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Technology Integration as an Intervention Strategy for At-Risk Eighth Graders

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Abstract

This study evaluated the impact technology had upon at-risk middle school students' learning in language arts and reading using technology. A cohort of 24 eighth grade repeaters in a small public school was isolated from the rest of the student population for 27 weeks of the school year. Technology (hypermedia, online research, PowerPoint™, and word processing) was integrated within the curriculum as an intervention strategy. Students had significantly higher CRCT test scores in language arts and reading ($p < .05$) over the previous year's scores resulting in a 29 point percentile gain in reading and a 23 point percentile gain in writing. Findings suggested that when students accepted ownership of their work and were able to use a variety of technology methods to demonstrate comprehension they became more invested in their own writing and spelling skills.

Introduction

Research offers evidence that integrating technology within the curriculum improves students' overall academic achievement as well as learning in literacy, spelling, and writing. A technology-integrated curriculum seems to provide more results than traditional instruction in relation to student achievement (Liao, 1998). Elbourne (2002) finds information and communication technology (ICT) motivational as well as effective for students learning to spell.

This action research project explored the question of whether a technology-based and integrated classroom curriculum would be more beneficial to student learning in language arts than traditional instruction. The author was charged with creating an effective, motivating, technology-based curriculum for low achieving eighth grade repeaters that would increase students' academic skills.

Literature Review

Hypermedia

One of the main strategies used in this project to create a motivating technology-based curriculum involved the use of hypermedia. Liao (1999) pointed to the confusion that exists in definitions of hypermedia and multimedia and how the terms have come to be used synonymously in the literature. Hypermedia, a combination of multimedia and hypertext (Chen & Ford, 1997), is defined by Nunes & Fowell (1996) as, “non-linearity and information retrieval by association. The interaction with the hypermedia system is based on a web of links, which associate all stored chunks of information, and allow the user to navigate within this informational body by creating his own path.”

Research has been inconclusive on the effectiveness of hypermedia instruction. Liao (1999) suggested that hypermedia instruction proved more beneficial than non-hypermedia instruction. Trotter (1989) contended that hypermedia employed beneficial strategies for discovery learning that enabled students to be in charge of their own work and to express their learning through multimedia. Moore (1994) described four advantages for students using hypermedia: interactive learning, self-directed learning, self-controlled learning, and the ability to make cross-references. Hammond and Allinson (cited in Chen & Ford, 1997), on the other hand, found four disadvantages associated with hypermedia learning: disorientation; lack of comprehension; problems with access, and inefficient learning strategies.

Current hypermedia research focuses on the user rather than the system. “There is evidence to suggest that learners may often adopt differing, but equally valid, effective, and navigational approaches to learning” (Chen & Ford, 1997). Additional research needs to determine the types of technology instruction most beneficial to students. Chen & Ford (1997) acknowledge, “Research on individual differences may help us create systems that can adapt to learners according to their needs. It may help the development of hypermedia learning environments that are useful to a wide range of users with differing abilities, styles and preferences.”

Challenges of Implementing Technology Integration

The researcher considered several challenges before implementing technology in the curriculum as an intervention strategy for at-risk students. Wong (2001) found that while literacy skills in reading comprehension, word recognition, writing, and spelling improved with the introduction of technology as a teaching tool, different computer-assisted instruction (CAI) software yielded different results. No one perfect software existed.

Another consideration was the selection of students to receive the instruction. While computer software designers attempted to accommodate an array of students beyond

one target population in addressing improved literacy instruction, a program that worked for one student might not necessarily work for all. In addition, at-risk children would not necessarily respond to the same type of CAI as students that were not in the at-risk category. At-risk students might not respond readily or willingly and might be more resistant to instruction. Therefore, an instructional method that delivered longer, more intense practice might prove more helpful for at-risk students who were often more resistant to help (Wong, 2001).

Students with learning disabilities could benefit from a technology-integrated curriculum which supports diverse learning styles as well. As these students entered middle and high school, the achievement gap and learning difficulties increased. Swanson (2001) asserted that multiple approaches of instructional delivery were needed with learning disabled students.

Purpose of Study

The purpose of this study was to evaluate the effectiveness of integrating technology into academic instruction in language arts. The researcher believed that by integrating technology into the curriculum for students who were repeating eighth grade, students would perform better academically than if they participated for a second time in traditional instruction. Reading and language arts scores on the eighth grade Criterion-Referenced Competency Test (CRCT) were used to measure changes in academic achievement.

Methods

Participants

The participants in this study included 24 students all repeating eighth grade. All students were considered at-risk of academic failure or dropping out. The purposive sample had 11 boys and 13 girls; 12 black and 12 white. The study took place in a small town public school with approximately 630 students broken down demographically as 47% black, 45% white, and 8% Asian/Pacific Islander or Hispanic.

Procedures

Initially a three-teacher team discussed better ways to teach a class of eighth grade repeaters. Among the instructional ideas considered for intervention were integrating technology and separating students by gender for 27 weeks of school. It was determined to use technology as the primary intervention, however, in the group of 13 girls and 11 boys, all collaborative work was done in same gender groups. Student repeaters received the same curriculum from the previous year from one team of teachers with the exception that technology was integrated into the curriculum and some instruction involved gender segregation.

Technology integration involved student use of the Internet to conduct online research; authentic student hypermedia products done in PowerPoint™; and word processing reports generated in Microsoft Word™. Creating authentic products in electronic data format facilitated students' abilities to store, revise, edit, and reflect on their work.

Design & Data Analysis

This study incorporated a pre-experimental design since no control group was available. Student achievement as a result of intervention (after integrating technology as a part of the curriculum) was measured by collecting the current year and the previous year's CRCT scores in reading and language arts. Data was collected anonymously. Parental permission to use the test scores was not deemed necessary since this was an overall curriculum improvement intervention. Test scores were compared by using a paired *t* - test, setting the alpha level at .05. Passing rates were also compared using Chi-Square tests.

Results

The purpose of this study was to determine if 27 weeks of technology-enhanced instruction would help 24 students who were repeating eighth grade perform better on the CRCT in reading and writing. The reading CRCT benchmark mean score was 316. After technology-enhanced instruction, the mean score rose to 345 (a gain of 28 points). The writing CRCT mean score went from 307 to 321 for a gain of 14 points. These gains were statistically significant (see Table 1). Effect sizes were substantial using the Cohen's d formula. Reading had an effect size of .82 yielding a gain of 29 percentile points while writing had an effect size of .68 yielding a gain of 23 percentile points.

The correlation of the set of writing scores was $r = .63$, $p = .001$. The correlation of the reading scores was lower at $r = .45$, $p = .03$. The cut off score for both tests was 300, leaving a passing rate on the reading pretest and on the writing pretest of 71% for this group of students. On the posttest, the passing rate in reading was 96% [X 2 (1) = 7.3, $p < .007$] and 83% in writing, [X 2 (1) = 1.8, $p < .18$]. See Figure 1 for histograms of all four sets of scores.

Discussion

The most important finding from the research was the improvement in students' reading and writing CRCT scores with students making statistically significant gains. Challenges to the study's validity included student maturation and the fact that students had received the same curriculum previously.

The major change in the intervention curriculum was the addition of technology to the instructional delivery method. Exposing students to a technology-based curriculum had a positive impact educationally for this group of at-risk students. Traditional instructional methods which were teacher-centered gave way to student-centered learning. Students took more ownership of their work and were more involved and motivated by the interactive, technology-infused learning environment. Students accepting ownership of their own learning may have been a significant contributing factor in the overall improvements evidenced in higher test scores in reading comprehension, word recognition, writing, and spelling.

About the Author

Eric B. Little is a fourth year classroom teacher and graduate student working on an Ed.S degree. He holds a B.S. and M.Ed. in middle grades education. He is certified in grades 4 through 8, and his interests are in using technology to improve student learning.
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Table 1

Descriptive Statistics on Eighth Grade Reading & Writing CRCT Tests

	M	N	SD
Reading Pretest Scores	316	24	35
Reading Posttest Scores	345	24	36
Writing Pretest Scores	307	24	20
Writing Posttest Scores	321	24	21

Note: Reading t (23) = 3.7, p = .001; Writing t (23) = 3.9, p = .001

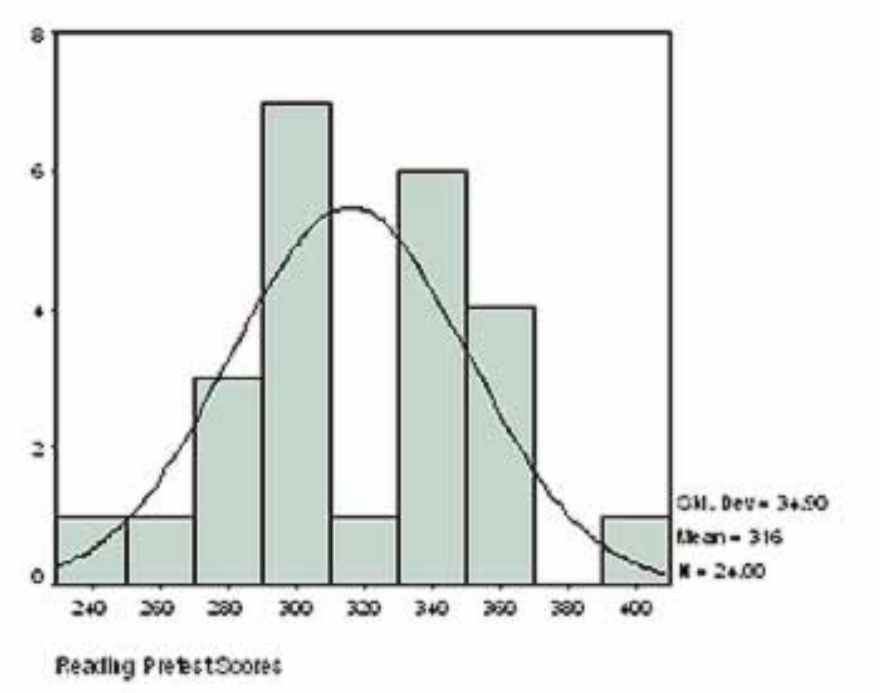


Figure 1: Histograms of pretest and posttest reading and writing scores.

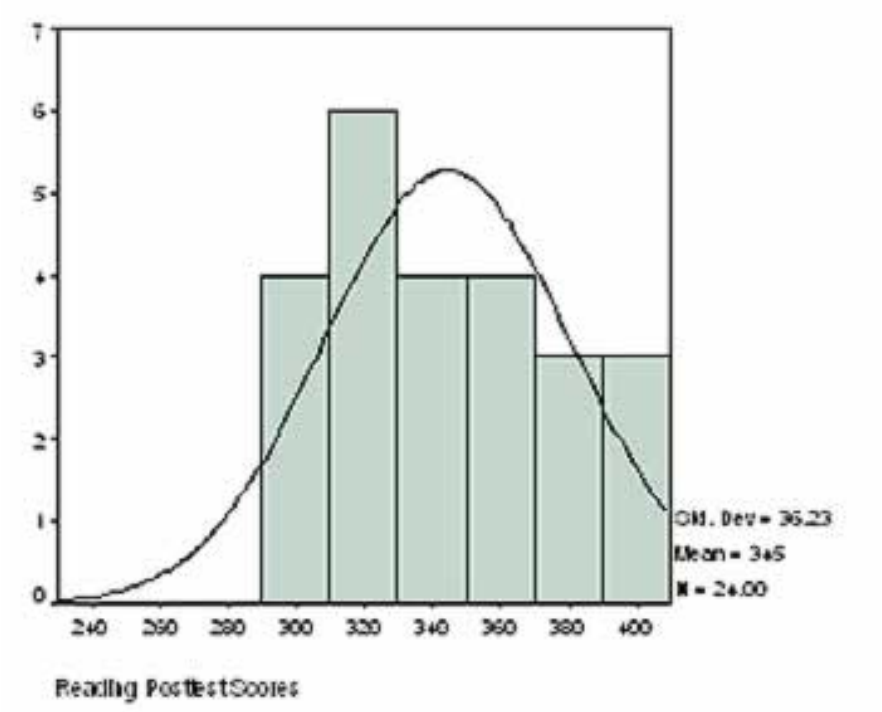
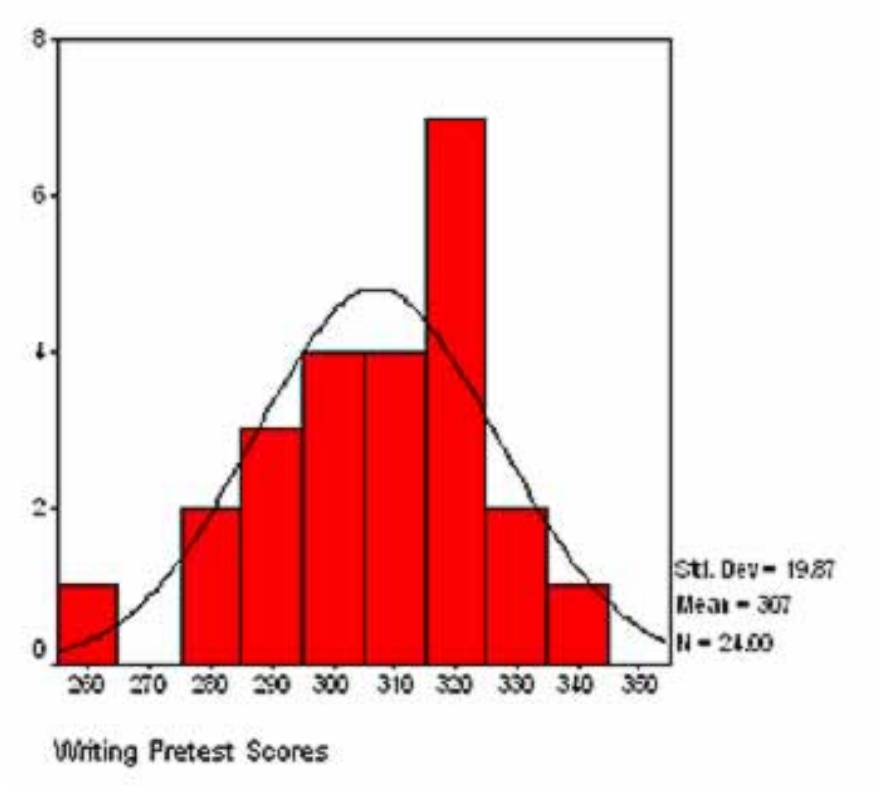
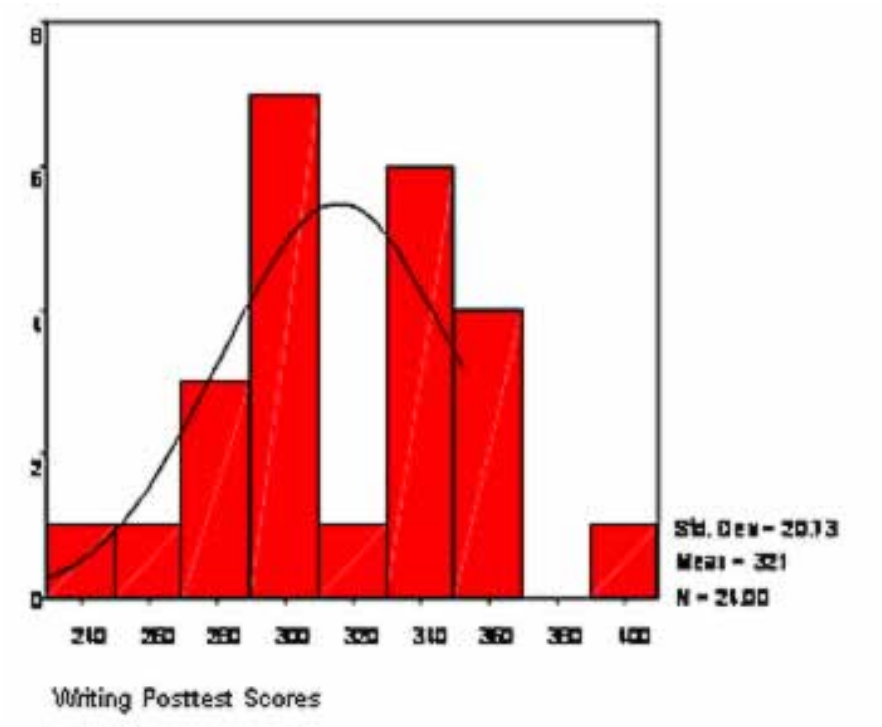


Figure 2: Gains in eighth grade reading and writing CRCT scores.


8
6
4
2
0
260 270 280 290 300 310 320 330 340 350
Std. Dev = 19.87
Mean = 307
N = 24.00
Writing Pretest Scores


8
6
4
2
0
Std. Dev = 20.13
Mean = 321
N = 24.00
Writing Posttest Scores

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