are not using appropriate techniques or good learning habits. Often, the adolescents who are dropping out of schools are doing so because they believe they cannot learn. For the majority of these students, they lack suitable reading and study techniques, which

impede their growth in learning and contribute to their negative beliefs about themselves and school.

Although most secondary teachers have a thorough understanding of their subject, many responding teachers in this study indicated they lack the knowledge of instructional/study strategies by which to help students internalize the concepts. Research shows that with an organized system of study, students can increase their comprehension of subject matter up to 50 percent (Annis, 1983). As nations seek to assist adolescents in gaining higher levels of literacy, the knowledge and skills that teachers need to teach their students effective study habits and strategies may likely become central to the curriculum in secondary teacher preparation programs and in the curriculum of secondary schools.

Struggling Readers

Struggling readers ranked as the fourth greatest challenge to the high school teachers. Teachers responded that these students can be found "hiding out" in content classrooms. They frequently are passive and disengaged. Many have found coping strategies to help them get by, but they do not significantly improve their literacy skills or their knowledge in the content areas.

Although comprehension of text material is difficult and sometimes impossible for struggling readers, there are research-based strategies that have proven to be successful when used with struggling readers. One such strategy is instructional scaffolding, an effective strategy that gives students a better chance to be successful than if left on their own (Vacca, 2002). Pedagogy, which includes instructional techniques for diverse learners, is glossed over in many teacher preparation programs for secondary teachers. However, it is as important in the preparation of high school teachers as is cognitive knowledge (Darling-Hammond, 2000). If high school teachers are to make substantial contributions to all adolescents, it will require more knowledge of relevant instructional methodologies.

Darling-Hammond (2000) found that teacher subject-matter knowledge was related to student achievement only up to a certain point.

Marzano (2003) asserts that the importance of the relationship between pedagogical knowledge and student achievement has been consistently reported in the research literature. Furthermore, in a study conducted by Ferguson and Womack (1993), they found that the number of courses teachers took in instructional techniques accounted for four times the variance in teacher performance and student achievement than did subject-matter knowledge.

Teachers stated that more information about how to assist the struggling readers in their classrooms is sorely needed in preservice teacher education programs. Additionally they need to know that the strategies and support to assist these learners are realistic for today's classrooms.

Key Concepts and Vocabulary

Helping students to understand concepts and vocabulary ranked as the fifth greatest challenge. Every subject area has its own vocabulary and modes of argument, and its language is the common denominator for learning subject matter knowledge. Vacca and Vacca (2002) agree: they state, "Vocabulary must be taught *well enough* to remove potential barriers to students' understanding of texts as well as to promote a long-term acquisition of the language of a content area" (p. 160-161). Teachers want more knowledge about ways to teach vocabulary and concepts to adolescents, strategies that will provide adolescents with a deeper and richer entry into the content area of study, and strategies that will work in the classrooms of today.

Intriguing Findings

It is a noteworthy finding that the cultural and language diversity among students in the classrooms was not identified among the greatest challenges. The majority of teachers in this study were from diverse schools, and yet only two percent ranked this to be a challenge. Equally notable was the fact that state, district, and school standards, writing skills, and integrating technology were not identified among the greatest challenges.

Of all the findings, the most revealing was that provided by the driver's education teachers: whereas every other content-area group of teachers, albeit art, music, business, foreign language, etc., ranked student motivation as the greatest challenge, they did not. This is not surprising as it supports the findings of this study as well as long standing research in the field, as cited in Marzano, 2003. The hypothesis being that when motivated, students strive to learn. It is likely safe to say that >99 percent of all high school students want to learn to drive.

Teachers Views for Confronting the Challenges

The high school teachers stated that improving literacy for secondary students must begin long before the high school years. They believe it requires better basic skills instruction in elementary schools, more parental responsibility and support for adolescents, and greater respect and support for education professionals from society. The secondary teachers further reported that mandatory inclusion of critical thinking questions on all assessments at local, state, and national levels may lead to improvements in the literacy levels of students.

The majority also reported that study skills must become a required part of the curriculum beginning in elementary schools. Teacher education programs need to emphasize study skills knowledge and strategies that are content specific and will assist future teachers with ways to help their students achieve literacy in their subject areas. Staff development needs serious attention and reform. Emphasis needs to be on real issues identified by the teachers, and the staff development needs to be content specific. Some teachers elaborated that schools can do little to improve high school literacy because the things that need to be changed are outside the scope of the educator's responsibility.

A smaller percentage of teachers stated that teacher task forces, instead of politicians and administrators, should make policy decisions at all levels. Several called for a complete restructuring of the current education model and structuring of schools to contain a "center for struggling readers." Others stated that teachers should have a full year-round professional contract: envisioning that students would attend school for 10 months and teachers would work the remaining two

months revising curriculum, collaborating with colleagues, and participating in relevant and rigorous staff development. These teachers held similar views with Brandt (2001), as they see their schools attempting to implement elements of the newer ideologies of literacy into traditional structures and curriculum which results in institutional confusion, vulnerability, and a mismatch of schooling and society in contemporary times.

Conclusions and Implications

Improving literacy levels for secondary students is too complex for simplistic explanations, yet one thing seems clear: faculties in schools of education need to attend to the voices of secondary teachers. When we fail to do so, we do this at the peril of the students they teach. The voices of the teacher participants in this study identify the greatest challenge to literacy development to be student motivation, and the teachers feel unprepared to deal with this serious challenge. Marzano (2003) states:

The link between student motivation and achievement is straightforward. If students are motivated to learn the content, then they will achieve in that subject. If students are not motivated to learn the content, then achievement will likely be limited. The validity of this relationship is supported by a fair amount of research (Bloom, 1976; Geisler-Brenstein & Schmeck, 1996; Schiefele & Krapp, 1996; Schiefele, Krapp, & Winteler, 1992; Tobias, 1994; Willingham, Pollack, & Lewis, 2002) as reported in Marzano (p.144).

The other greatest challenges, critical thinking skills, study skills, pedagogy for struggling readers, and vocabulary and concept development, need critical attention as well. To successfully confront these challenges, the most critical and urgent need, as stated by the teachers, is to revise secondary teacher preparation.

Implications for Secondary Teacher Preparation

Faculty in secondary teacher preparation programs have a pivotal role to play in the literacy growth of adolescents, as well as the

preparation of secondary teachers. The results of this study point to the following implications for secondary teacher educators.

- Engage in partnerships between secondary teacher preparation faculty and practicing secondary teachers. Partnerships in which the voices of practicing teachers are central to reform in secondary teacher preparation, and the voices of college and university teacher educators are central to high school literacy reform.
- Revise the secondary teacher preparation curriculum to include more opportunities for prospective teachers to experience and understand the real-life literacy challenges identified in this study.
- Create a secondary teacher preparation curriculum that gives significant attention to motivational practices, such as incorporating the new media, which has become integrally bound up with adolescents' affiliations, identities, and pleasures (Nixon, 2003).
- Reform the secondary teacher preparation curriculum that divides subject matter courses and methods' courses. "Content and processes of learning to teach must be brought together, since how teachers learn, shapes what they learn and is often part of what they need to know" (Feiman-Nemser & Remillard, 2001, p.78). The debates that center on the disciplinary boundaries that keep scholars apart and leave students to make their own interdisciplinary connections must invite new initiatives.
- Align and teach pedagogical practices, critical thinking skills, study skills, and vocabulary within subject matter content.
- Finally, teacher educators need to provide students with more sustained and guided experiences; those which help prospective teachers learn to teach those things that matter most to students in ways that are meaningful to them, and are grounded in actual classroom practice.

These views provide common ground for discussion and future exploration regarding improving literacy skills and understanding for secondary students. Moreover, they involve a commitment to secondary literacy reform in a context of uncertain challenges and outcomes. What would it mean to build comprehensive, integrated partnerships across institutional lines and across disciplines? What powerful vision might we see if we could finally get hold of the big picture (Schoem, 2002) of secondary education? If secondary teacher education programs were redesigned along the lines of the characteristics identified in this study, teaching and learning experiences would look much different and would represent a newly defined literacy for secondary students and their future teachers.

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Appendix

High School Literacy Survey

This study is being conducted by Mary Campbell, a faculty member in the School of Education at Saint Xavier University. The purpose of this study is two-fold. The study seeks to, 1) determine the greatest literacy challenges facing high school content area teachers today, and 2) determine the ideas high school teachers have to improve content area literacy practices in classrooms. Your participation in this study is strictly voluntary; there are no penalties if you choose not to participate. If you decide to participate, the information you provide will remain completely anonymous.

Demographic Information (Please check the appropriate response)

1. Your highest academic degree (check one)
☐ BA/BS ☐ Masters ☐ Doctorate

2. Your primary teaching responsibility is in which of the following content areas?
☐ Art
☐ Business
☐ Computers
☐ English
☐ Foreign Language
☐ History
☐ Mathematics
☐ Music
☐ Physical Education
☐ Science
☐ Social Studies
☐ Vocational Education
☐ Other _____

3. Your high school classroom teaching experience:
☐ first year teacher

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- ☐ 1-5 years
 - ☐ 6-10 years
 - ☐ 11-20 years
 - ☐ more than 20 years
4. Ethnic Origin
- ☐ White (Non-Hispanic)
 - ☐ Hispanic
 - ☐ African American
 - ☐ American Indian or Alaskan Native
 - ☐ Asian or Pacific Islander
 - ☐ Other
5. Which best describes your school? (check two)
- ☐ Urban
 - ☐ Suburban
 - ☐ Public
 - ☐ Private
6. Which best describes your school? (check one)
- ☐ Predominately diverse(50percent + minority)
 - ☐ Considerably diverse(30-50percent minority)
 - ☐ Somewhat diverse(10-30percentminority)
 - ☐ Primarily white (Euro-American less than 10percent minority)
7. Gender
- ☐ Female
 - ☐ Male

SURVEY QUESTIONS

1. Please identify what you believe to be the 5 greatest challenges in helping your students to attain content literacy in your subject area. On the lines provided, write the numeral 1 meaning your greatest challenge, the numeral 2 meaning the next greatest challenge, the numeral 3 for the next and so forth p to 5.

_____ Assessment of student learning

- _____ Classroom environment (physical setting and classroom conducive to learning)
- _____ Class size
- _____ Cultural and language diversity among students
- _____ Curriculum
- _____ Helping students to construct meaning from text
- _____ Helping students interpret graphics in text material
- _____ Helping students to learn and use critical thinking skills
- _____ Helping students to locate and organize information
- _____ Helping student to understand concepts and vocabulary
- _____ Homework issues
- _____ Integrating technology for teaching and learning
- _____ Selecting materials for instruction and student learning
- _____ Organizing and managing the classroom for learning (discussion, activities, etc.)
- _____ State/district/school standards for students
- _____ Struggling readers
- _____ Student motivation/interest/attitudes
- _____ Students with special needs
- _____ Students who lack study skills
- _____ Writing skills of students
- _____ Other _____

2. What do you believe will help to diminish these challenges for current and/or future high school teachers? Please write your ideas below.

Thank you for your participation in this study



Teaching Metalinguistic Skills To Enhance Early Reading Instruction

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This article focuses on practical classroom ideas for enhancing early literacy learning by teaching a broad range of metalinguistic skills. These skills include phonemic and word awareness, but focus largely on syntactic and pragmatic skills in order to give children a richer understanding of language and its functions. Theoretical background is provided along with activities that can be used in the primary classroom.

TEACHERS TODAY ARE DEEPLY concerned with the literacy development of low-income and minority children (Snow, 1991). Not only do these children lag behind children who are more economically and socially advantaged, but the gaps between their achievement and the achievement of others become greater as they enter the middle elementary grades (Snow, 1991). In fact, less than half of these disadvantaged children will achieve literacy skills beyond a basic level (Applebee, Langer, & Mullis, 1988). Recent research has focused on emergent literacy or the development of literacy related skills prior to formal reading instruction (e.g., Bissex, 1980; Heath, 1982; Snow & Ninio, 1986; Sulzby, 1986; Teale, 1986). Much of this research has been related to knowledge about print and phonemic awareness. While successful beginning readers need to have skills in letter recognition, phoneme segmentation, and word recognition, they also need "broad cultural understandings about literacy, its value and its uses" (Snow, Tabors, Nicholson, and Kurland, 1995, p. 37). In other words, children need to learn how language works in addition to acquiring language skills.

Children learn about language through social interaction. In her work, Catherine Snow (1991) suggests that social interaction plays an important role in predicting a child's oral language achievement and in turn, this achievement may predict success in learning literacy skills. According to Snow, et al. (1995), "the prerequisites for literacy acquisition [should include] print knowledge, culture of literacy, metalinguistic awareness, and decontextualized oral language skills" (p. 38). This has many implications for the kindergarten and first grade classroom. Young children need to develop metalinguistic awareness or the ability to think about and manipulate the structural features of spoken language (Tunmer, Herriman, & Nesdale, 1988, p. 136).

Metalinguistic Ability

Metalinguistic ability can be divided into four broad categories (Tunmer, et al., 1988):

- phonological
- word

- syntactic
- pragmatic awareness

Phonological and word awareness refer to the ability to think about and use phonemes and words. Syntactic awareness is the ability to think about the structure of language. The final category, pragmatic awareness, involves the purposes for which we use language (Snow, Burns, & Griffin, 1998). Perhaps with so much emphasis being placed on the development of phonological awareness, other aspects of language are being ignored. We believe that in a balanced literacy program, attention must also be placed on the syntactic, semantic, and pragmatic components of language learning.

Of the four types of metalinguistic abilities, phonological and word awareness have received the most attention (Tunmer, et al., 1988). Many Kindergarten and first grade teachers predominately focus on these aspects of metalinguistic development. This is understandable because there is much evidence to support that phonemic awareness is a powerful predictor of later reading achievement (Juel, Griffith, & Gough, 1986; Lomax and McGree, 1987; Tunmer & Nesdale, 1985). Because there are many resources for teachers on how to provide instruction that aids children in acquiring and developing phonemic awareness, we have chosen to focus this paper on instructional practices which teachers of emergent and early readers can use to enhance the learning of these other often overlooked aspects of language learning.

Syntactic Awareness

Syntactic awareness is an understanding for the structure of our language and influences reading development by enabling readers to monitor their comprehension processes and by helping children acquire useful word recognition skills other than sound symbol correspondence. (Tunmer et al., 1988; Roth, Speece, Cooper, De La Paz, 1996). Children with a good ear for the structures of standard English as well as literary structures are more skilled at trying out different pronunciations of words with uncommon spellings until they find the one that "sounds right" and "makes sense" in terms of standard language structures. This puts children who speak English as a second language or in an informal

register (Joos, 1967) at a disadvantage. For instance, the pattern "ough" is pronounced differently in each of the following words: dough, cough, and rough. In order to identify these words, a successful reader must know the different pronunciations for the spelling pattern, have word knowledge, and have a sense of what would be appropriate syntactically.

Syntactic awareness is a skill that even young children can develop. Children under the age of two demonstrate knowledge of syntactic awareness when they understand the difference between two sentences where the subject and predicate are reversed. Very young children understand the difference between "Mommy is calling Daddy," and "Daddy is calling Mommy." As children mature, their own sentences grow in length and complexity. This sophistication allows them to understand and use more complex language (Snow et al., 1998).

Children become more sensitive to semantic and syntactic features in reading as they mature and have more opportunities to use language. These skills develop dramatically in grades one through three (Muter & Snowling, 1998).

If syntactical awareness is a fundamental language skill that children need to become successful readers, we need to ask how teachers can provide instruction that scaffolds the development of these skills. There are several strategies that we have found to be effective.

Teachers regularly engage in shared, interactive and guided writing with their students, but for the vast majority of time they model concepts of print, print conventions, and phonics skills. We have found that if time is spent modeling and thinking aloud about the structure of language and especially written language, children begin to internalize this knowledge. Following is a transcript of what this conversation and writing might look like:

- T: "I want to write about our trip to the zoo yesterday and I need your help." "What would be a good way to start my story?" Turn to your neighbor and discuss possible ways to begin. (Children talk)
- T: Who would like to share what they discussed? Jeremy.

- S1: We think it would be good to start with "We went to the zoo yesterday."
- T: Why do you and your partner think that is a good idea?
- S1: It sounds like other beginnings.
- T: Could we write the sentence another way using the same words?
- S2: Yesterday we went to the zoo.
- T: Are both ways correct?
(Kids nod)
- T: Does one sound more like how we talk? ...Does one sound more like book language?

The above vignette shows a conversation in which the teacher is deliberately focusing the children's attention on the differences between language patterns used in writing and speaking.

Another example illustrates how interactive writing can be used to help students who speak in nonstandard English develop an ear for more formal structures. Notice that the teacher uses this opportunity to teach explicitly.

- S: "We gots to go to the zoo yesterday."
- T: Yes, we did get to go to the zoo yesterday. When we write we need to use formal language like we find in books. So we would write "We got to go to the zoo yesterday."

With an ESOL student, a teacher may find it necessary to provide more scaffolds and conduct this as a guided writing session. In this case, the teacher would work with one or two students and guide them as they write the sentences on their own papers.

- S: We get to go to the zoo yesterday.
- T: (Teacher writes both sentences as she speaks) We get to go to the zoo tomorrow. Yesterday we got to go to the zoo. Now you say your sentence using the word got.
- S: (Teacher writes the sentence as the child says it.) We got to go to the zoo yesterday.

This would be followed up by making word cards for both of these sentences and having the child put the words together to make two correct sentences. After repeated practice and when the teacher is confident that the child can correctly reassemble the sentences, they will be sent home.

Pragmatic Awareness

Another kind of metalinguistic ability is pragmatic awareness. Pragmatic awareness is the ability to use language appropriately in social contexts (Halliday, 1975, 1977; Snow et al., 1998). Snow et al. suggests that children develop pragmatic awareness in three areas. The first is conventional speech, such as requesting something, getting attention, or describing something. In the second area, children develop conversational skills like taking turns, sticking to a topic, and expanding a topic. The third area deals with producing extended autonomous speech like narratives, explanations, and definitions. Halliday (1975, 1977) explains that children develop socialized speech and an understanding for the functions for which they use it through interaction with others. Understanding the various uses for and the structure of language (Moore, 1995) are two areas that are problematic for poor readers. By teaching children to "tune in" to the structure of language, children's reading skills will be strengthened. Teachers can introduce the concept of text structure including the structure of narrative text and uses of language through teacher read alouds and shared reading. Both the syntactical features and the pragmatic functions of language are components that build metalinguistic knowledge.

A teacher read-aloud supports the development of syntactic and pragmatic knowledge because it invites children to participate in the reading process with a text that is often too difficult for them to read on their own. Teachers model good reading and thinking behaviors. Children participate in rich discussions about carefully chosen books which exhibit or possess the desired characteristics. Read-alouds help children develop schema and expectations for different types of text and invite children to become engaged and motivated. Emergent storybooks are particularly useful for teacher read-alouds. They are students' introduction to the wonderful world of literature and reading. These

books are *not* intended serve as texts for teaching students to decipher print.

Emergent Storybooks should tell a wonderful story that children want to hear over and over again and have a basic story structure with a recognizable beginning, middle, and end. The characters, often animals or toys, are easy for children to identify with and will serve as a young child's first independent reading as they approximate the reading process with very familiar text. These books contain a rich literary language and provide many language learning opportunities. One example might be a discussion about the use of imagery in creating the setting. A first grade teacher might choose Leo Lionni's *It's Mine* as a read-aloud. This story, with its memorable characters, basic storyline, and rich language introduces emergent readers to the use of imagery to develop setting. The very first page reads *In the middle of Rainbow Pond. There was a small island. Smooth pebbles lined its beaches, and it was covered with ferns and leafy weeds.* The teacher could read this page and say something like, "Leo Lionni has painted me a picture with his words. If I think about these words as I read I can create a picture in my mind. I can even think about last summer when I went camping near a pond and I can recall how the ferns and weeds were growing all around. Turn to your neighbor and talk about the picture you see in your mind." After a few minutes the teacher might share some conversations they overheard and then go on reading. This book could be revisited many times for many purposes.

Shared Reading actively engages readers in the reading process. As the name implies, the teacher and students share the responsibility for the reading of the text. A shared reading text should tell a good story and have characters and situations for which children can relate. The illustrations should be attractive and support the text. The text should contain rich memorable language that is predictable with a familiar or cumulative sequence. Every child should have access to the print. While shared reading texts are usually in big book form with large print, in some cases a shared reading might involve each child having a copy of the text. Shared reading provides opportunities to investigate the workings of print with a teacher who is providing scaffolding and modeling. The primary distinction between a shared reading text and an

emergent storybook is that a shared reading text is meant to be read by the students and teacher while an emergent storybook should be read by the teacher and will generally be above the reading level of most of the children.

Narration, storytelling, or oral descriptions are forms of discourse that serve as an important transition between oral language and literacy acquisition. Therefore, it stands to reason that children's discussions during and after a teacher read aloud as well as oral story retellings will assist them in acquiring skills that are likely to contribute to their later success in reading. A child's prior experience with syntactical structures of written and spoken language, the pragmatic aspects of language, story structure, story comprehension, and story production may be influential in learning to read and developing the ability to comprehend text.

Additionally, children need many opportunities to have real conversations where they practice describing and explaining things to others. Teachers can facilitate these conversations, but it is important to maintain high expectations for students to use complex and varying sentence structures. This will not happen quickly or easily. Teachers must provide lots of modeling, scaffolding, and give explicit feedback to students as they are learning how to converse with one another. A fishbowl activity may be useful for helping children understand what a "real" conversation and/or discussion "sounds and looks like." For example, the teacher would ask her class to form a circle on the floor and she might invite one student to sit in the center with her to demonstrate a conversation about a nonfiction book. In this case, the discussion is about how nonfiction books use both text and pictures to help the reader understand the concepts being discussed. The children would use sticky notes to mark places in their nonfiction texts where they learned something new by using both text and pictures.

T: Michael, when I was reading this book, I learned that frog's ears are called tympana and that they look like flat circles just behind the eyes. The picture helped me understand what the words said. Did you find a place in your book where words and pictures together helped you understand better?

- S: In my book about turtles, I learned that turtles that live on the land have elephant-like feet. Sea turtles have flippers like paddles and turtles which live in fresh and salty water have webbed feet. The pictures showed me exactly how their feet look.
- T: How interesting, Michael. I did not know that sea turtles had such different feet from other water turtles. In my book about frogs, I learned about a flying tree frog that has large webbed feet that puff up like parachutes. The picture was really helpful, because I could not imagine what its feet really looked like. As a reader of nonfiction, it is so important to know that the pictures and text work together to help me understand the information better.

After the demonstration, the teacher would discuss it with the class. The teacher would help the students recognize that the conversation was focused on this strategy for reading nonfiction text. She would then ask students to work in pairs to discuss the places in their own nonfiction text where they used text and pictures together to better understand the material.

Conclusion

Downing (1979) likens language to a glass through which children view the world (in Snow, et al., 1998, p.45). At first they do not suspect that it has its own existence or aspects of construction, yet in order to grow in literacy this perception must change. Children must treat language as an object of thought. They must develop metalinguistic awareness or the ability to think about and play with language apart from its meaning. Today in the United States, the most powerful nation in the world, many children continue to fail to acquire even basic literacy skills. We believe that most teachers have the structures in place for effective instruction, but need to increase the direct and explicit teaching of metalinguistic skills and facilitate children's use of language as a tool for thinking. Because of the predictive power of these metalinguistic skills on reading accuracy and comprehension, children who do not receive quality literacy experiences in their pre-school years must be provided with intensive instruction when they arrive in Kindergarten. Teachers can

support emergent and early readers by teaching these language skills explicitly during modeled, shared, and guided reading as well as during interactive writing. Much time must be spent modeling and talking about the uses and functions of language. Children need ample time to discuss and explore ideas with peers and teachers, to practice using language for different purposes, and to learn how oral language relates to the written word. Simply put, if adequate time is devoted to developing oral language, metalinguistic skills, and critical thought processes in young literacy learners, more children will successfully learn to read in the early grades.

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Reading and Writing Poetry in Math

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Though poetry and math may seem to be unrelated, there are parallels such as rhythmic language and language skills. Reading and writing poetry about math involves students with listening, speaking, reading, and writing in order to develop and demonstrate an understanding of mathematical concepts and relationships. This article features an annotated list of mathematical poetry books and a variety of writing ideas for math poetry. Encouraging students to read and write poetry about math will encourage them to find a deeper meaning of math concepts as they develop their poetic voices.

AT FIRST GLANCE, it would appear that poetry and math are at the opposite ends of the elementary curriculum. Poetry relies on the nuance of metaphor, the crispness of diction, a dance of symbolism, emotion, and action. On the other hand, math is governed by rules and a demand for estimates and right answers; it presents students with rows and columns of numbers and requests a solution. Upon closer examination it is obvious that both poetry and math rely on patterns and are dependent on students' skill with language, whether it is the language of verse and rhythm or the language of symbols and signs. The research on the relationship between rhythm and math, the importance of language skills to math, and the benefits of writing poetry are relevant when proposing that reading and writing poetry in math classes will be valuable for students.

Review of related literature

The relationship between rhythmic language and math

When defining poetry, people usually include phrases such as: "an important characteristic of poetry for children is the musical quality of the work" (Danielson & LaBonty, 1994, p. 144) or "a poem has a music of its own" (Huck, Hepler, Hickman, Kiefer, 2001, p. 352) or "poetry is the rhythm of our living" (Luce-Kapler, 1999, p. 298). It does not seem possible for us to talk about what poetry is or is not or how to create it without referring in some way to rhythm or music, and it is the musical nature of poetry that connects it to math. The claim that rhythm and math are connected is supported by the research regarding the language preferences of infants and children and studies that link exposure to music to skill with math.

A preference for rhyme and rhythm is contained in the linguistic make-up of all humans; rhyme is easier to recall than prose; rhythm helps carry the predictability of language. There is pattern and measure in every language and in the way we structure our lives (LaBonty, 1997a). We know that infants are born with a preference for hearing the musical type of language that parents supply almost automatically when they talk to a baby. This soft, lilting language, often called 'baby talk' or 'parentese', includes changes in stress, pause, and juncture, and the

repetition and rhyme that are the exact elements of poetry (Reich, 1986). Once they learn to talk, children still cling to a love of musical language; as young as three they invent their own rhymes and poetic, sing-song speech (Danielson & LaBonty, 1994).

With studies that further connect rhythm to math, researchers have reported that exposure to music rewires the neural circuits in the brain, enlarging its somatosensory cortex of the brain (Begley, 1996). Applying this complex information to practice, Shaw and Rauscher (as cited in Begley, 1996) found that children who took music lessons improved significantly in their ability to solve mazes, draw geometric figures, and copy patterns. The results of their study led them to conclude that music strengthens the circuits in the brain that will later be used for math. The attention to, and expectation of, a pattern that is developed when listening to music is also reinforced in poetry.

The importance of language skills to math

Poetry is an ideal vehicle for fine tuning language skills (Hadaway, Vardell, & Young, 2001), and skill with mathematics is dependent in part on students' facility with math as a language and their comprehension of the language of math (Miller, 1993). The National Council of Teachers of Mathematics has included the importance of the "language of math" for students in all grades (*Principles and Standards for School Mathematics*, 2000, p. 60). Monroe and Livingston (2002) emphasize the important role that language plays in understanding math. They suggest that children's trade books (picture books) can provide an ideal vehicle for learning this unique lexicon. Concepts of numeracy; relationships such as first, same, different; geometric labels, and information about time, money, and measurement are appealingly presented in picture books for children. Illustrations are designed to entice and enhance the text and in doing so they encourage prediction on the part of the reader, a skill essential in math (Monroe & Livingston, 2002).

The facets that make picture books conducive to learning the language of math are evident even more powerfully in poetry, in part due to its brevity, rhyme, and repetition (Christison & Bassano, as cited in Reid, 1995). Poetry contains the same elements of story grammar that

makes trade books written for children so appealing (Cullinan, Scala, & Schroder, 1995). Oral reading activities that center on poetry enhance fluency, a component of mastering any language (Gasparro & Falleta, 1994). The brevity, the strong aural quality, and the clear focus of poetry make it ideal for language development. Many of the benefits of sharing poetry with children also support the skills that are needed for success with math: poetry enhances oral reading skill and improves the ability to listen and it exposes children to rich vocabulary words (LaBonty, 1997a). Reading and listening to poetry about math allows children to use language to learn about math while satisfying their need for beauty in words.

The benefits of writing poetry

The values of having children write poetry are also well-documented. Steinberg (1999) asserts that writing poetry develops children's facility with metaphorical language, a precursor to abstract thinking. Huck et al. (2001) discuss the value of having children write poetry as a means to excite them about reading it. The language play that is integral to poetry helps children expand their understanding of the world and how it functions (Grainger, 1999). Luce-Kapler (1999) states that "the writing or reading of a poem is a way of coming to know in a different language" (p. 299).

Kuhlman and Bradley (1999) recommend poetry writing as a means of helping children develop voice in their written work. The collaborative work that can be involved in writing poetry helps children function as "problem solvers rather than information receivers" (Hadaway et al., 2001, p.798). Creating poetry that explores and demonstrates mathematical concepts accomplishes many goals. It involves students with listening, speaking, reading, and writing in order to develop and demonstrate an understanding of mathematical concepts and relationships.

Reading poetry about math

Poetry evokes emotions and gives clarity and fresh originality to the abstract and challenging facets of math. It is simultaneously reductive and expansive and by using all the features of language, poets can stretch

our understanding of difficult concepts while they surprise and intrigue us. There are several collections of poetry and individual poems about math that will appeal to teachers and students. Whether a poem is used to introduce or conclude math class it will catch the attention of the class and give a unique perspective and an invigorating outlook on the topic at hand.

Mathematical poetry books

Atherlay, S. (1995). *Math in the bath (and other fun places, too!)*. Ill. by M. Halsey. New York: Simon and Schuster.

Math is everywhere, if we only pay attention! These poems feature math throughout the school day (in music, art, social studies, recess) and math at home as well (dividing a pizza, bubbles in the bath). The book ends with a list of mathematical concepts found each day, a perfect invitation for further writing about math.

Barrett, J. (2002). *I knew two who said moo*. Ill. by D. Moreton. New York: Scholastic.

This counting book focuses on the rhyme of each of the numerals, 1 through 10. Students might try to write their own rhymes for other numerals (11 through 20) for a class book or act out the story in Reader's Theatre format with illustrated posters or pictures.

Franco, B. (1999). *Counting caterpillars and other math problems*. New York: Scholastic.

Poems and companion activities are included in this lively collection of verse about counting, addition, subtraction, shapes, patterns, measurement, time, and money.

Heide, F. P., Gilliland, J. H., & Pierce, R. H. (1999). *It's about time*. Ill. by C. Flalwell. New York: Hyperion.

Illustrated with the charming actions of a blue-haired child, this book contains poems about the minutiae of telling time and the grander concepts of past and present.

Hopkins, L. B. (1997). *Marvelous math: A book of poems*. New York: Simon & Schuster.

This collection of 16 math poems presents a variety of math concepts in verse form. From time to measurement and even the occasional outrage of math (Sammy has a long division poem stuck in his brain), this medley of math poems celebrates the subject matter.

Lewis, J. P. (2002). *Arithme-tickle: An even number of odd riddle-rhymes*. Ill. by rank Remkiewicz. San Diego: Harcourt Brace.

This is a collection of rhyming word problems that encourages readers to apply their mathematical problem solving skills. Answers are found upside down at the bottom of each page.

Pappas, T. (1991). *Math talk: Mathematical ideas in poems for two voices*. New York: Wide World Publication.

Pappas' book features poems about a variety of mathematical concepts such as googols, radicals, and triangles in side-by-side verse that is meant to be read by two voices. The format serves as an ideal vehicle for having students use the poet's pattern to write their own math concept poem (See examples further on).

Shields, C. D., & Meisel, P. (1995). *Lunch money and other poems about school*. Ill. by P. Meisel. New York: Trumpet.

Shields and Meisel have written poems that address schools issues familiar to every child: finding lunch money, learning how to add, writing the dreaded book report, and watching the clock for recess time.

Tang, G. (2001). *The grapes of math*. Ill. by H. Briggs. New York: Scholastic.

This rhyming book of verse offers various addition problems that advise the reader to group the objects on the page to add. The back of the book offers strategies (such as grouping by ten) to make adding large numbers easier. Students could use these poems as a springboard for their on math strategy poems.

Tang, G. (2002). *Math for all seasons*. Ill. by H. Briggs. New York: Scholastic.

Another rhyming book of verse gives children story problems to solve. The back of the book again offers strategies for answering each one. In the preface of the book, Tang suggests that this book might "make a smoother transition from counting to arithmetic by introducing intuitive ways to group and add numbers" (Tang, 2002, unpagged).

Ziefert, H. (1999). *Mother Goose math*. New York: Puffin.

Mother Goose is used to highlight the numbers. From "1, 2, Buckle My Shoe," to "Sing a Song of Sixpence," math and Mother Goose join together for a trip down memory lane.

Poems about math

Numerous poetry anthologies contain individual poems related to math that can be shared with students.

Ciardi, J. (1985). *Doodle Soup*. Ill. by M. Nacht. Boston: Houghton Mifflin.

"There's nothing to it" p. 12

"How much is a gross?" p. 28

Dakos, K. (1990). *If you're not here, please raise your hand*. Ill. by G. B. Karas. New York: Simon and Schuster.

"Math is brewing and I'm in trouble" p. 4

"They don't do math in Texas" p. 17

Korman, G., & Korman, B. (1992). *The D-poems of Jeremy Bloom*. New York: Scholastic.

"How to wake a guy for school" p. 81

"I pulled an A" p. 88.

Merriam, E. (1989). *Chortles*. Ill. by S. Hamanaka. New York: Morrow.

"Gazinta" p. 9

"A number of words" p. 16

Prelutsky, J. (1983). *The Random House book of poetry for children*. Ill. by A. Lobel. New York: Random House.

"Homework" p. 141 (Russell Hoban)

"Homework" p. 141 (Jane Yolen)

"Smart" p. 157 (Shel Silverstein)

"Arithmetic" p. 218 (Carl Sandburg)

Prelutsky, J. (1984). *The new kid on the block*. Ill. by J. Stevenson. New York: Greenwillow.

"Nine mice" p. 9

"A Microscopic topic" p. 100

"Forty performing bananas" p. 147

O'Connell George, K. (2002). *Swimming upstream: Middle School poems*. Ill. by D. Tilley. New York: Clarion.

"Math" p. 26

"Is it Monday again?" p. 38

Silverstein, S. (1981). *A light in the attic*. New York: Harper and Row. (unpaged)

"How many, How much?"

"Homework machine"

"Eight balloons"

"Shapes"

Silverstein, S. (1996). *Falling up*. New York: Harper Collins. (unpaged)

"The monkey"

"Allison Beals and her 25 eels"

"When I was your age"

Writing poems about math

Once children have been exposed to the variety of poetry about math they will be ready to try their hands at writing math poems. Poetry is briefer than prose and writing it makes less demand on time during the day; its brevity is appealing to novice writers. The process lends itself to partner work, cooperative writing, and solitary writing, giving the teacher flexibility in grouping for poetry-writing activities during math class. When we remove the expectation of rhyme, poetry writing takes on new possibilities of quality writing since skillfully-written children's poems often depend on syllable count, on a specific number of words, or on certain parts of speech for rhythm and structure (LaBonty, 1997b; Luce-Kapler, 1999).

The quality of the finished products can be enhanced with specific teaching strategies. If children brainstorm before they begin their poems it will help them choose words carefully. Developing semantic maps will encourage young poets to organize their thoughts. Once the teacher has introduced the rhythmic elements or pattern of a certain poem, one or two examples can be developed as a class.

I used to be . . . but now poems

Students can use the following pattern to describe mathematical terms:

I used to be _____
But now I'm _____

The following example was written by fifth graders:

I used to be a 10, but now I am 100 (because I was squared)
I used to be a 9, but now I am a 3 (because I was square rooted)
I used to be a 15, but now I am a 3×5 (because I was factored)
I used to be a $\frac{3}{3}$, but now I am a 1 (because I was divided)

Alphabet pyramids

These are cumulative poems that contain specific parts of speech that begin with the same letters.

- Line 1: the letter
- Line 2: a noun
- Line 3: add an adjective
- Line 4: add a verb
- Line 5: add an adverb

The following example was written by middle school students:

R
Remainder
Reluctant remainder
Reluctant remainder remembers
Reluctant remainder remembers recess

Terquain

A terquain is a descriptive, three line poem.

- Line 1: one word, the subject
- Line 2: one or two words about the subject
- Line 3: one word, a feeling about the subject

This is a terquain from a second grader:

Circle
Big ball
Round

Cinquain

A cinquain is a five line descriptive poem that contains about 22 syllables.

- Line 1: the subject
- Line 2: four syllables describing the subject
- Line 3: six syllables showing action
- Line 4: eight syllables expressing a feeling or observation about the subject
- Line 5: two syllables renaming the subject

Sixth graders wrote this cinquain about base numbers:

Base 2
Two numerals
Only two numerals
Representing all the numbers
Zero, One

Diamante

A diamante is a seven line poem that compares opposites using specific parts of speech. The diamond shape of the finished product gives this poem its names and it is ideal for helping students compare and contrast mathematical concepts.

- Line 1: noun for the subject
- Line 2: two adjectives describing the subject
- Line 3: three participles
- Line 4: four nouns, two about the subject, two about its antonym
- Line 5: three participles describing the antonym
- Line 6: two adjectives
- Line 7: the antonym

The following examples are from middle school students studying geometry:

Square
Flat, same
Drawing, measuring, rotating
90 degree angle, lines / brick, eraser
blocking, building, erasing

three-dimensional, hard
Cube

Base
Parallel, flat
Measuring, counting, seeing
Floor, ceiling / walls, sides
Classifying, building, dividing
Lateral, cylindrical
Surface

Haiku

Haiku is Japanese poetry that contains three lines and 17 syllables arranged in a 5-7-5 pattern.

The following haiku is from middle school students:

Perpendicular
Two straight intersecting lines
Forming right angles

Tanka

This is another type of Japanese poetry that contains 5 lines and 31 syllables arranged in a 5-7-5-7-7 pattern.

This is a tanka poem from a fifth grader:

Denominator
Find a common one to add
Fractions easily
The least common multiple
Is often the one you need.

Parody

A parody poem borrows its structure and rhythm from someone else. This is a student version of a poem from *Math talk: Mathematical ideas in poems for two voices*:

Addition	Addition
Start with	start with
Six	
Then add	then add
	Seven
What you are left with	
	Is 13
Which is also called	
The unlucky sum.	The unlucky sum.

Fill in the blank poems

Using parts of speech and specific guidelines students can write poems that stretch their understanding of math.

I LIKE

I like (noun) _____

Adj. _____ Noun

Adj. _____ Noun

Adj. _____ Noun

Adj. _____ Noun

Any kind of _____

I like _____

Noun _____ Prep. Phrase

Noun _____ Prep. Phrase

Noun _____ Prep. Phrase

Noun _____ Prep. Phrase

I like _____

Adj. _____ Noun

Adj.	_____	Noun
Adj.	_____	Noun
Adj.	_____	Noun
Adj.	_____	Noun
Adj.	_____	Noun
I like	_____	

An "I Like" poem from third graders:

Addition

We like addition
Easy addition
One through ten addition
Hard addition
Fat answer addition
Any kind of addition
We like addition
Addition in school
Addition at home
Addition at the store
Addition at the game
We like addition
Any kind of addition
Quick addition
Scribbly addition
Copy cat addition
Computer addition
Homework addition
Test addition
We like addition!

Definition Poem

Name it
Describe it
Tell where it would be found
Tell more about it
Use emotion words to tell how you feel about this

Explain why you used the emotion words on line 5
A definition poem from a fourth grader:

Fractions
Broken into pieces
Splitting up a pizza
Means part of the whole
Friendly, sharing work
Give me half of yours!


Poetry and math would seem to be natural partners. As students put their own words to the mathematical operations they are learning, math finds deeper meaning and poetry becomes its voice.

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Matching Instructional Design with Vocabulary Instruction

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Instructional design is an integral part of a balanced approach to teaching vocabulary instruction. The goal of this paper is to reflect on several lessons using research-based vocabulary strategies, and to present think-alouds that detail the steps in matching instructional design with those strategies in order to reach the learning outcome. Vocabulary instruction should encourage students to make associations and accommodations to their experiences and provide them with varied opportunities to practice, apply, and discuss their word knowledge in meaningful settings. The ultimate goal of teaching vocabulary is for the students to expand, refine, and add to their existing conceptual knowledge and enhance their reading abilities (Rupley, Logan & Nichols, 1999). Students should be engaged in learning new words and expanding their understanding of words through instruction that is based on active processing. A key component of effective vocabulary instruction is thoughtful reflection about instructional design.

THROUGH OUR RESEARCH, observations, and discussions with students and classroom teachers over the years, the primary strategy used for vocabulary instruction is to focus on the memorization of an arbitrary set list of words. The instructional features typically include looking up the definitions of words in the dictionary, doing some type of skill work (e.g., writing sentences, definitions, word find), and taking a test at the end of the week. We imagine that this method of vocabulary instruction will also sound familiar to the readers of this text and begs the important question: "What instructional strategies will better enable students to learn, retain, and use their vocabulary knowledge rather than memorize words for a test and seldom use the words thereafter?"

Vocabulary instruction is an integral component of teaching children how to read both narrative and expository text. Students who are successful at decoding can, and often do, struggle with comprehension when they encounter too many words for which they have limited or no meaning. Not having access to the meaning of words representative of the concepts and content of what they read causes difficulty in children's comprehension of texts, limits their ability to make a connection with their existing background knowledge, inhibits their capacity to make coherent inferences, and impacts their ability to reason (Heilman, Blair, & Rupley, 2002). As noted by Joshi (in press), vocabulary is the connecting link between decoding and comprehension. Vocabulary knowledge that is rich and well developed contributes significantly to fluent reading (Cunningham & Stanovich, 1997); however, poor vocabulary knowledge hampers reading comprehension and reading development (Pinnell, Lyons, Deford, Bryk, & Seltzer, 1994; Madden, Slavin, Darweit, Dolan, & Wasik, 1993).

Readers' experiential and conceptual backgrounds are crucial in vocabulary development. Background experiences are what the learners rely on to develop, expand, and refine concepts that words encountered in speech and print represent. Since individuals' background knowledge development is continuous, refinement, elaboration, and acquisition occur throughout their lives. Therefore, the vocabulary that reflects this background knowledge is also in an endless state of development (Readence, Bean, & Baldwin, 1998). Direct and vicarious daily experiences with concepts constantly modify meanings for words as new

information is associated into existing concepts for the word, or the new experience with the word may have to accommodate an adjustment or modification to the concept itself.

Learning either a new word, or concept for that word, requires an active process of vocabulary development. Students learn and process new words to the extent the new word relates to other words and concepts already known by them. Connections between previously learned vocabulary words and new words encountered in reading help students begin to understand relationships among words. When instruction is based on strengthening these connections, students are not just asked to provide an abstract definition of a word, but instead are asked to make connections between the newly encountered word, their past experiences, and how these past concepts fit with the stories and informational texts they are currently reading (Rupley, Logan, & Nichols, 1999). Knowing a word in the fullest sense goes beyond simply being able to define it or getting some basic meaning for the word from context, instead it means being able to discuss, elaborate and demonstrate the meaning of the word in multiple contexts in which the word occurs.

Researchers Goerss, Beck, & McKeown (1999) support the use of instruction that encourages students to make associations and accommodations to their experiences and provides varied opportunities for students to practice, apply, and discuss their word knowledge as a means for students to learn and retain new vocabulary. Students should be engaged in learning new words and expanding their understanding of words through instruction that is based on active processing. Students must go beyond just memorizing definitions, to integrating the word meaning with their existing knowledge in order to build conceptual representations of vocabulary in multiple contextual situations. As students expand their experiential and conceptual backgrounds, they expand and refine their knowledge of words.

Furthermore, when reading instructional design is paired with appropriate vocabulary strategies, learners can further refine their vocabulary knowledge based on these experiences. Instructional activities that visually display new words while at the same time

allowing students the opportunity to compare and contrast these new words to already known words can be a beneficial means for increasing students' vocabulary knowledge. Biemiller (1999) has noted that students can learn two to three new words a day when the instructional strategies are based on active processing and applied in context. For this reason, vocabulary strategies such as concept wheels, semantic word maps, webbing, semantic feature analyses, and teaching relationships among words are effective tools that incorporate many of the guidelines for the active processing of vocabulary.

Such vocabulary activities enable students to expand their vocabularies, understand relationships between the new word and existing concepts, and ultimately learn the meaning of the new word. These strategies when matched with the appropriate instructional design can become part of pre-reading activities, during reading activities, and post reading activities. When used as a pre-teaching activity these visual displays of words can activate and construct key concepts prior to reading, which help motivate and set a purpose for the reading task, while at the same time reinforcing the cohesiveness between vocabulary development and reading comprehension.

It is important that vocabulary instructional practices immerse students in language-rich activities that teach words as part of meaningful reading experiences. Vocabulary instruction that never allows students the opportunity to fully own new words, such as copying a list of words' definitions from a dictionary and flashcard activities provides no active or actual learning of the new concept associated with the word. Vocabulary instruction, whether it is focused on narrative or informational text, is most effective when it relates new words or derivations of words to students' existing vocabulary and background knowledge.

Using instructional guidelines that reflect active processing components (Blachowicz & Fisher, 1996; Blachowicz & Lee, 1991), we have attempted to walk through and think aloud how teachers might match instructional design with a vocabulary strategy in order to reach the learning goal. The following instructional techniques paired with an appropriate vocabulary strategy build on students' existing background

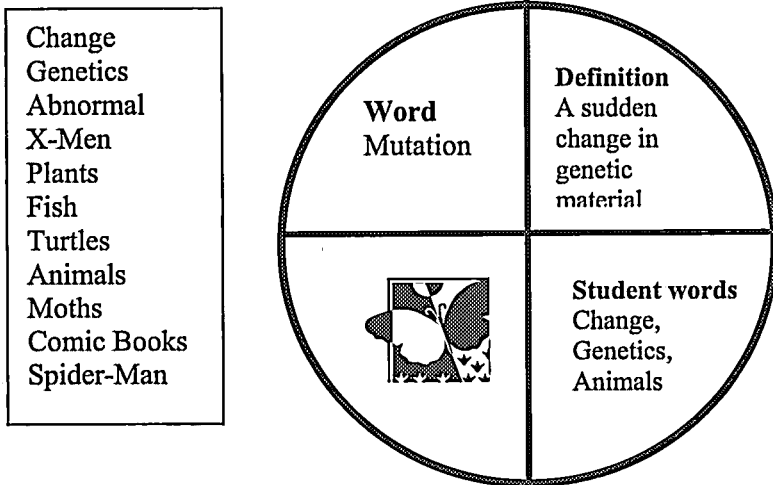
knowledge, encourage brainstorming and discussion and at the same time visually display the connection between previous conceptual knowledge and the new words being encountered. We will try to thoroughly describe and explain each of the strategies from the perspective of the classroom teacher.

Concept Wheels/Circles/Squares

Concept wheels provide students an opportunity to critically examine words and relate them conceptually to one another (Heilman, Blair, & Rupley, 2002; Rupley, Logan, & Nichols, 1999; Vacca & Vacca, 1999). This instructional procedure builds on students' background knowledge and stimulates brainstorming and discussion. When introducing this instructional vocabulary strategy to students, it is a good idea to have a pre-made list of the vocabulary words with space provided for brainstorming, and pre-made concept wheels that include a section for the vocabulary word, a section for the definition, a section for related words, and a section for the picture (Figure 1).

Figure 1. A Concept Wheel/Circle

Mutation



The activity is best begun with a whole class focus and review of the content in which the new vocabulary words are located. Using the K of the KWL (Know, Want to Know, Learned) (Ogle, 1986), or another similar strategy, students should be asked to share everything they already know about the subject. For example if the unit was on adaptation and behavior, the teacher would start the lesson by asking students to share what they already know about adaptation and behavior as it relates to their science class.

Next, the teacher would provide the list of new vocabulary words to the students. Still in a whole class setting, the teacher would then allow students to brainstorm words that came to mind when they heard the new vocabulary word. For example, if the new science term were mutation, the teacher would ask the students to brainstorm everything that comes to mind when they hear the word mutation. The teacher then records the brainstorming session on the board or overhead. After about a minute per word of brainstorming, the students and teacher reflect upon the brainstormed list and the teacher directs a word sort activity. For example, because this is part of a science unit on adaptation and behavior, the teacher and students would organize the brainstormed words into two categories, words that seem to coincide to what the students already know about adaptation and behavior as it relates to science and words that seem to relate to something else. Using the example above (mutation), students might brainstorm words such as: change, genetics, abnormal, X-Men, fish, turtles, plants, comic books, etc. While all of these words may have something to do with mutation, certain words such as change, genetics, and abnormal seem to be critical to the understanding of mutation and words such as, fish, turtles, and plants, may be more relevant to the unit on science than words such as X-Men or comic books.

For some students the brainstorming activity provides the opportunity to activate their background knowledge around the new term. They make associations between the new word, and in many cases, already well-developed concepts regarding the word. For other students, such as struggling readers, it provides them with an opportunity to begin to accommodate and construct concepts in which the new term will be an additional component. For the students, who prior to brainstorming had

no idea about the word mutation, they now have an idea that it may have something to do with change in genetics, fish, turtles, plants and so forth. While the brainstorming is a critical part of this lesson, the concept wheel itself serves as a visual display in which the new vocabulary connections can be viewed and more correctly represented.

Once all of the words have been brainstormed and sorted, the teacher then provides the students with pre-made concept wheels with the word and definition already provided in two of the quadrants. Together the teacher and students examine the definition for the word and discuss how the brainstormed words fit the definition. Students then are instructed to complete their concept wheels by including words from the brainstormed list and a picture that will help them remember the definition of the new word.

Concept wheels can be modified in many different ways, for example instead of drawing a picture or listing words students can either create analogies, write sentences, use synonyms and antonyms, or some other technique that will help them make associations or accommodations for the new vocabulary word. The concept wheel can also be used as a review strategy by providing students with completed concept wheels and instructing them to add the new vocabulary terms to the completed organizer.

Semantic Word Mapping

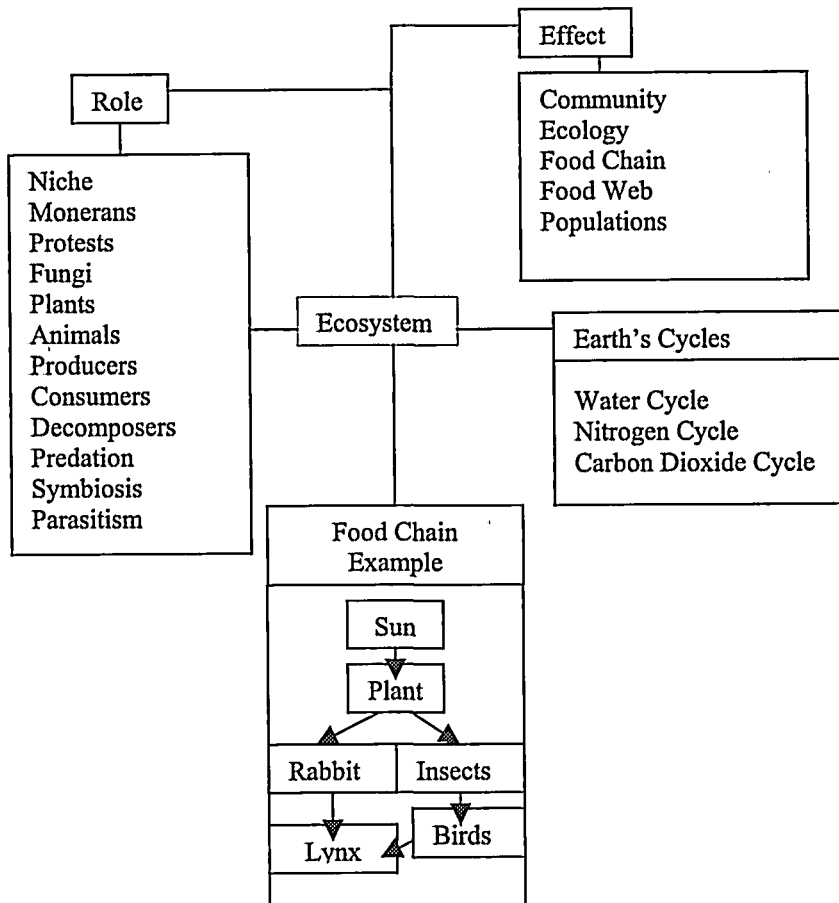
Semantic word mapping (Schwartz & Raphael, 1985) incorporates many of the recommended guidelines for vocabulary teaching, such as activating and building background knowledge, encouraging discussion about the attributes of words, and displaying visually the connections between the new word and existing concepts about the word. These instructional strategies enable students to enlarge their vocabularies, understand relationships between existing and new concepts, perceive multiple meanings of words, and become actively engaged in the learning process. Semantic word mapping allows structuring information into categories so that students can more readily see relationships between new words and concepts and their existing background knowledge. Heimlich and Pittelman (1986) define a semantic map as a

diagram that groups related concepts through the use of a graphic organizer and allows the learner to visually display the connections between the concepts. According to Vacca and Vacca (1999) concepts create mental images and these mental images can be grouped by similar criteria or attributes. These visual representations of concepts can lead to a deeper understanding of the new word and allow the learner to see how the new word relates to the existing mental image of the concept. This is extremely beneficial to the struggling learner, who may already feel overwhelmed and be under the impression that each object, or event that is encountered is unique and not related to other concepts.

While semantic word mapping can be used for a variety of purposes and with a variety of texts, it seems to be vital for pre-teaching struggling learners difficult concepts and information for content area text. Upon completion of the semantic word map, the teacher discusses with the students how the new vocabulary words relate to words that they already know. Students thus understand better the content of the topic they will cover or the story they will read. Figure 2 presents an example of a semantic word map for a unit on ecosystems and illustrates how teaching certain words prior to reading can help students activate their background knowledge, relate existing knowledge to new concepts, and understand how new words and concepts are related.

The process should start in whole group by the teacher inviting class discussion by relating students' past reading and direct experiences to the semantic map. In discussing the semantic word map, students must think about the relationships between the target word and their experiences. In this case the target word would be Ecosystems. When using content that may not be familiar to the students, such as concepts found in many expository text, the teacher may want to consider allowing students a few minutes to survey the chapter so that background knowledge can be activated or built. Once students have had a chance to survey the material, they need to brainstorm and write down as many words that they can think of that relate to the central theme or topic.

Figure 2. A Semantic Word Map for Ecosystems



Next, have students form small heterogeneous groups and have the students sort the brainstormed list of words into categories and label these categories. Once this is completed move back to whole class, and focus on shared negotiation as the students and the teacher place these newly sorted categories around the central word or topic. At this point the teacher may want to add additional words essential to the topic. In the case of Ecosystems the teacher may need to add key vocabulary such as

niche, ecology, community, cycles, food chains, populations, etc. Make sure to provide time for discussion and questioning as it relates to the newly constructed semantic map.

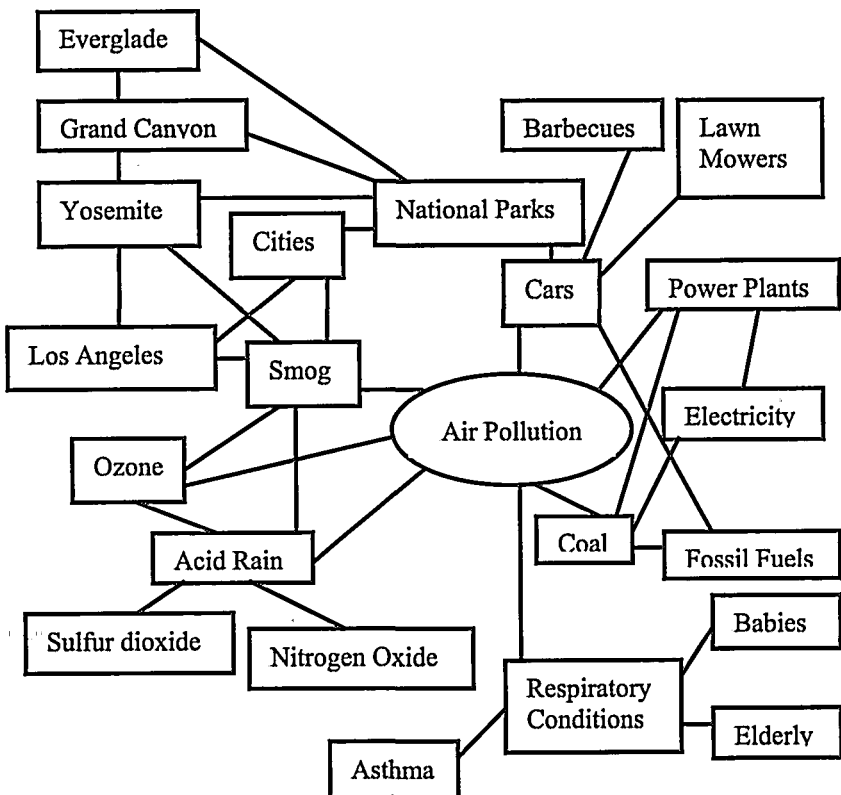
Once again, just as with the concept wheel, struggling learners, who prior to the semantic word mapping activity had a limited understanding of ecosystems, are now able to accommodate the new information into modified schemata. A semantic map used prior to reading gives the struggling learner a scaffold that facilitates comprehension of expository text, which provides the non-visual information that the struggling reader needs to free themselves from textual restraints.

Webbing

Another instructional vocabulary strategy based on graphic organizers and visual information is webbing. This method graphically illustrates how to associate word meaning and enables students to make connections between what they know about words and how they are related. Webbing makes it possible for students to see the relationship between words and concepts that they have already read or experienced. To help promote concept acquisition and vocabulary knowledge, teachers can leave the center word blank. Students can begin to understand the relationship of words in the web by choosing and discussing words that might complete the center word. The web in Figure 3 was done with a fourth grade teacher directing students to think of words that could be associated with air pollution. As noted in the web, their responses ranged from smog, cars, and cities to ozone and acid rain. Each time a child added a word to the web a new word was associated. For example, when one child said the word smog, another child immediately raised her hand and added the word city, which elicited another response Los Angeles. These students were obviously recalling previous information they had heard or read about smog. Of course these initial responses were just scratching the surface of the content on the science chapter dealing with air pollution. As the students gained more knowledge about air pollution through their interaction with the text and the activities conducted in class, they updated their web by adding other words, places and concepts such as national monuments and parks, electricity, coal, fossil fuels, respiratory conditions, asthma, sulfur dioxide, nitrogen oxide, etc.

The main difference between webbing and mapping is that webbing is more of a free association of words and is more student centered, while mapping imposes more teacher directed categorization of the new concept. Webbing can be used to introduce a lesson to determine students' vocabulary and concept knowledge, to summarize a lesson that reflects what students have learned, and as a follow-up activity in which students can expand and refine their own webs as they critically evaluate the web or use the web to assist in the writing of a report or short story. Cells can be linked by a variety of relationships, such as synonyms, antonyms, expanded concepts, connotations, and preciseness as illustrated in Figure 3.

Figure 3. A Semantic Web of Words for a Unit on Air Pollution



Semantic-Features Analysis

Semantic-features analysis (Johnson & Pearson, 1978) can help students improve their vocabulary and categorization skills, understand relationships among words, relate their background knowledge to the new words, and expand and retain content area vocabulary and concepts. Figure 4 is an example of a semantic-feature analysis on polygons used by a fifth grade teacher. Semantic-features analysis (SFA) is most appropriate for words related by class or common features.

Figure 4. A Semantic-Feature Analysis for Polygons

Features

Polygons	2 pair parallel sides	1 pair parallel sides	Right angles	Even # of sides	Odd # of sides	All sides equal	Some sides equal	Equal angles
Parallelogram								
Rectangle								
Square								
Rhombus								
Trapezoid								
Pentagon								
Hexagon								
Heptagon								
Octagon								
Nonagon								
Decagon								

Semantic Feature Analysis created by: Beth Swain, and Gillian Rai

For example, in order to develop students' understanding about basic geometric ideas most elementary grade math curriculum includes a study on polygons. While words such as parallelogram, rectangle, square, rhombus, trapezoid, pentagon, hexagon, heptagon, octagon, and so forth are very difficult for most elementary students to grasp when encountered in a math text, they all share a common characteristic in the fact that they are all polygons. Since part of the math curriculum states that it is important that students know the differences between these geometrical terms, a semantic-feature analysis would be a good instructional strategy to use.

In order to analyze these similar words it is best to start the semantic-feature analysis activity by once again combining this instructional strategy with another instructional strategy such as the KWL chart. While students are in a whole class setting, the teacher would ask students to share everything they currently know about polygons and shapes. Usually, when conducting this lesson, a student states that there are types of shapes, and on further prompting students generate the names of several types of shapes including circles, squares, rectangles, and triangles. As students share what they know about polygons they realize that shapes have different lengths and widths, different angles, and different amounts of sides. Upon the completion of the K of the KWL chart, the students are guided to discuss features associated with polygons. As the students suggest features, they are written across the top of the board or chart, creating a matrix that the students complete in terms of present (+), absent (-), and sometimes (0). As students broaden and define their concepts, the teacher adds words and features to the list and analyzes them. In order to facilitate comprehension of the text in which these words occur, the teacher may want to guide the selection of the features that will be used to analyze the selected vocabulary. In the example provided on polygons, the characteristics associated with the polygon types might be number of parallel sides, right angles, even number of sides, odd number of sides, all sides equal, some sides equal, and equal angles.

Once the students have completed discussing the features of polygons, the teacher may want to discuss the etymologies of the

vocabulary words that the students will encounter as they attempt to complete the semantic-feature analysis chart. Providing students with the Greek etymologies for /tri-/ , /penta-/ , /hexa-/ , /hepta-/ , and /octa-/ can be beneficial to the students as they complete the chart.

After the completions of the K of the KWL chart, the discussion of the features, and the examination of the word origins, students attempt to complete the semantic-feature analysis on their own. Since most of these words are still unfamiliar to the students and because they are unsure of the features of the polygons the analysis usually takes a couple of minutes. Having each student attempt to complete the chart individually first establishes ownership of the activity and activates each student's individual knowledge about the words. After this initial struggle with the SFA (semantic feature analysis), place students in heterogeneous groups and have them reach a consensus and complete one SFA based upon what the group already knows about polygons. Placement of students in heterogeneous groups and allowing them the opportunity to deliberate and discuss what they know about the vocabulary terms increases their knowledge of the word, stimulates the active involvement in the reading activity, and provides peer scaffolding for the struggling learner in the classroom.

After several minutes in the groups, the teacher should pull the whole class back together to complete the W of the KWL chart. At this point the W may actually change from what I Want to know about polygons, to what I Need to know about polygons in order to complete the semantic-feature analysis chart. As the students work on the KWL chart, they determine what they need to know about polygons in order to differentiate between the polygons. For example, they realize that they need to know which polygons have which amounts of sides, which polygons have equal angles, and which polygons have parallel sides. All of the questions developed during the W of the KWL chart reflect the initial struggles that the students had while interacting with the SFA. These questions now become legitimate reasons for reading the text, thus setting a purpose for reading and facilitating comprehension of the text.

Each of these activities has been a pre-reading activity that activated background knowledge for the text and provided a purpose for reading. Most importantly, it enabled further vocabulary development for

concepts and knowledge about what they would read.

Students would now be ready to move to the math text and begin actively reading and interacting with the material in order to accurately complete the semantic-feature analysis and answer their questions presented on the KWL chart.

Upon completion of the during-reading-activity the teacher can pull all of the students back together as a whole class to have them discuss what they learned about polygons and create a whole class SFA that is agreed upon by everyone. This post reading activity helps students make connections between what they knew about polygons and shapes at the beginning of the vocabulary lesson and what they now know about polygons at the completion of the lesson, thus completing the L of the KWL chart.

In addition to content-area text, semantic-features analysis can be used with narrative reading materials to analyze characters, settings, plots, and so forth. It is also effective in the content areas when introducing new topics, reviewing topics, and integrating topics across different content areas.

Summary

The words that readers know represent the concepts and information available to them to comprehend and understand what they read (Anderson & Freebody, 1981; Brett, Rothlein, & Hurley, 1996). Readers who know a word in its fullest sense can associate experiences and concepts with the word. Vocabulary knowledge supports the reader's text processing and interaction with the author, which in turn promote the formation and validation of concepts and new learning.

Increasing one's vocabulary is much more than learning names to associate with experiences. Vocabulary knowledge closely reflects students' breadth of real-life and vicarious experiences. Students cannot comprehend and understand well without some knowledge of the concepts that are represented by the print. As noted by Rupley, Logan, & Nichols (1999), "Vocabulary is a shared component of reading and

writing—it helps the author and the reader to comprehend through the shared meanings of words” (p. 337).

Any instructional practice that fails to teach words so that students encounter the words in meaningful text and fails to immerse the students in vocabulary-rich activities must be called into question. Teaching vocabulary within the context of real books and teaching words that are functionally important within a particular content area can promote vocabulary development (Zechmeister, Chronis, Cull, D’Anna, & Healy, 1995).

Vocabulary emphasis should include direct/explicit instruction and appropriate practice in specific skills along with broad reading opportunities and other language activities. We support a position that recognizes both wide reading and explicit vocabulary instruction to:

- relate new words to background knowledge
- provide opportunities to encounter and learn new words
- focus on words that have utility in learning new concepts.

To enhance vocabulary learning, engage students in discussions about the words they are learning from their reading of literary and content-area texts.

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