EFFECTS OF EXTENSIVE ENGAGEMENT WITH COMPUTER-BASED READING AND LANGUAGE ARTS INSTRUCTIONAL SOFTWARE ON READING ACHIEVEMENT FOR SIXTH GRADERS

By

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ABSTRACT

K-12 school practitioners and schools administrators need reliable results about the effects of instructional technology products as they strive to meet achievement compliance levels in politically accountable local and national contexts in the U.S. This study presents evidence regarding the effects of extensive engagement with computer-based instructional software on the reading achievement of 86 6th graders, within a backdrop of two previous similar investigations at the same middle school between AY 2003-2007. A treatment group received computer-based, reading instruction for 24 weeks x 90 minutes weekly in addition to four, 90 minute blocks of conventional instruction. Control peers received conventional instruction in five, 90 minute blocks per week. Comparisons of achievement scores on year-end, standardized reading tests yielded substantial gains for treatment subjects compared to controls, with an effect size of .92. Girls significantly outperformed boys and those not receiving lunch funding did significantly better than those receiving lunch funding. The conclusion is that extensive software engagement combined with in class instruction is an effective instructional context for enhancing reading achievement. Recommendations for further research suggest a "repeated trials" model in the same settings to give fidelity to curriculum, research methodology and the socio-cultural context for students and school.

Key Words: Reading Achievement, Computer-Assisted Interventions, Scientifically Based Reading Research, Reading and Language Arts Research and Computer-Based Instruction.

INTRODUCTION

With the passage of the No Child Left Behind Act [NCLB] in 2001, public school systems in the United States became heightened to "Twenty-First Century Learning Skills" and technically based instruction. Schools, school leaders and teachers increasingly turned to technology to help meet the compliance standards of the new federal mandates, particularly in reading and mathematics achievement (No Child Left Behind, 2001). Computer-based instruction progressively became the means in schools for enhancing reading and literacy achievement and the tools for correcting and remediating reading deficiencies. Likewise, educational software manufacturers found their products in great demand and heralded in a vast assortment of reading and language arts instructional software.

Whether school districts paid attention beforehand to the available research regarding the overall effects of instructional technology products and resources is an important question. There is an enormous amount of research literature examining the effects of instructional technology interventions and related products on student achievement, albeit invariant. Regardless, school districts in the United States are subjected to the political pressures of NCLB and the need to substantiate school/student compliance levels in math and reading achievement. Consequently, schools have invested greatly in the promise of commercial instructional technology. Kinnaman (1990) foreshadowed the issue in a summary of microcomputers and schools noting then that the educational use of computer technology would grow far beyond expectation, resulting in considerable expense and investment. Parents

and educational stakeholders needed assurance about the educational effectiveness of using computers in schools and desired evidence that such learning is enhanced in a accountable manner.

Moran et al. (2008) cautioned about the relatively modest effects of commercial technology products on literacy outcomes and for consumers to carefully scrutinize related claims. Moreover, in the age of fast forward computer technology and continuous development of instructional software products and systems, research on student achievement should be continually up-dated and the effects of emerging programs evaluated and presented. The authors contend that little empirical research has been conducted with such products at the middle school level, and in general, there are not enough experimental studies to reliably substantiate the claims about the efficacy of instructional technology on student achievement.

Some of what Moran contends is backed up with recent research conducted for the U.S Department of Education (USDE) by Dynarski et al. (2007).These researchers examined the effectiveness of instructional software products on reading achievement for first and fourth graders. Over 100 schools were selected and 350 teachers, who volunteered to participate. Teachers were randomly assigned to teach either in classrooms with instructional technology products or to teach in control classrooms with conventional instructional resources. Results for first grade reading achievement showed that test scores were not distinguished statistically by classrooms that did or did not use technology products, although larger effect sizes were found between schools. The authors noted the latter effect was most likely a matter of sampling variances associated with teacher assignment to groupings within schools. The results for fourth graders, likewise, were not statistically significant between the groupings.

A second year study for the USDE, conducted by Campusano, Dynarski, Agodini and Rall (2009), followed up the teachers who participated in the first year. The focus was to determine if reading achievement scores were increased by an additional year of experience for teachers using technology products. The effect on first grade test scores when using the software for the additional year was nil—overall statistically insignificant. Similarly, the effect of the second year of experience on fourth grade reading test scores was non-significant. Overall, nine of the ten products tested (6 reading; 4 math) had insignificant effects for the full sample. One reading product had a statistically significant effect on test scores, but with an effect size of .09.

Differences in school contexts and instructional abilities may have influenced these outcomes. Notwithstanding, as schools rely greatly on instructional software resources to help meet NCLB and district compliance criteria, research on these products needs to be continually conducted and updated.

Merit Software, a publisher of K-12 instructional software for the past 25 years, commissioned independent, quantitative investigations of an integrated learning system in elementary and middle schools in southern West Virginian between 2002 and 2007. The purpose was to determine the effects of instructional software on content achievement test scores, particularly in reading and language arts and mathematics.

Researchers at Marshall University Graduate Center designed and conducted these investigations independent of Merit involvement, other than providing the appropriate software and initial training for school personnel. Of interest are three such investigations conducted at the same middle school in a rural school district between 2002 and 2007. In each case, groupings for computer-based and conventional instruction were compared on year- end, state mandated content assessments, albeit with variations in intervention periods and time. The current investigation is the third of these interventions at that same middle school.

The initial study, Jones et al. (2004), was conducted in the 2002-2003 school year with 116 subjects placed in computer-based groupings distributed in three, sixth-grade and three, eighth-grade settings. These subjects received reading and language instruction in a computer software lab for four weeks in two, 45 periods per week, plus in-class conventional instruction for the remainder of the week. There were 70 subjects in control groupings distributed in

one sixth- grade and one eighth grade classroom. Controls received all of their instruction in class with five, 90 minute blocks per week.

SAT-9 test scores from the previous school year were compared to the next years test scores to determine growth in the nine content areas. A regression model was employed to determine the level of growth predicted for the groupings. Seven of the nine sub-tests on the SAT-9 had significant coefficients favoring the intervention, including math problem solving (.003),math procedures (.014), language expression (.042), reading vocabulary (.003), comprehension (.040), science (.020) and social studies (.028). Language mechanics (.147) and spelling (.084) were below significance. Overall R^2 values ranged between 19 and 22 percent. The authors concluded that computer-based instruction, on average, yielded greater pre to post-test standardized test scores.

Based on a recommendation for an "experimental" design from the previous Investigation, a second study at the same middle school extended the computer-based instruction to an 8-week period, with two, 45 minute blocks per week of intervention (O'Byrne, Securro, Jones & Cadle (2006). There were 172 students in computer-based groupings of which 72 were in three, sixth grade settings and 50 each in a seventh and eighth grade setting. A control group of 66 subjects included 19 sixth graders; 22 seventh graders and 25 eighth graders. Control subjects received conventional reading and language instruction in class for five, 90 minute blocks per week.

Subjects were pretested with the Grade Achievement Test which included sub-tests in language, sentence construction, vocabulary and comprehension. There were no statistical differences measured between the computer-based and conventional groupings, thus assuring homogeneity. The Westest (West Virginia's mandated, year-end content assessment) was given to assess the impact of the groupings. It reports standardized scaled scores in four content areas: (i) reading and language arts, (ii) social studies, (iii) science and (iv) mathematics. These results showed, on average, moderate differences in mean test scores favoring computer-based instruction with 4.38 in reading and language arts, 8.23 for social studies, 2.14 for science and 3.82 for mathematics.

Although not significant statistically, a trend occurred for greater test scores across all computer-based groupings. Additionally, post- hoc quartile comparisons were made by ranking the frequencies for Westest raw scaled scores in four quartiles distributed equitably at the 25th, 50th and 75th percentiles. Independent Samples t tests were obtained for each quartile comparing computer-based and control groupings, with homogeneity of variance corrections. Those in the bottom quartile for computer-based outscored their peers in control groupings on all four measures, with statistical significance for reading and language arts (p.035) and social studies (p .000). Consequently, in this study, the computer- based intervention had the greatest impact on lower achieving students.

The third (current) investigation, conducted in the 2006-2007 school year, focused specifically on reading/language achievement of 6th graders who had no previous experience with the integrated learning system in the school. Again, students were grouped into computer-based and control conditions except in this design, the intervention was extended to 24 weeks (90 minutes per week) to test the effects of extensive engagement with instructional software. The outcome measure was scaled scores in reading and language arts on the state-mandated Westest.

Computer-based instruction was effected by the series of intermediate reading and language arts instructional software for middle schools from Merit (Merit Corporation, 2006). The details and results of that investigation follow.

Purpose

The study aimed to determine the differences in reading achievement test scores among 6th graders given instruction with computer-based, reading and language arts software and conventional in-class reading instruction compared to their peers who were given only conventional, in-class reading and language arts instruction.

Null Ho: There are no differences in Westest reading and language arts scaled test scores among 6th graders given

instruction with computer-based, reading and language arts software and conventional, in-class instruction compared to their peers who are given only conventional in-class reading and language arts software instruction.

Further, the study determined if significant differences resulted in the numbers of subjects in these groupings who placed in compliance or noncompliance levels of the West Virginia performance rubric for Westest reading and language arts scaled scores for sixth grade (West Virginia Department of Education, 2005-2008).

Null Ho: There are no differences in the frequencies of experimental and control subjects who placed in compliance and noncompliance levels on the West Virginia rubric for Westest reading and language arts scaled scores for sixth grade.

Westest

Reading achievement was measured by the West Virginia Test (Westest), a state mandated, year-end standardized test given to students in grades 3-10 in four content areas: Reading/Language Arts, Mathematics, Science, and Social Studies. It is a criterion-referenced measure aligned with West Virginia Department of Education [WVDOE] standards and objectives per content area and grade level. Standards' reviews were conducted in 2003, 2004 and 2005. In a supplemental technical report from CTB/McGraw-Hill, internal consistency coefficients (stratified alpha) for reading and language arts were .95 for grade 6 (McGraw-Hill, 2005).

Raw Westest scaled scores are reported to students and scaled score ranges per grade level are reported to schools for reading and mathematics. Test data are then keyed to ranges in the state-wide performance rubric as: Distinguished, Above Mastery, Mastery, Partial Mastery and Novice. The latter two levels do not meet NCLB and district compliance in West Virginia (West Virginia Department of Education, 2005-2008).

Method

Subjects

Subjects were 86 middle school students in the sixth grade, assigned to two reading/ language arts teachers in a rural public school district in southeastern West Virginia. Demographics were: (i) 99% Caucasian, (ii) 58% participation in free/reduced lunch program and (iii) a gender distribution of 43 females and 42 males. There was missing data for one male subject. Where socio-economic status (SES) is noted, it is operationally defined as "those students who did (58) or did not (28) receive Free/Reduced Lunch".

Before the school year began, subjects were randomly assigned to either computer-based or conventional groupings for instruction, which resulted in 43 subjects in each grouping, in two classes each. Each teacher was randomly assigned to a computer-based or control grouping

Instructional Software

Merit software solutions for middle school is an integrated computer-based learning system with tutorial and content modules arranged to deliver, on demand, basic and intermediate individualized reading and language arts instruction for grades 5-8. Programs include a curriculum of various skill and sub-skill reading comprehension sets, e.g., main idea, sequence and inference, factual recall, fact-opinion and vocabulary comprehension and enhancement. These lessons advance to critical thinking skills for improving comprehension and for mastering specific reading skills within core content such as social studies and science. Interactive grammar exercises provide more difficult points of English grammar. The management component provides performance feedback to students and teachers on respective lessons and maintains related records. Teachers can access student progress through the Teacher Manager Program, monitor areas of concern and access lessons to address individual needs (Merit Corporation, 2010).

The major focus of the software is to help students achieve critical, intermediate reading skills, such as to identify vocabulary words in context and then reinforce meanings through interactive practice. The validity of Merit's vocabulary lists are based on several research sources including the Chall-Dale List of Easy Words (Chall & Dell, 1995); Basic Reading Vocabularies (Harris & Jacobson, 1982); and the EDL Core Vocabularies, (Taylor, et al.1989). Content validity for 6th grade reading and language arts

occurred by correlating the related WV standards with the modules for Intermediate Reading Solutions. An example of these is found in Appendix A.

Additionally, O'Byrne, Securro, Jones & Cadle (2006) described the reading content of the middle school software program to be significantly aligned to the West Virginia standards and objectives for reading and language arts in middle school grades. Moreover, practitioners (users) have informally evaluated these modules and have provided qualitative feedback about "best practices". For example, it is recommended that "program usage should be paced to allow students sufficient time between sessions to absorb the material". Additional examples are found in Appendix B.

Design and Procedure

The design is a two-group, quasi-experimental, post-test only, with random assignment to control and computer-based groupings. The latter groupings (two classes) received computer-based reading instruction for 90 minutes each week in two-45 minute periods, for 24 weeks in addition to conventional in-class instruction for four, 90 minute blocks per week. Only those in computer-Based groupings had password access to the software program in a computer lab. The design is only one of three investigations over the past ten years that extended the treatment period to 24 weeks. That length coincided with the delivery of the instructional content up to the month of standardized testing (late April).

Controls received conventional instruction in class for five, 90 minute blocks per week, including a variety of supplemental activities such as Writing Roadmap and Compass Learning. All students, whether in conventional or treatment groupings, were given content instruction germane to the West Virginia Department of Education [WVDOE] standards and objectives for reading and language arts at grade level.

The intervention began in early October, 2006. Beforehand, all students were given relevant, conventional content instruction, including several weeks of review of essential reading and language content and skills from the previous year. Random assignment somewhat assured that subjects in the groupings were on equal footing in reading achievement before the intervention. Additionally, Stanford-9, Reading Total test scores from the previous year were compared for homogeneity. Results indicated equivalency (Levene's .894;Computer-based, M=73.2, s.d., 10.93; Control, M = 76.l, s.d ,10.47; t(81)=1.24, p .217), with three cases of missing data.

The investigation concluded in mid-April, 2007 when the Westest was administered to all subjects under state-directed testing procedures and security. Subjects in the database were identified by case number, instructional methodology, gender, grade level and receiving "free/reduced lunch or not".

Descriptive Results

Various descriptive data were obtained for Westest Reading/Language Arts scaled scores, including "trimmed" and overall means, variance, standard deviation and skew values. Histograms were obtained for the dependent variable to examine the distribution of test scores. The histogram for 6th grade was symmetrical and approximated normal distribution and variability, with a skew value of -1.083. A test of significance for normality (Smolgorov/ Smirnov) was not significant (p.20). Differences in trimmed (654.8) and overall (653.2) mean scores were minimal and indicated no extreme or outlier effects.

Computer-Based and Control

Table 1 shows the Westest mean scores and standard deviations of 6th graders for reading/language arts in computer-based and control groupings across gender and SES.

Mean scaled scores for computer-based exceeded the control group by approximately 29 points, with a s.d. of 26.5 compared to 35. Statewide, standard deviations average approximately 39 on the Westest. A 16 point, mean score

N	Grouping	Mean	Standard Deviation
43	Computer-Based	667	27
42	Conventional	639	35
43	Female	661	29
42	Male	645	37
28	No Free/Reduced L.	664	29
57	Free/Reduced L	648	35

Table 1.Sixth-Grade Westest Reading and Language Arts Mean Scaled Scores and Standard Deviations for Computer-Based, Control, SES* and Gender.

difference favored females. Not unexpected, a difference of 16 favored those not receiving Free/Reduced L. Although standard deviations are within expected ranges, the disproportionate sample sizes (58/27) may have skewed that result. But the outcome is likely related to socio-economic differences negatively affecting standardized test scores for those from low income groups.

Scaled scores have subsequent implications for placement of students (and schools) in the statewide performance rubric noted earlier. (West Virginia, Scaled Scores/Cut Score Ranges, 2005-2008). Table 2 shows the resulting frequencies in the rubric for Westest reading and language arts scaled scores noted by grade level and rubric category.

Approximately 19% in computer-based groupings placed in Novice and Partial Mastery levels (8/25) compared to 60% of those in control groups (25 of 42). The aforementioned levels do not meet compliance standards in annual yearly progress (AYP) school reporting. Conversely, 35 of 43 computer-based subjects (80%) placed in compliance levels while 17 of 42 (40%) did so in control groupings.

Inferential Analysis and Results

Computer-Based and Control

Scaled scores for computer-based and control groupings were analyzed with an Independent Samples t–test. With equal variances assumed, (F, .660, p .419), a significant difference in scores resulted between Computer-based (M= 667.4, Sd., 28) and Control M= 638.8, Sd., 35) t (83) = 4.254, p .000, CI 95% - 41.99 to -15.23. These data resulted in an effect size measure of .92 (Cohen's d, with pooled σ). Given the differences in scaled scores between boys and girls, an Independent Samples t-test was obtained for comparison. Gender balance across the groupings was equivalent, (43 and 42) and equal variances were assumed (Levene's, F, .877, p .352). Significance occurred for Girls, (M= 661.4, Sd., 29) over Boys (M = 644.9 sd., 37), t (83) = 2.294, p .024, with a moderate effect size of .47.

Performance Level	Scaled Score Ranges	Frequency in Range for Merit / Control	
* Novice	505-606	1	8
* Partial Mastery	607-643	7	17
Mastery	644-680	17	15
Above Mastery	681-704	15	2
Distinguished	705-810	3	0

* Does not meet state/district compliance standards

Table 2. Frequencies of Sixth-Grade Westest Scaled Score Ranges on the West Virginia Rubric for Reading and Language Arts.

Socio-economic circumstances are factors to consider when standardized test scores are used as dependent measures, particularly in a language-laden content area. As expected there was a significance for Not Free Reduced/L (M =663.6, Sd. 29.3) compared to Free-Reduced/L (M =648.1, Sd.35.2), t (83)= 1.998, p .049, with a moderate effect size of .48. Although standard deviations were within expected ranges, the disproportionate sample sizes (58/27) may have skewed the result. But the outcome could just as likely have been a valid socio-economic difference which often impacts standardized test scores negatively for those from low income groups.

Based upon the results, the hypothesis of no differences in Westest Reading/Language Arts scaled scores among 6th graders given Computer-based and Conventional instruction is rejected.

A Chi Square Test of Independence (with Yates Correction) was obtained to compare the proportions of scaled scores in compliance and noncompliance categories per the groupings. These results indicated a significant association between compliance status and method of instruction, $\chi^2(1, n = 85) = 11.4$, p =.000, phi= .39. Approximately 19 % of those in the computer-based groupings did not meet compliance compared to nearly 60 % of those in the control groups.

Based upon the results, the hypothesis that there are no differences in the numbers of subjects in the groupings who placed in compliance and non-compliance levels on the West Virginia rubric for Westest reading and language arts scaled scores in sixth grade is rejected.

Conclusion and Discussion

The initial purpose of the investigation was to determine if reading comprehension test scores are benefitted by a computer-based, instructional learning system, complemented with in-class instruction. Consequently, youngsters using the system for an extended period of time

had significantly greater tests scores than did their control peers given only conventional, in-class reading instruction. The effect size evidence, .92, further supported the benefit of computer-based instruction. Others have described similar systems resulting in gains for reading attainment, although the effect sizes of the magnitude found in the present study rarely have been reported. Pearson, Ferdig, Blomeyer &Moran (2005) meta-analyzed 20 investigations (with 89 effect sizes), concerning the effects of instructional technology on reading performance in the middle grades. The authors reported a weighted effect size of .489, and of the 89 effect sizes obtained, six met or exceeded the .90 level.

The instructional implications are evident. Compared to conventional classroom teaching methods, achievement in content learning (with the initial thrust at the middle school level) can be enhanced with technically supported instruction, assuming that software content is aligned to local course content and to the expected assessments. Year-end standardized tests measure a range of content that represent a year-long curriculum. Consequently, supplemental technical instruction should extend accordingly. The current intervention (24 weeks) extended from early October to mid-April, when the Westest was given statewide. Moreover, the 24-week intervention exceeded the great majority of similar computer-based interventions found in the literature.

Of practical (and "political") importance to local educators and policy-makers are differences among the groupings for placement in school compliance performance levels. Nearly a 4 to 1 ratio of computer-based to control subjects placed above sub-standard levels (Novice and Partial Mastery). This was a significant event for a small rural school under pressure to meet NCLB and district compliance measures. It will be seen if such proportions can be replicated in future investigations and the risks reduced for students (and schools) ending up in noncompliance levels. The use of emerging instructional curricular software systems is likely to be an important mode for achieving these outcomes.

The current study had a "one shot" dependent variable—a year-end, state sponsored, standardized test. To better understand the various effects of extensive curricula engagement within technological contexts, more frequent and finer curriculum-based assessments are warranted along with standard, year-end assessments, as well as concomitant "affective" measures. Moran et al. (2009) argue that a good deal of the research on instructional technology and literacy achievement has narrowly focused on content achievement. A greater emphasis needs to be given to the interaction effects of affective measures including student motivation, meta-cognition and self-efficacy.

The evolvement of computer-based instructional systems and products to effect school achievement is evident. There are more and better things to come. For sure, the expectations are that such tools will continue to be used by educators to help students learn—particularly for struggling students. The effects of these tools and programs are important items on a continuing research agenda for enabling literacy achievement of all youngsters. How that research will be conducted and represented is an important issue. Single studies cannot validate results with certainty. The investigations described here necessarily cannot be claimed as "replications" since replication was not the purpose at the outset. Also, there were differences in sample sizes, the length of the interventions and data analyses. But there were common elements. The research occurred in the same school, essentially at the same grade levels, with the same instructional software and system, with students who shared the same similar socio-cultural backgrounds, with a consistent cadre of classroom teachers and with essentially the same kinds of measures. An important common outcome of these interventions was that student performance improved, particularly for a significant number with a history of sub-standard achievement.

The results of these studies suggest a model for research based upon "repeated trials". By repeating research within the same schools, fidelity is given to curriculum, instructional resources and products, delivery systems, assessments, the social-cultural context of the students and the school community and to a cadre of experienced teachers. Too often, isolated single studies cannot validate

results with enough certainty or confidence for teachers and administrators who are investing time and money in selecting instructional technology resources. The accumulation of repeated results and know-how can lead to greater certainty and validity for the effects of instructional technology tools and products on student achievement, whatever the outcomes.

References

[1]. Campuzano, L., Dynarski, M., Agodini, R., & Rall, K. (2009). *Effectiveness of Reading and Mathematics Software Products: Findings From Two Student Cohorts* (NCEE 2009-4041). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved on October 1, 2008 from:http://ies.ed.gov/ncee/pubs/20094041/pdf/ 20094041.pdf

[2]. Chall, J.S. & Dale, E. (1995). *Readability Revisited: The New Dale-Chall Readability Formula.* Cambridge, MA: Brookline Books.

[3]. Dynarski, M., Agodini, R., Heaviside, S., Novak, T., Carey, N., Campuzano, L., Means, B., Murphy, R., Penuel, W., Javitz, H., Emery, D, & Susses, W. (2007). *Effectiveness of Reading and Mathematics Software Products: Findings from the First Student Cohort* (NCEE 2007-4005) Washington D.C.: U.S. Department of Education, Institute of Education Sciences. Retrieved from: http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/28/06/e7.pdf

[4]. Harris, A.J. & Jacobson, M.D. (1982). *Basic Reading Vocabularies.* New York: MacMillan.

[5]. Jones, J.D., Staats, W.D., Bowling, N., Bickel, R.D., Cunningham, M.L. & Cadle, C. (2004). An evaluation of the Merit reading software program in the Calhoun County (WV) middle/highschool. *Journal of Research on Technology in Education*, *37*(2), 177-195.

[6]. Kinnaman, D.E. (1990). "What's the research telling us"? *Classroom Computer Learning*, (Oct.) 31-35; 38-39.

[7]. McGraw-Hill. *Education Standards Test, Technical Report, 2005 Supplement, Nov 15, 2005.* Retrieved on November, 15, 2007 from: http://westest.k12.wv.us/pdf/Board%20report%cutscores.pdf

[8]. Merit Corporation (2009). *Teacher Practices for Using Software Solutions to Enhance Student Achievement.* Retrieved on July 21, 2010 from: http://www.meritsoftware.com/teaching_tips/index.php

[9]. Merit Software Solutions. (2010). *Middle School: Reading Comprehension Software Solutions, Intermediate Level.* Retrieved on February, 11, 2010 from: http://www.meritsoftware.com/solutions/middle_school/reading_comprehension.php

[10]. Merit Corporation, (2005). *Reading and Language Arts Correlations with WV Standards and Objectives.* Retrieved on February, 10, 2010, from: http://www.meritsoftware.com/solutions/middle_school/reading_comprehension.php

[11]. Moran., Ferdig, R. E., Pearson, P. D., Wardrop, J. & Blomeyer, R. L., Jr.(2008). Technology and reading performance in the middle-school grades: A meta-analysis with recommendations for policy and practice. *Journal of Literacy Research*, *40*(1), DOI: 0.1080/10862960802070483 No Child Left Behind Act of 2001. Pub. L. No.107-110 Stat. 1425 (2001).

[12]. O'Byrne, B., Securro, S., Jones, J. & Cadle, C. (2006). Making the cut: The impact of an integrated learning system on low achieving middle school students. *Journal of Computer Assisted Learning*, *22*, 1-11.

[13]. Pearson, P.D., Ferdig, R.E., Blomeyer, R.L. Jr., & Moran, J. (2005). *The Effects of Technology on Reading Performance in the Middle-School Grades: A Meta-analysis with Recommendations for Policy.* Retrieved on October 14, 2008 from http://www.ncrel/org/tech/reading/index.html

[14]. Securro, S., Jones, J., Quantrell, D. & Blackwell, J. (2006). Intervention that adds up: The impact of Merit software on standardized achievement tests scores of middle school students. *i-manager's Journal on School Educational Technology*, *2*(1), June-August, 2006.

[15]. Taylor, S.E., Frankenpohl, H., White, C.E., Nieroroda, B.W., Browning, C.L. & Birsner, E.P. *EDL Core Vocabularies in Reading, Mathematics, Science and Social Studies.* Austin, TX: Steck-Vaughn Company.

[16]. West Virginia Department of Education (2005-2008).

Scale scores/Cut scores. Westest Assessment Office. k12.wv.us/pdf/Board%20Report%20cutscores.pdf Retrieved on November 21, 2007 from: http://westest.

Appendix A

Examples of Sixth Grade Reading and Language Arts Content Standards for West Virginia Schools Correlated to Merit Software Reading Comprehension Intermediate Modules

Standard 1: Reading (RLA.S.1)

Students will use skills to read for literacy experiences, read to inform and read to perform a task by: identifying and using the dimensions of reading (phonemic awareness, phonics, background knowledge/vocabulary, high frequency words/fluency, comprehension, writing and motivation to read)

Reading Objectives

Students will:

RLA.6.1.3 determine theme and locate supporting details in a literary passage and across the curriculum.

RLA.6.1.4 analyze text to determine transitional words/language.

RLA.6.1.5 use comprehension skills (e.g., draw conclusions; interpret meaning).

RLA.6.1.8 explain text connections for understanding a literary passage.

RLA.6.1.12 use root words, prefixes and suffixes to spell words, change word meanings and generate new words appropriate to grade level.

[Merit Modules]

Accu-Reading Sets 1 - 2,

Reading Shape Up Set 2

Reading 1.1. Learning to

Read Independently

Critical Thinking Skills, 1-2

Appendix B

Teacher Practices to Enhance Software Effects Reading Comprehension Intermediate

For best results the authors recommend that students can use these programs 20 to 30 minutes a session - two to three times a week - for six to eight weeks in conjunction with other methods of instruction.

Program usage should be paced to allow students sufficient time between sessions to absorb the material.

Some programs will offer both a Warm-up section and a Workout section. If a Warm-up section is offered, go here first. The Warm-up section will give students in-depth practice with individual skills. The Workout section will give students more difficult practice with mixed skills.

Follow up each software Workout session. Ask students to name something from software texts that was already familiar to them before their session. Can they name something they read about for the first time? What new questions do they have?

Look at a sample text from a book. Ask students to find the key words that tell the main idea. Can they list 2 - 3 details? Find a fact and/or an opinion? Explain text sequence? What can they infer from the text?

Give students short texts from social studies, science, or language arts classes. Have students work in pairs to create additional sentences that could be inserted into each text.

Have students imagine they are making up reading/vocabulary questions for the Merit program being used. Give students a short text.

Have them work in pairs to create and write their own skill-related questions and answers.

Return to the software and let students try Merit's Finals. Discuss scores with students. In what areas are they making the most progress since the Tryout section?

Have students print scores for completing the Tryout section. Discuss problem areas with students

Follow up each software Workout session. Ask students to name something from software texts that was already familiar to them before their session. Can they name something they read about for the first time? What new questions do they have?

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