

# Theory and Research Into Practice: Examining the Role of Gaming and Learning in Vocabulary Instruction for Struggling Readers

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The 21st century is a time of rapidly changing technology that has fundamentally changed the way we live and how we function, especially in our ability to communicate and access information. As Prensky (2001) illuminates, today's students "think and process information fundamentally differently" (para.4) than previous generations of learners. The digital age has shaped a new generation of children who have grown up immersed in new media technology their entire lives. Prensky aptly refers to them as "digital natives" who are native speakers of the digital language of computers, video games, the Internet, emails, and instant messaging.

Keeping pace with new technology is an especially daunting task for those in the education field. Although the increase in the use of new digital technology is causing literacy and national technology standards to be redefined (Luke & Elkins, 1998; RRSF, 2002; Devaney, 2007), according to the Federation of American Scientists (2006), "textbooks and teacher lectures remain the mainstay of teaching and learning" (p. 11). The question still remains as to how to harness the full potential that new technologies have to offer students and teachers alike.

For the last decade, the U.S. Department of Education has responded to addressing the ever-changing educational landscape by promoting research that explores innovative uses of technology through its Star Schools Program, which falls under the Office of Innovation & Improvement's Technology in Education Programs. The most recent 2005 Star Schools grants were awarded to projects that met their priorities of improving instruction in the areas of reading and math by utilizing mobile technologies and the use of games and simulations for use in supplemental educational services (SES).

Pacific Resources for Education and Learning (PREL) was awarded a 2005 Star School grant for JUMP Into Reading for Meaning (JUMP). The JUMP project focuses on the development, delivery, and evaluation of a supplemental vocabulary instructional game for the Nintendo DS™. The curriculum targets low-performing 4th grade students enrolled in after school and SES programs to address the "4th grade slump"—a well-documented drop-off in standardized test scores that occur as these students encounter progressively difficult texts and content-area reading.

This digital game-based vocabulary enrichment program is designed to increase 4th grade struggling readers' word knowledge and use of word learning strategies to help improve comprehension. JUMP increases the amount of time struggling readers are engaged in vocabulary learning through the use of mobile handheld devices in extended school settings.

## RATIONALE AND THEORETICAL BASE

The latter elementary grades are critical for students. During this period, the increased cognitive load of reading to learn in content areas and exposure to more complex linguistic structures make it especially challenging for struggling readers (Chall, Jacobs, & Baldwin, 1990; Hirsh, 2003). Researchers propose that a "4th grade slump" can be attributed to students lacking the comprehension skills and vocabulary knowledge to deal with the greater number of abstract, technical, and literary words found in 4th grade texts and beyond (Chall & Jacobs, 2003). Hiebert (2005) found that within the typical 4th-grade text, approximately 4.3 words per 100 words are rare or uncommon words not likely to be a part of students' oral vocabularies.

The latest National Assessment of Educational Progress (NAEP) data revealed that, despite the fact that for the first time in 30 years of testing gains were made at 4th grade, performance

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at 8th grade continued to be flat (Perle, 2005). Clearly, the “inoculation” model of educational reform, that for years has focused on early literacy needs, has begun to make an impact, but it remains evident that students in 4th grade and beyond need continued support in reading.

The act of reading involves a complicated orchestration of skills and processes to construct meaning from written text. Invariably, comprehension is the ultimate goal of reading. However, as Pressley (2000) emphasizes in his review of comprehension instruction, and as reviews and syntheses of research make clear (Snow, Burns, & Griffin, 1998; NRP, 2000; RRSg, 2002) a number of component skills underlie skilled comprehension. These include phonemic awareness, phonics, fluency, and vocabulary.

The focus for the JUMP project is on vocabulary development. Decades of research have found that vocabulary is inextricably linked with comprehension. As noted by the National Reading Panel (NRP; 2000), reading comprehension cannot be understood without examining the critical role of vocabulary learning and instruction. This is supported by numerous correlational studies that have revealed a strong relationship between the extent of students’ vocabulary knowledge and their ability to comprehend text (Baumann, Kame’enui, & Ash, 2003; Anderson & Freebody, 1981; Becker, 1977). In fact, vocabulary is a major determinant of poor reading comprehension, and students’ word knowledge is strongly linked to academic success (NRP, 2000; Nagy, 1988). Studies have shown that vocabulary knowledge in the primary grades is a predictor of reading comprehension in the middle and secondary grades (Cunningham & Stanovich, 1998; Scarborough, 1998).

Lack of vocabulary knowledge clearly makes reading, especially reading in the content areas, an overwhelming task for students. To compound the issue is the fact that many children who have primary languages other than English and children from lower socioeconomic status begin school without the necessary literacy experiences that help provide a sophisticated foundation in the vocabulary of literate English. Hart and Risley’s (2003) definitive longitudinal study found that by age 4, based on cumulative experiences with words heard, there is a 30 million word gap between children from lower socioeconomic status and children from higher socioeconomic status.

This is supported by logical analyses and empirical data (Becker, 1977; Chall & Jacobs, 2003; Chall, Jacobs, & Baldwin, 1990; Hirsch, 2003; Biemiller, 1999) that indicate lack of vocabulary is the single most important factor underlying the school failure of disadvantaged children. Moats (2001) refers to this stark situation as “word poverty,” which emerges as a huge challenge for educators, since it is difficult to narrow the gap once it has been established (Biemiller, 1999, 2001; Hart & Risley, 1995). Many students are able to increase their vocabulary naturally by reading widely and extensively. Clearly, for struggling readers, acquiring vocabulary primarily through reading is “not efficient enough to produce the desired rates of learning” (Nagy

& Scott, 2000, p. 280). Biemiller (2001) suggests that in order to compensate for the differences in word knowledge between high- and low-performing students, “vocabulary-disadvantaged children have to acquire vocabulary at above-average rates” (p. 26).

## ENGAGEMENT AND MOTIVATION

With an emphasis on new levels of achievement and high-stakes learning to accommodate the requirements of the *No Child Left Behind Act of 2001* (NCLB), engagement and motivation are critical factors that need to be in place for students who face difficulties while on the “fast track” of learning to read. Frustration and discouragement are roadblocks to learning for these children who have years of schooling ahead of them. Allowing them to experience successful reading experiences is especially important when the demands placed on students increase as requirements to read more expository text in the content areas of math, science, and social studies become more intensive at approximately 4th grade. The RRSg (2002) cites a number of investigators (e.g., Guthrie & Wigfield, 2000; Skinner, Wellborn, & Connell, 1990) who have documented the roles motivation and engagement play as links between instruction and achievement. Studies have found that motivation facilitates long-term engagement in reading (Guthrie, Schafer, Wang, & Afflerbach, 1995; Oldfather & Wigfield, 1996).

In fact, recent reviews of motivation and engagement by the National Research Council (2004) show that motivation and engagement are crucial to any sort of school success. The RRSg concludes that instruction that combines ways to increase student engagement can affect reading comprehension outcomes in a positive way (PREL, 2004).

The potential of technology to engage and motivate struggling readers plays a key role in the JUMP project. As Kamil, Intrator, and Kim (2000) confirmed in their study, technology is highly motivational for students. McKenna, Reinking, Labbo, and Watkins (1996) also note that the interactive capabilities of the computer and multimedia are an effective way to make reading less frustrating and more enjoyable. Moreover, computers and other technology provide the necessary practice, support, and motivation that are critical for students who have reading difficulties (Meyer & Rose, 1998). In fact, Kim (2002) found that “due to its great potential for providing reading supports, computer software has been credited as an effective tool for teaching reading to students who suffer from reading difficulties” (p. 8).

Additionally, while electronic and digital texts may present possible challenges to comprehension because of the non-linear nature of features like hypertext, it also has the potential to support reading comprehension through quick hyperlinks to definitions and other electronic text features (RRSg, 2002). According to some empirical research, a dual code theory of information processing makes multimedia information more memorable because there are two memory traces—verbal and visual—

instead of one (Mayer, 1997; Mayer & Moreno, 1998; Plass, Chun, Mayer, & Leutner, 1998).

JUMP is motivated by the NRP (2000) findings that computer technology with multimedia formats has great potential for effective vocabulary instruction. The interactive and supportive quality that technology can provide is an ideal context for vocabulary development. In addition, technology permits multimedia instruction of words in a compressed period of time that usually would consume considerable attention in traditional approaches and teacher-led discussions.

More importantly, Kim (2002) stresses that emphasis needs to be placed on creating reading software that is grounded by sound theoretical principles in reading. JUMP is firmly based on research-based principles regarding vocabulary learning; it provides a rich vocabulary program in an interactive multimedia program that is instructionally powerful, highly motivating for students, easily implemented in schools, and easily transportable to school districts throughout the nation. By harnessing students' palpable attraction to gaming media, JUMP's vocabulary instructional game for the Nintendo DS intends to improve the reading skills of 4th grade struggling readers who often do not benefit from traditional forms of instruction.

### OVERVIEW OF THE INTERVENTION

The *Report of the National Reading Panel* (NRP, 2000) and *Reading for Understanding* (RRSG, 2002) serve as foundational documents for the design of the vocabulary instructional content for JUMP. It is clear from the collective findings that dependence on a single vocabulary instructional method will not result in optimal learning. The design of the JUMP instructional game builds upon several vocabulary instructional methods shown to be effective in empirical studies. The following effective methods and approaches noted by NRP and RRSG provide the content framework:

- Provide multiple exposures in varied ways to vocabulary items.
- Teach words both directly (explicitly teach meaning of words) and indirectly (increase reading volume).
- Create opportunities for active engagement in vocabulary learning tasks.
- Provide both definitional and contextual information.
- Allow students to actively process new word meanings.
- Teach word learning strategies to unlock the meaning of unknown words:
  - contextual analysis.
  - morphemic analysis.
- Use of technology in the instruction of vocabulary words.

Additionally, with the NCLB mandate and the emphasis on standards-based curriculum, 4th grade national and states' curricula standards in language arts, science, math, and social studies served as guides for the selection and focus of the 10 JUMP

“themes and modules (levels)” and vocabulary items featured in the game.

The project targets struggling readers who are broadly defined as students who do not read well enough to comprehend and learn from their content area texts. Generally, most struggling readers fall into the *below basic* category, as defined by the NAEP (Grigg, Daane, Jin, & Campbell, 2003). JUMP is designed as a role-playing game that requires fairly extensive reading to complete quests and to advance in the game. As a result, non-readers—many of those in stanine 1—may not be able to take advantage of the program, since it is likely that stanine 1 readers will have other problems that might not be amenable to treatment by JUMP's focus on supplemental vocabulary instruction. For the purposes of this project, JUMP is intended for struggling readers who are in stanine 2 to stanine 4, or those students who are approaching standards and below standards.

The overall premise of JUMP is to leverage the attraction of games to impact vocabulary learning. The intent is to fuse research-based vocabulary learning with good game design to produce an effective instructional digital game. Many gaming researchers have argued that good learning principles, which educational psychologists and cognitive scientists have strongly recommended for decades as the foundation behind effective teaching and learning in classrooms (e.g., the shift from teacher-centered to student-centered), are actually an integral part of every well-designed game. For example, Gee (2007) offers that one component of good game design is employing the learning principle that “learning works best when challenges feel hard but doable” (p. 8). In other words, effective teaching and understanding occurs within a student's “zone of proximal development” (Vygotsky, 1978). See *The Instructional Design of an Education Game: Form and Function in JUMP* document for further elaboration of good learning principles and good game design.

The JUMP intervention is designed to be a versatile supplemental vocabulary instructional program that can be used as an extended literacy activity or in before and after school settings. The portability of the Nintendo DS™ and the nature of an independent student-driven game provide schools with the flexibility to use the program in diverse ways.

An evaluation study is planned, which will assess whether students in after school programs improve their vocabulary acquisition and word learning strategies, as well as add to the research regarding the overall feasibility of digital games as a medium for school-based learning. At the end of the evaluation study, JUMP will be poised to provide data on whether research-based vocabulary methodologies are effective on a gaming platform.

### Advisory Panel

An advisory panel of leading experts in the fields of reading, education, and technology provides critical guidance and review in their respective fields, and works closely with the content and instructional developers to ensure optimum content and game

development. The distinguished Advisory Panel for the 2007–2008 year is composed of the following professionals: Dr. John Q. Adams, Western Illinois University; Dr. James Gee, Arizona State University; Dr. Michael Kamil, Stanford University; and Dr. Kurt Squire, University of Wisconsin-Madison. Former advisory panel members included Dr. Cathy Collins Block, Texas Christian University; and Dr. John Mangieri, Institute for Literacy Enhancement.

## DESCRIPTION OF THE VOCABULARY INTERVENTION

JUMP comprises two games with five levels each that combine instruction in vocabulary representing math, science, and social studies words or concepts, topically related words, and high-utility words with instruction in using morphology and context in unlocking the meanings of unfamiliar words. The first game is an adventure that unfolds at various environments on earth, featuring science and math topics. The second game moves the adventure to another galaxy, featuring social studies and math topics.

### **Teaching Individual Words**

Choosing which words to teach and the number of words students need to learn has been difficult to establish by vocabulary researchers. This makes it challenging to teach vocabulary in a systematic way. There is general agreement that the average student in grades 3 through 12 is likely to learn 2,000 to 3,000 words a year, if they read between half a million and a million words of running text (Baumann, Edwards, Boland, Olejnik, & Kame'enui, 2003). While this may hold true for proficient readers who are able to encounter rich vocabulary through incidental learning and independent reading (Nagy, Anderson, & Herman, 1987), these opportunities seldom materialize for those who struggle to read and are, therefore, limited in their ability to engage in extensive and wide readings.

The size of the number of vocabulary words that students eventually acquire makes it impossible to teach all the words they need to learn. But this does not mean vocabulary instruction should not occur in a focused and strategic way (Graves, 2000; Nation, 2001; Stahl, 1999). Unfortunately, effective vocabulary instruction is not as frequent or as robust as it should be in classrooms (Durkin, 1978–79; Watts, 1995) and in basal readers (Ryder & Graves, 1994). However, one study found that when successful curricula have been implemented, it increased children's vocabulary by approximately 300 words a year (Stahl & Fairbanks, 1986). Beck, McKeown, and Kucan (2002) provide teachers with a manageable alternative that students learning approximately 400 *Tier Two* words, high-frequency academic words found across disciplines, a year can make a significant impact (Baumann et al., 2003). JUMP proposes to slightly increase the number of words taught by introducing 45 words at each of the 10 levels of game play. JUMP provides students with

the opportunity to learn 450 words with additional forms of target words, making it possible to increase students' word knowledge by approximately 600 or more words in a school year.

The 450 target words represent: (a) content words taken from 4th grade basal texts in the subject areas of math, science, and social studies; and (b) high-utility basic words which are academic and general purpose words that support understanding of content-area reading and are likely to be encountered with some frequency throughout all subjects.

### **Word Selection Process**

Selecting words for instruction was of critical importance for the content team. Based on discussions held during the first Advisory Panel meeting, it was determined that word-choice decisions should be based on the importance and usefulness of a word. It was also decided that the primary source of words should be content area textbooks and reading materials. In other words, word selection should focus on content area words or concepts and high-utility words, which are words that are likely to be encountered with some frequency in their reading throughout all subjects. This was influenced in large part by the NRP's recommendations that students should learn vocabulary words that are likely to appear and be useful in many other contexts.

The first step of the process for identifying words was using math, science, and social studies state and national standards and strands as a framework. Several textbooks from leading publishers in these content areas were then used to select clusters of topically-related words and high-utility words that support the understanding of the content.

The selected high-utility words were then validated as high-frequency basic words with the following references: *The Living Word Vocabulary* (Dale & O'Rourke, 1986) and *The American Heritage Word Frequency Book* (Carroll, Davies, & Richman, 1971). Additional words from the Mid-continent Regional Educational Laboratory's (McREL's) 1991 analytical study of 4th grade high-frequency basic words, *The Analysis and Identification of Basic Words in Grades K–6* generated a larger quantity of words to present to student focus groups.

Struggling 4th grade readers at two public elementary schools participated in our student focus groups to help determine the level of difficulty and appropriateness of the words. The final list of 450 words was derived based on their weighted scores on whether or not they knew a word.

Immediately following the establishment of the final list of words, each word's definition was written using student-friendly language. In addition, the following content assets were developed for each targeted word in a level:

- Cloze sentence
- Semantic association
- Antonym analogy
- Two rounds of higher order questions serving as formative assessments

In combination with strategy practice activities, such as end-of-level assessments, the current total number of discrete content assets that has been developed for both games is well over 2,000 items.

### **Teaching Word-Learning Strategies**

Since it is impossible to learn thousands of words through instruction alone, students need word-learning strategies to help them determine the meaning of words independently. Two approaches to teaching word-learning strategies—contextual analysis and morphemic analysis—are supported by substantial bodies of research and have been widely recommended to be part of a comprehensive vocabulary program. With the guidance of the Advisory Panel, a decision was made to teach four specific types of contextual clues and a limited number of high-frequency affixes in word-part clues strategy. Each level (with the exception of Game 1, Level 1, which serves as an introduction to the game) provides students with a choice of accessing direct teaching instruction for a specific word-learning strategy in either contextual or word-part analysis. Direct instruction is immediately followed with guided practice, and additional practice opportunities are then built into the game after that point.

### **Contextual Analysis**

The most widely recommended and most powerful word-learning strategy is that of using context (Graves, 2006; NRP, 2000; Sternberg, 1987). Recent reviews of research (Baumann, Kame'enui, & Ash, 2003; Fukkink & de Glopper, 1999; Kuhn & Stahl, 1998) indicate that the strategy can be taught. The Advisory Panel recommended that the following types of context clues be addressed:

- Definitional clues
- Parenthetical clues
- Comparison clues
- Elaboration clues

### **Morphemic Analysis**

Using word parts to unlock the meanings of unknown words is a widely recommended strategy (Lehr & Osborn, 2004), which is well supported by research (Anglin, 1993; White, Power, & White, 1989). Morphemic awareness has been found to be a contributing factor in reading and writing for beginning readers (Nunes, Bryant, & Bindman, 1997; Treiman & Cassar, 1996) and becomes increasingly important as reading skills develop (Nagy & Anderson, 1984). A number of reading experts have advocated instruction in morphological analysis (Baumann, et al., 2002, 2003), and a substantial body of research supports the efficacy of such instruction (Graves & Hammond, 1980; Nicol, Graves, & Slater, 1984; Fukkink & de Glopper, 1999). A working knowledge of morphemes helps children build their vocabularies and comprehend otherwise unknown words. Nagy and Anderson (1984) provide a research-based estimate that nearly 60% of the new words students encounter in reading can be analyzed accord-

ing to their morphological components and provide students with help in understanding the new word's meanings (PREL, 2004).

The morphological component of the program introduces students to high-frequency affixes—the meaning of the most common prefixes, and procedures for recognizing prefixes and suffixes in morphologically complex words. Based on White, Sowell, & Yanagihara (1989) findings that there are a relatively small number of affixes that are used in a large number of words, the following are included in JUMP:

- *un-, dis-, re-, in- (im-, il-)*—the four most frequent prefixes that account for 58% of prefixed words in printed school English
- *-er/-or, -ly, -ion (-tion, -ation, -ition), -able (-ible)*—four of the seven most frequent suffixes that account for 82% of suffixed words in printed school English

## CONTENT AND INSTRUCTIONAL DESIGN PROCESS

Close collaboration between the content team, internal instructional designers, and Aloha Island (AI), an official Nintendo game developer is critical to create instructional episodes and practice activities that not only address the vocabulary content word, but also fit into the metaphor of the game. There is mutual understanding that tight collaboration and teamwork between the content and design team is a critical factor, if the tension that exists between gaming and learning is to be resolved in a win-win situation whereby struggling readers are engaged in learning and improving their vocabulary while playing a fun game.

### General Instructional Overview

There are three main instructional components featured in the game: instruction, practice, and assessment. All encounters with content within the game fall into one of these three categories. In addition, players have access to a glossary-like word bank filled with student-friendly definitions as instructional support.

### Instruction

Players are presented with multiple opportunities to acquire information about word meanings, as well as being provided with multiple exposures to words in a variety of contexts and settings. Due to the nature of role-playing games, the primary means of word exposure occurs during branching dialogues (read and not heard), which offer players response choices. The interaction between the player's in-game avatar, or player character (PC), with engaging and unique non-player characters (NPCs) helps to gradually unveil a compelling story narrative and is the primary means for advancing in the game. More importantly, these interactive dialogues ensure that students encounter words in context during

purposeful activities. In addition, to circumvent players reading at a frustration level, professional writers were hired and given guidelines to help them create dialogues at a 4th grade readability level, with the clear understanding that the targeted audience is struggling readers.

Through other interesting dynamics, such as *hotspots* (hidden features in the environment that provide a meaningful context for a vocabulary word) and fetch quests, players continue to have opportunities to respond to words, both affectively and cognitively, to promote rich and sustained knowledge and develop a deeper appreciation of words and their meanings.

### Practice

Practice allows players to actively use words and strategies and to develop deeper word knowledge. Players may practice word or strategy application through word interactions and activities embedded in gameplay (refueling games, fetch quests, word-learning strategy training, word applications, or verification questions embedded in dialogue).

### Assessment

Assessments evaluate the player's ability to make meaning from text in a way that requires higher-level application. Players must demonstrate word knowledge (a correct use) for every word presented in the game through robot challenges, and are assessed on their ability to use reading strategies (context clues, word part clues) in additional "Boss Bot" challenges. Assessment results are tracked and reported.

### Instructional Support

The word bank is a support that is available throughout all activities to support learning. It is not a methodology that receives direct instruction on how to use a reference tool effectively; rather, it exists to support players as they learn and apply words.

## CONCLUSION

Games and other interactive media environments have become part of the culture of a new generation of digital natives who are able to confidently function in the world of technology. Today's classrooms are filled with students who interact with engaging interactive multimedia tools, complex games with state-of-the-art graphics, and virtual worlds that have moved them beyond the novelty of "old media." JUMP is at the helm of a unique oppor-

tunity to explore the educational value of utilizing emerging new technology to serve as a powerful teaching tool that can help a new generation of children learn.

## REFERENCES

- Anderson, R. C., & Freebody, P. (1981). Vocabulary knowledge. In J. Guthrie (Ed.), *Comprehension and teaching research reviews* (pp. 77–117). Newark, DE: International Reading Association.
- Anglin, J. M. (1993). Vocabulary development: A morphological analysis. *Monographs of the Society for Research in Child Development, 58*(Serial No. 238).
- Baumann, J. F., Edwards, E. C., Boland, E. M., Olejnik, S., & Kame'enui, E. J. (2003, Summer). Vocabulary tricks: Effects of instruction in morphology and context on fifth-grade students' ability to derive and infer word meanings. *American Educational Research Journal, 40*(2), 447–494.
- Baumann, J. F., Edwards, E. C., Font, G., Tereshinski, C. A., Kame'enui, E. J., & Olejnik, S. (2002). Teaching morphemic and contextual analysis to fifth-grade students. *Reading Research Quarterly, 37*, 150–176.
- Baumann, J. F., Kame'enui, E. J., & Ash, G. E. (2003). Research on vocabulary instruction: Voltaire redux. In J. Flood, D. Lapp, J. R. Squire, & J. M. Jensen (Eds.), *Handbook on research on teaching the English language arts* (2nd ed., pp. 752–785). Mahwah, NJ: Erlbaum.
- Beck, I. L., McKeown, M. G., & Kucan, L. (2002). *Bring words to life: Robust vocabulary instruction*. New York: Guilford.
- Becker, W. C. (1977). Teaching reading and language to the disadvantaged—What we have learned from field research. *Harvard Educational Review, 47*, 518–543.
- Biemiller, A. (1999). *Language and reading success*. Cambridge, MA: Brookline Books.
- Biemiller, A. (2001). Teaching vocabulary: Early, direct, and sequential. *American Educator, 25*(1), 24–28.
- Carroll, J. B., Davies, P., & Richman, B. (1971). *The American Heritage word frequency book*. New York: Houghton Mifflin.
- Chall, J. S., Jacobs, V. A. (2003, Spring). The classic study on poor children's fourth-grade slump. *American Educator, 27*, 14–15.
- Chall, J. S., Jacobs, V. A., & Baldwin, L. E. (1990). The reading crisis: *Why poor children fall behind*. Cambridge, MA: Harvard University Press.
- Cunningham, A. E., & Stanovich, K. E. (1998). What reading does for the mind. *American Educator, 22*(1–2), 8–15.
- Dale, E., & O'Rourke, J. (1985). *The living word vocabulary*. Chicago: World Book—Childcraft.
- Devaney, L. (2007, March). ISTE releases draft of new tech standards. *eSchool News, 10*(3), 6.
- Durkin, D. (1978–79). What classroom observations reveal about comprehension instruction. *Reading Research Quarterly, 14*, 481–533.

## Examining The Role of Gaming and Learning in Vocabulary Instruction for Struggling Readers

- Federation of American Scientists (FAS). (2006). *R & D challenges in games for learning* [Electronic version]. Washington, DC: The Learning Federation. Retrieved July 26, 2007, from [www.fas.org/gamesummit/Resources/R&D\\_Challenges.pdf](http://www.fas.org/gamesummit/Resources/R&D_Challenges.pdf)
- Fukkink, R. G., & de Glopper, K. (1999). Effects of instruction in deriving word meanings from context: A meta-analysis. *Review of Educational Research, 68*, 450–469.
- Gee, J. P. (n.d.) *Good videogames and good learning*. Retrieved July 19, 2007, from [www.academiccolab.org/resources/documents/Good\\_Learning.pdf](http://www.academiccolab.org/resources/documents/Good_Learning.pdf)
- Graves, M. F. (2000). A vocabulary program to complement and bolster a middle-grade comprehension program. In B. M. Taylor, M. F. Graves, & P. van den Broek (Eds.), *Reading for meaning: Fostering comprehension in the middle grades* (pp. 116–135). Newark, DE: International Reading Association.
- Graves, M. F. (2006). *The vocabulary book*. New York: Teachers College Press.
- Graves, M. F., & Hammond, H. K. (1980). A validated procedure for teaching prefixes and its effect on students' ability to assign meaning to novel words. In M. L. Kamil & A. J. Moe (Eds.), *Perspectives on reading research and instruction*. Washington, DC: National Reading Conference.
- Grigg, W. S., Daane, M. C., Jin, Y., & Campbell, J. R. (2003). *The nation's report card: Reading 2002*. Washington, DC: U.S. Department of Education.
- Guthrie, J. T., Schafer, W. D., Wang, Y. Y., & Afflerbach, P. (1995). Relationships of instruction of reading: An exploration of social, cognitive, and instructional connections. *Reading Research Quarterly, 30*(1), 8–35.
- Guthrie, J. T., & Wigfield, A. (2000). Engagement and motivation in reading. In M.L. Kamil, P.B. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research: Volume III* (pp. 403–422). Mahwah, NJ: Erlbaum.
- Hart, B., & Risley, T. R. (2003, Summer). The early catastrophe: The 30 million word gap by age 3. *American Educator, 27*(1), 4–9.
- Hiebert, E. H. (2005). In pursuit of an effective, efficient vocabulary curriculum for elementary students. In E. H. Hiebert & M. L. Kamil (Eds.), *Teaching and learning vocabulary: Bringing research to practice*. Mahwah, NJ: Lawrence Erlbaum.
- Hirsch, E. D., Jr. (2003, Spring). Reading comprehension requires knowledge—of words and the word. *American Educator, 27*, 10–29.
- Kamil, M. L., Intrator, S. M., & Kim, H. S. (2000). The effects of other technologies on literacy and literacy learning. In M. L. Kamil & P. B. Mosenthal (Eds.), *Handbook of reading research: Volume III* (pp. 771–788). Mahwah, NJ: Lawrence Erlbaum.
- Kim, M. (2002). *The use of the computer in developing L2 reading*. Bloomington: Indiana University. (ERIC Document Reproductions Service No. ED472671)
- Kuhn, M. R., & Stahl, S. A. (1998). Teaching children to learn word meanings from context: A synthesis and some questions. *Journal of Literacy Research, 30*, 119–138.
- Lehr, F., & Osborn, J. (with Hiebert, E. H.). (2004). *A focus on vocabulary*. Honolulu, HI: Pacific Resources for Education and Learning.
- Luke, A., & Elkins, J. (1998). Reinventing literacy in “New Times.” *Journal of Adolescent & Adult Literacy, 42*, 4–7.
- Marzano, R. J., Kendall, J. S., & Paynter, D.E. (1991). *The analysis and identification of basic words in grades K–6* (Tech. Rep.). Aurora, CO: Mid-continent Research for Education and Learning.
- Mayer, R. E. (1997). Multimedia learning: Are we asking the right questions? *Educational Psychologist, 32*(1), 1–19.
- Mayer, R. E., & Moreno, R. (1998). A split-attention effect in multimedia learning: Evidence for dual processing systems in working memory. *Journal of Educational Psychology, 90*, 312–320.
- McKenna, M., Reinking, D., Labbo, L., & Watkins, J. (1996). *The effects of electronic trade books on the decoding growth of beginning readers* (Tech. Rep.). Athens, GA: National Reading Research Center, University of Georgia and University of Maryland.
- Meyer, A. & Rose, D. H. (1998). *Learning to read in the computer age*. Cambridge, MA: Brookline Books.
- Moats, L. (2001, Summer). Overcoming the language gap. *American Educator, 25*(2), 5–9.
- Nagy, W. E. (1998). *Teaching vocabulary to improve reading comprehension*. Newark, DE: International Reading Association.
- Nagy, W. E., & Anderson, R. C. (1984). How many words are there in printed school English? *Reading Research Quarterly, 19*, 304–330.
- Nagy, W. E., Anderson, R. C., & Herman, P. A. (1987). Learning word meanings from context during normal reading. *American Educational Research Journal, 24*, 237–270.
- Nagy, W. E., & Scott, J. A. (2000). Vocabulary processes. In M. Kamil, P. Mosenthal, P. D. Pearson, & R. Barr (Eds.), *Handbook of reading research: Volume III* (pp. 269–284). New York: Longman.
- Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge, U.K.: Cambridge University Press.
- National Reading Panel (NRP). (2000). *Report of the National Reading Panel: Teaching children to read*. Bethesda, MD: National Institute of Child Health and Human Development.
- National Research Council. (1999). *Improving student learning*. Washington, DC: National Academy Press.
- Nicol, J. A., Graves, M. F., & Slater, W. H. (1984). *Building vocabulary through prefix instruction*. Unpublished manuscript, University of Minnesota, Minneapolis.
- Nunes, T., Bryant, P. & Bindman, M. (1997). Spelling and grammar: The nessed move. In C. Perfetti, L. Rieben, & M. Fayol (Eds.), *Learning to spell*, (pp. 151–170). Mahwah, NJ: Lawrence Erlbaum.
- Oldfather, P., & Wigfield, A. (1996). Children's motivations for literacy learning. In L. Baker, P. Afflerbach, & D. Reinking (Eds.), *Developing engaged readers in school and home communities* (pp. 89–113). Mahwah, NJ: Erlbaum.
- Pacific Resources for Education and Learning (PREL). (2004). *Rich content vocabulary instruction project* (submitted to the U.S. Department of Education, Institute of Education Sciences). Honolulu, HI: Author.

- Perle, M., Moran, R., Lutkus, A., & Tirre, W. (2005). *NAEP 2004 trends in academic progress: Three decades of student performance in reading and mathematics*. Washington, DC: National Center for Education Statistics.
- Plass, J. L., Chun, D. M., Mayer, R. E., & Leutner, D. (1998). Supporting visual and verbal learning preferences in a second-language multimedia learning environment. *Journal of Educational Psychology, 90*(1), 25–36.
- Prensky, M. (2001). *Digital natives, digital immigrants*. Available at [www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf](http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf)
- Pressley, M. (2000). What should comprehension instruction be the instruction of? In M. Kamil, P. Mosenthal, P.D. Pearson, & R. Barr (Eds.), *Handbook of reading research: Volume III* (pp. 545–561). Mahwah, NJ: Erlbaum.
- RAND Reading Study Group (RRSG). (2002). *Reading for understanding: Toward an R&D program in reading comprehension*. Santa Monica, CA: Rand Education.
- Ryder, R. J., & Graves, M. F. (1994). Vocabulary instruction presented prior to reading in two basal readers. *Elementary School Journal, 95*, 139–153.
- Scarborough, H. S. (1998). Early identification of children at risk for reading disabilities: Phonological awareness and some other promising predictors. In B. K. Shapiro, P. J. Accardo, & A. J. Capute (Eds.), *Specific reading disabilities: A review of the spectrum* (pp. 75–119). Timonium, MD: York Press.
- Skinner, E. A., Wellborn, J. G., & Connell, J. P. (1990). What it takes to do well in school and whether I've got it: A process model of perceived control and children's engagement and achievement in school. *Journal of Educational Psychology, 82*(1), 22–32.
- Snow, C. E., Burns, M. S., & Griffin, P. (Eds.). (1998). *Preventing reading difficulties in young children*. Washington, DC: National Academy Press.
- Stahl, S. A. (1999). *Vocabulary development*. Newton Upper Falls, MA: Brookline Books.
- Stahl, S. A., & Fairbanks, M. M. (1986). The effects of vocabulary instruction: A model-based meta-analysis. *Review of Educational Research, 56*, 72–110.
- Sternberg, R. J. (1987). Most vocabulary is learned from context. In M. G. McKeown & M. E. Curtis (Eds.), *The nature of vocabulary acquisition* (pp. 89–105). Hillsdale, NJ: Erlbaum.
- Treiman, R. & Cassar, M. (1996). Spelling acquisition in English. In C. Perfetti, L. Rieben, & M. Fayol (Eds.), *Learning to spell* (pp. 61–80). Mahwah, NJ: Lawrence Erlbaum.
- Vygotsky, L. S. (1978). *Mind in society*. Cambridge, MA: Harvard University Press.
- Watts, S. M. (1995). Vocabulary instruction during reading lessons in six classrooms. *Journal of Reading Behavior, 27*, 399–424.
- White, T. G., Power, M. A., & White, S. (1989). Morphological analysis: Implication for teaching and understanding vocabulary growth. *Reading Research Quarterly, 24*, 283–304.
- White, T. G., Sowell, J., & Yanagihara, A. (1989). Teaching elementary students to use word-part clues. *The Reading Teacher, 42*, 302–308.