ANALYSIS OF ACCELERATED READER TEST COMPREHENSION LEVEL

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ANALYSIS OF ACCELERATED READER TEST COMPREHENSION LEVEL

A Field Study

Presented to the

Graduate and Research Council of

Austin Peay State University

In Partial Fulfillment

Of the Requirements for the Degree of

Education Specialist

Michelle G. Rayle

August, 2002

DEDICATION

To my husband David.

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ABSTRACT

The purpose of this study was to determine if Accelerated Reader quizzes contain more knowledge level questions than comprehension level questions. Data was gathered by a team of evaluators, utilizing an evaluation instrument based on Bloom's Taxonomy of Educational Objectives: Cognitive Domain. A sample of 390 Accelerated Reader third through sixth grade quizzes were evaluated in terms of the questions' formats.

Descriptive statistics revealed that 20% of the Accelerated Reader quizzes at each grade level were entirely composed of knowledge level questions. Inferential statistics, in the form of an ANOVA, were calculated to determine if a statistical difference at the $\alpha = .05$ level existed when evaluating Accelerated Reader quizzes based on Bloom's Taxonomy in terms of the number of knowledge level questions as compared to the number of comprehension level questions. Results supported rejecting the null hypothesis because a difference existed.

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CHAPTER I

INTRODUCTION

The desire to increase literacy in the United States of America is the aspiration of the highest educational official in the land. In an address to the International Reading Association in May of 2001, United State Secretary of Education Rod Paige focused on the national concern of the literacy rate in the United States (Paige, 2001). Paige went on to state the "problems" (p. 1), are primarily in the area of reading. President George W. Bush's plan, Paige further stated, is to increase funding for early intervention programs, such as Reading First and Early Reading First, which target reading through research-backed instructional strategies in the early grades.

The Problem

With the emphasis on increasing literacy, school districts are held accountable for student progress and often seek reliable means of assessment for evaluating achievement. The dilemma with reading assessment is verifying that what is tested is actually what is learned. Are the current methods of assessments, which are typically multiple-choice, able to measure the actual cognitive level of student comprehension achieved?

Importance of the problem

Reading comprehension assessment in the United States has remained comparatively constant over the last thirty years (Sarroub & Pearson, 1998). Methods used to assess student reading comprehension have changed significantly less than the propagators of assessment. Educational institutions, which today are held to much higher levels of accountability than in the past, are required to seek effective ways of instructional delivery and to provide evidence of achievement (Sarroub & Pearson, 1998). With the high stakes assessment currently at work in the United States the concern is whether cognitive processes involved in reading can actually be measured with the instruments currently utilized. In the early grades, the emphasis is on learning to read whereas in grades four and above the emphasis is on reading to learn. Therefore, the need to find high quality assessment designs, which accurately measures student achievement, is of concern to educators (Perry, Walton and Calder, 1999).

Relationship of the study to this problem

An understanding of cognitive skills utilized in reading in order to formulate a comprehensive assessment tool is essential in monitoring, diagnosing and reporting student achievement. With this understanding, educators are then able

to gain essential information enabling them to make crucial professional judgments regarding reading instruction. It is imperative that what is reported in an assessment of reading achievement is actually what has been gained by the student. This study determined the levels of questions generated by individual test items that accompanied the Accelerated Reader programs, based on Bloom's (1956) taxonomy.

Research Questions

Specific questions to be addressed by the research will include:

1. What percent of each individual Accelerated Reader quiz's questions are knowledge level?
2. What percent of each individual Accelerated Reader quiz's questions are comprehension level?

Hypothesis

There will be no significant difference in the number of knowledge level questions utilized as compared to the number of comprehension level pquestions utilized in each individual Accelerated Reader quiz.

Definition of Terms

1. Accelerated Reader (AR) Program is a curriculum-level assessment tool that provides a summary and analysis of results to enable teachers to monitor both the quantity

and quality of reading practice. Students complete comprehension tests voluntarily, and the system is intended specifically to have strong formative effects on subsequent learning (Advantage Learning Systems, Incorporated, 1999).

2. Learning Information Systems (LIS) are computer based programs that help educators accelerate learning and increase motivation by providing immediate, individualized constructive feedback on student's reading, writing, and mathematics tasks (Paul 1996).

3. Bloom's (1956) Taxonomy of Educational Objectives Cognitive Domain is a hierarchically ordered classification scheme for six levels of questions: knowledge, comprehension, applications, analysis, synthesis and evaluation.

> *Knowledge*. Behaviors and test situations, which emphasize remembering, by recognition, recall of ideas, material or phenomena.
> *Comprehension*. Objectives, behaviors or responses representing an understanding of the literal message contained in the communication. In reaching such understanding, students may change the communication in their minds to some parallel form more meaningful to them. Responses may also represent simple extensions beyond what is given in the communication itself.
> *Application*. Remembering and bringing to bear upon given material the appropriate generalizations and principals.
> *Analysis*. The breakdown of material into constituent parts and detection of the

relationships of the parts and of the way they are organized.
Synthesis. Combining elements and parts to form a whole. This is a process of working with elements, parts etc. and combining them in such a way as to constitute a new pattern of structure not clearly there previously.
Evaluation. Making judgements about the value of material and methods for given purposes. Quantitative and qualitative judgements about the extent to which material and methods will satisfy a given criteria are determined (Bloom, 1956).

Limitations of the study

The limitations of the study were as follows:

1. Only third through sixth grade level Accelerated Reader quizzes, purchased for a specific facility in a North Middle Tennessee school system, will be utilized.
2. The grade equivalents for Accelerated Reader quizzes are determined by Renaissance Learning Systems and may not agree with other organizations determination of materials' grade equivalents.
3. Quiz evaluations are limited by the biases and influences of the volunteers' assessments.
4. Quiz evaluations are limited by the biases and influences of the trainer as researcher and participant in the study.

CHAPTER II

REVIEW OF LITERATURE

Chapter II was composed of reviews of specific studies relating to Learning Information Systems, Accelerated Reader, Bloom's Taxonomy and reading comprehension development. Studies with regard to effective questioning necessary to evaluate reading comprehension and its impact on student achievement are also included.

Learning Information Systems Technologies

Management of reading programs, which utilize computer assessments, are replacing book reports as a "high-tech" method of insuring assigned reading materials are actually read (Everhart, 2001). Learning Information Systems (LIS) has addressed this concern with "computerized curriculum-based self-assessment and computerized evaluative feedback" (Topping, 1999, p. 5). Topping noted responsibility for learning is shared by both the student and the teacher. Formative computerized evaluative feedback, provided to the student and teacher, is intended to improve learning effectiveness (Topping, 1999). According to Renaissance Learning, Incorporated (1999) the three "task levels" in LIS are:

1. Task level, where LIS helps teachers manage and assess student progress with tasks and activities. This level can include activity sheets that are non-computerized, hand-scored tests and grade books. With computerized task-level LIS, the teacher's time is more efficiently balanced with smaller amounts of paperwork.
2. Classroom Achievement Level is where computerized task software assists teachers in evaluating students' current reading instructional level. Further, the software at this level allows the teacher to continuously evaluate growth and adjust instruction to insure continuous growth. Used intermittently, these assessment tools can help teachers anticipate results on mandatory achievement tests. The focus for this study was the Classroom Achievement Level.
3. High-stakes LIS measures the degree of student mastery as determined by district, state and national levels. Examples include mandated tests, such as the SAT, ACT, TAAS or Terra Nova.

Computerized LISs, which provide for student self-assessment of silent reading comprehension of literature, provide immediate and enhanced feedback and are increasingly sophisticated (Paul, 1995; Paul & Toppings, 1996; Vollands,

Topping, & Evans, 1996). Computerized formative feedback, according to Kluger and DeNisis (1996), yields a significant positive effect on student motivation. Goal clarity, student commitment and the belief in success were important influences on developing proficiency (Kluger & DeNisis, 1996). In addition to providing analysis data and reports for the teacher, computerized software also produce take-home reports to promote parent involvement. This software when coupled with norm-referenced reading tests can be delivered, scored and interpreted by computer. These tests can also be programmed to be time efficient and reduce student testing time presenting only individually chosen items to promptly determine the child's functional level.

Accelerated Reader

An example of a computerized LIS is Accelerated Reader (AR), which is utilized by more than 45,000 schools in the United States (Topping, 1999; Renaissance Learning, Inc, 1999). Accelerated Reader provides structured detailed formative feedback of student comprehension to both the student and the teacher (Topping, 1999; Renaissance Learning, Inc, 1999). Accelerated Reader facilitates computer-assisted assessment of a student's comprehension of reading selections completed. According to the software

designers, AR facilitates more frequent and detailed assessments, which effectively utilizes the teacher's time and provides increased consistency in formative feedback. As a result, students' development of meta-cognitive awareness and motivation are heightened, leading to an increased desire to read more challenging books (Advantage Learning Systems, 1993). Formative feedback is provided to the teacher in terms of a class-wide diagnostic report that includes alerts noting students who are at-risk (Advantage Learning Systems, 1993). Ease of teacher management allows for effective reading practices and are viewed as essential to the software (Advantage Learning Systems, 1999). Accelerated Reader curriculum-based assessment provides a summary and analysis of results to enable teachers to monitor both the quantity and quality of reading practice engaged in by their students (Advantage Learning Systems, 1999).

A student who utilizes the AR program, self-selects a book from one of the 25,000 titles on the AR list (Advantage Learning Systems, 1999). Each book on the list is assigned a point value based on the number of words it contains and its reading difficulty (Topping, 1999). A formula based on the Flesch-Kincaid readability index that considers the number of syllables in words and sentence complexity is utilized to

assign the point values (Topping, 1999). Point values are calculated as follows: AR points = (10 + reading level) x (words in book ÷ 100,000).

Accelerated Reading classrooms' strategies require that after completing a reading selection at their individualized pace, a student completes a computer generated multiple-choice quiz on the book's content. Quizzes may consist of 5, 10 or 20 items, determined by the length and difficulty of the book. Each quiz is computer scored and points are awarded to the student based on the results. Record keeping is computerized allowing for the effective use of a teacher's time. Based on the established quizzes' scores, students must earn at least 60 percent on a quiz in order to earn any points. It is recommended by the designers of the software that teachers target 85 percent as the optimal score for students. Another option teachers have is to allow students to take quizzes on books that are read to and with them. This can be utilized with new or delayed readers and in classrooms where the program is used with class-wide, selective, or elective peer tutoring. Topping (1999), however, notes implementation with delayed or struggling readers can be time consuming for the teacher.

Accelerated Reader Design

The format and design of AR quizzes are intended primarily to measure literal comprehension and to determine whether the student has read the book (Institute for Academic Excellence, 1998). The purpose of using lower level literal comprehension questions, according to the designers, is to lessen subjectivity to bias (Institute for Academic Excellence, 1998). Avoidance of higher order thinking test questions is based on the belief that successful readers could possibly score higher than lower ability readers on questions (Institute for Academic Excellence, 1998). Some studies have found, a rise in student test scores, which is closely related to computer test format (Bangert-Downs, Kulik, Kulik, & Morgan, 1991). Others believe AR quizzes are electronic versions of the questions listed at the end of reading passages or on worksheets in basal reading series of the past (Labbo, 1999). "The psychometric properties of the instrument make it more like a standardized testing situation than a rich forum for reflecting on text." (Labbo, 1999). Kohn (1999) notes when students involved in Accelerated Reader programs read, the tendency is to skim for facts needed to correctly answer questions on the quizzes, this "is altogether different from the sort of thoughtful engagement

we'd like to see kids come to adopt when they open a book" (p. 269).

Topping study

Topping (1999) cites numerous large-scale studies in which AR has yielded positive results in student motivation, attitudes, gains in standardized test scores and reading comprehension. A major study conducted in Tennessee yielded AR data on 62,739 students in grades three through eight, which were merged with the Tennessee Value-Added Assessment System (TVAAS) teacher-effects database. Relationships between these independently acquired measures were explored (Topping, 1999). Analysis of the data at both student and teacher levels, yielded positive results. Topping noted a statistically significant relationship between the increased number of books students read and the value-added gains in grades three through six. Topping further revealed there was a positive and significant statistical relationship noted between the percent of AR test questions answered correctly and value-added gains across all grades.

Advantage Learning (1999) established 85 percent as the optimal measure for student achievement. Results of the Topping (1999) research yielded an average of 80 percent correct in grades three and four and 85 percent in grades

five to seven. The positive results were also apparent in the increase of students' reading abilities and the quantity of materials read by the students. In an analysis at the student level; however, 85 percent, more than half the children, were found to be working below the established standard. This may suggest, according to Topping (1999) implementation reliability was inconsistent.

Reading Comprehension Development

According to Torgesen (1998), "The ultimate purpose of reading instruction is to help children acquire the skills that enable learning from understanding and enjoyment of written language"(p.1). The end goal, Torgesen continues, is "to help children comprehend written material at a level that is consistent with their general intellectual abilities"(p.1). Reading in the elementary setting focuses on "learning to read", while "secondary reading instruction focuses on reading to learn" (Wilson, 1999, p. 2). Phonetic awareness, which is believed to be crucial to early literacy, is agreed to be the foundation of learning to read (Bond & Dykstra, 1997). Researchers and practitioners in this area of reading concurred that children need training in phonemic awareness, by which they develop an awareness of individual sounds and cueing strategies necessary for decoding and text

comprehension (Kelly, 1997). In a balanced reading approach a combination of whole language and phonics approaches are utilized to achieve this outcome (Reutzel, 1999; Stovicheva, 1999).

A 1995 California Department of Education Task Force report, "Every Child a Reader" noted, "the heart of a powerful reading program is the relationship between explicit, systematic skills instruction plus literature, language and comprehension. While skills alone are insufficient to develop good readers, no reader can become proficient without these foundational skills." (p.1).

According to Reutzel (1999) basic reading knowledge is the phonological skills required to interpret and interact with the text. At this level students recognize words and are able to recall syntax rules needed to decode. Reading comprehension conversely is the reader's ability to interact with the text using higher order thinking skills such as inferencing, predicting and summarizing (Wilson, 1999). According to Pressley (2001) reading can be thought of in hierarchical levels of skills, from processing the sounds associated with individual letters to word recognition to text-processing competencies. Comprehension of reading materials require proficient articulation of all these

processes, from sounding out and recognizing individual words to understanding sentences in paragraphs as part of much longer texts.

Bloom's Taxonomy

In 1956, Benjamin Bloom led a group of psychologists who developed a classification of levels of intellectual behaviors they regarded as important to learning. This development became known as Bloom's taxonomy. The taxonomy included three domains, the cognitive, affective, and psychomotor. For the purpose of this research, the focus was on the cognitive domain.

Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts to the more complex abstract higher order thinking levels. Cognitive learning includes knowledge recall and skills such as comprehension of information, organizing ideas, analyzing and synthesizing data, applying knowledge, making choices in problem-solving and evaluating ideas or actions. Verbs associated with each level are as follows (Bloom, 1956):

> *Knowledge:* arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce and state.
> *Comprehension:* classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate,

Application: apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, and write.
Analysis: analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, and test.
Synthesis: arrange, assemble, collect, compose, construct, create, design, develop, formulate, manage, organize, plan, prepare, propose, set up, and write.
Evaluation: appraise, argue, assess, attach, choose, compare, defend, estimate, judge, predict, rate, select, support, value, evaluate.

Students are typically instructed to read narrative or expository stories and then required to answer factual questions. Reading for literal comprehension is often emphasized because of the ease and objectivity of evaluation. As a result of this emphasis, many students do not develop a personal attachment to the books they read. They fail to connect what they read to their imaginations and do not view reading as a way to understand how others live their lives or as a way to gain self-understanding and evaluation (Serafini, 2000). Teachers can pose questions to direct students toward the realization that reading has a greater and more varied purpose than simply the recall of facts. When this is accomplished, it is likely that students will place a higher value on reading. As a result, they will continue to turn to it for pleasure and for learning, while establishing it as a life-long habit (Serafini, 2000).

Effectively Evaluating Reading Comprehension

Typically, standardized test formats are designed to evaluate educational programs on large district-wide scales for the purpose of accountability (Murphy, 1997). The key to these tests center around an efficient use of teacher time and public funds (Murphy, 1997). Purves (1990), in an analytical study of published tests primarily used by state assessment agencies concluded current test formats focus on literal comprehension, which fall within the lower knowledge level. Most of the secondary tests in the study utilized multiple choice format and were primarily focused on comprehension of content, the meaning of parts or themes in reading selections. The typical test, Purvis (1990) further reported, focused on recognition and recall level questions, which according to Bloom (1956) are at the lowest level of the cognitive domain. The resulting factor, Purvis' study revealed, was the unnecessary requirement of the student to thoroughly read the selection. Utilization of summaries, study guides and relying on the plot notations were sufficient to answer questions. Wiggins (1990), in a report prepared for the California Assessment Program states, "Test-validity should depend in part upon whether the test stimulates real-world ability." (p. 1). Validity, Wiggins

(1990) stated, on most multiple-choice tests can be a gauge of academic performance but too often is a misleading indicator of mastered skills to teachers and students.

The question of validity in tests, which measures reading understanding, is a strong consideration for reading comprehension assessments. Sternberg (1991) queried the validity of these tools in determining what processes are actually occurring as students read. Multiple-choice tests often reflect the student's ability to perform rather than reading ability, therefore measuring performance and interaction with an assessment instrument rather than comprehension (Sternberg, 1991).

Summary

A review of the literature indicated there existed multifaceted aspects to the cognitive processes involved in reading comprehension and its assessment. The use of computerized assessment is increasing in U. S. schools, consequently increasing its use in the reporting of student achievement. The utilization of such technology in the reporting of students' reading achievement has had mixed reviews in the literature. Proponents of AR report significant gains and opponents suggest caution be employed in relying solely on its results. What is lacking appeared to

be a focus on the cognitive complexity of questions, which surrounds computerized assessment programs such as AR. The literature indicated there was an interrelationship between the design of AR and that of standardized tests. While the multiple-choice format of standardized tests remains the most predominately utilized assessment tool in the United States, experts in the field of education agree alternative means of assessments, which focus on the cognitive process used when answering questions, must be utilized to accurately direct instruction. Reliability and validity of the assessment tool must be a major consideration in this age of high stakes testing.

CHAPTER III

METHODOLOGY

Chapter III describes in detail the methods and procedures utilized to acquire evaluators, the training provided, and includes a description of the instruments. This study analyzed Accelerated Reader quiz questions to determine their levels of reading comprehension according to Bloom's Taxonomy, as generated by individual quiz items.

Sample: Accelerated Reader Quizzes

Renaissance Learning, the distributors of Accelerated Reader quizzes, randomly assigns numbers to the Accelerated Reader, third through sixth grades reading quizzes. The current test bank consists of 50,000 quizzes available for grades kindergarten through twelve. A test bank of 15,000 quizzes was available to this researcher. Based on Educational and Psychological Measurement Table of Recommended Sample Sizes (*n*) for Populations (*N*) with Finite Sizes (Krejcie & Morgan, 1970), an appropriate sample size for a population of 15,000 is 375. For the purpose of this study, every 40th quiz was selected for analysis resulting in a minimal sample size of 375 quizzes. Accelerated Reader quizzes are grouped in 5, 10, and 20 question format. For the purpose of this study, only ten question quizzes will be

utilized. Accelerated Reader quizzes are categorized in alphabetical order. Utilizing a printout of all available quizzes, every 40th quiz was identified for evaluation.

Evaluators

Evaluators volunteered for the task of classifying Accelerated Reader quiz questions. Individuals were licensed to teach first through eighth grades and currently teach in the Clarksville/Montgomery County School System. Each evaluator had experience utilizing Accelerated Reader in individual classroom environments. Evaluators #1 and #2 had eight years public school teaching experience each, at the elementary level. Evaluator #2 had nine years public school teaching experience at the elementary level and evaluator #4 had seven years public school teaching at the elementary level. Each evaluator had a background in reading comprehension instruction and has at least one post-graduate degree. All were currently participating in educational programs towards advanced degrees.

Training

The trainer held a Reading Specialist certification in the state of Tennessee with fifteen graduate and twenty-one undergraduate hours in reading instruction. In addition, the

trainer had eighteen in-service credit hours related to reading instruction.

Evaluators were trained to consistently evaluate the knowledge and comprehension levels of Accelerated Reader test questions. The training consisted of four three-hour sessions. The purpose of each training was:

Session 1

Gain a common understanding of the criteria and framework necessary for reliable classification of reading quiz questions.

Session 2

Gain an inter-rater reliability coefficient of .80 or greater through practice activities utilizing quizzes not included in the sampling.

Sessions 3 and 4

Analyze the 390 Accelerated Reader quiz questions.

The researcher had prepared packets for each evaluator, which included:

a) Taxonomy of Educational Objectives Handbook: Cognitive Domain:

b) A list of verbs associated with each level of the cognitive domain;

c) Practice activity using Bloom's Taxonomy and

d) Samples of the scoring instrument.

Instrument

The data collection sheet designed for this study was utilized to categorize each quiz question in the sample as either knowledge or comprehension. Evaluators listed each question under a column heading of knowledge or comprehension based on Bloom's Taxonomy verbs. The number of quiz questions for knowledge and comprehension were listed and tallied.

Data Collection

Quizzes were listed on the table vertically by the assigned Accelerated Reader quiz number and categorized in the column heading according to the test manufacturer's assigned grade equivalents. Utilizing the list of verbs and the Taxonomy of Educational Objectives Handbook: Cognitive Domain, the evaluator listed quiz question item numbers under either the knowledge or comprehension column. Evaluators computed the frequency of each type of quiz questions by counting the number of questions, which appeared under each column.

Data Analysis

Inferential statistics, in the form of an ANOVA, were calculated to determine if a statistical difference at the $\alpha = .05$ level exists when evaluating Accelerated Reader

quizzes based on Bloom's Taxonomy Cognitive Development in terms of the number of knowledge level questions as compared to the number of comprehension level questions. Descriptive statistics were calculated to develop a better understanding of the ratio of knowledge level questions as compared to comprehension level questions contained in Accelerated Reader quizzes.

Null Hypothesis

The specific data to be generated and analyzed were based upon the following null hypothesis analyzed at $\alpha = .05$ level:

There will be no significant difference in the number of knowledge level questions utilized as compared to the number of comprehension level questions utilized in each individual Accelerated Reader quiz.

CHAPTER IV

RESEARCH FINDINGS

The central purpose of this study was to evaluate the number of knowledge level questions utilized within Accelerated Reader quizzes as compared to comprehension level questions for grades third through sixth.

Research Question One

Research question one focused on the variable knowledge level questions. Descriptive statistics revealed third grade Accelerated Reader quizzes were heavily weighed in knowledge level questions. Quizzes containing one to five knowledge level questions equated to 1% of the total number of tests evaluated. Quizzes containing six to ten knowledge level questions equated to 99% of the total number of tests evaluated. When evaluating fourth grade quizzes, quizzes containing one to five knowledge level questions equated to 3% of the total number of tests. Quizzes containing six to ten knowledge level questions equated to 97% of the total number of tests. When evaluating fifth grade quizzes, quizzes containing one to five knowledge level questions equated to 7% of the total number of tests. Quizzes containing six to ten knowledge level questions equated to 93% of the total

number of tests. When evaluating sixth grade quizzes, quizzes containing one to five knowledge level questions equated to 4% of the total number of tests. Quizzes containing six to ten knowledge level questions equated to 96% of the total number of tests.

Descriptive statistics support the lower the grade level the more weighted towards knowledge level questions are the Accelerated Reader quizzes. An interesting statistical note, sixth grade quizzes contained more knowledge level questions than fifth grade quizzes.

Table 1

Knowledge level questions in AR Quizzes

Knowledge Questions	3rd	4th	5th	6th
1 - 5	1%	3%	7%	4%
6 - 10	99%	97%	93%	96%

Note: Table 1 displays descriptive data delineating the number of knowledge level questions contained within the 390 Accelerated Reader quizzes evaluated.

Research Question Two

Research question two focused on the variable comprehension level questions. Descriptive statistics revealed third grade Accelerated Reader quizzes were not

strongly weighed with comprehension level questions. Quizzes containing one to five comprehension level questions equated to 99% of the total number of tests. Quizzes containing six to ten comprehension level questions equated to 1% of the total number of tests. When evaluating fourth grade quizzes, quizzes containing one to five comprehension level questions equated to 97% of the total number of tests. Quizzes containing six to ten comprehension level questions equated to 3% of the total number of tests. When evaluating fifth grade quizzes, quizzes containing one to five comprehension level questions equated to 93% of the total number of tests. Quizzes containing six to ten comprehension level questions equated to 7% of the total number of tests. When evaluating sixth grade quizzes, quizzes containing one to five comprehension level questions equated to 96% of the total number of tests. Quizzes containing six to ten comprehension level questions equated to 4% of the total number of tests.

Descriptive statistics support the lower the grade level the less weighted the quizzes are with comprehension level questions. An interesting statistical note, sixth grade quizzes contained less comprehension level questions than fifth grade.

Table 2

Comprehension Level Questions in AR Quizzes

Comprehension Questions	3rd	4th	5th	6th
1 - 5	99%	97%	93%	96%
6 - 10	1%	3%	7%	4%

Note: Table 2 displays descriptive data delineating the number of question contained within the 390 Accelerated Reader quizzes evaluated.

Hypothesis

There will be no significant difference in the number of knowledge level questions utilized as compared to the number of comprehension questions utilized in each individual Accelerated Reader quiz.

Inferential statistics in the form of an ANOVA at the $\alpha = .05$ level were calculated to address the null hypothesis. A total of three-hundred-ninety Accelerated Reader quizzes for grades three through six were evaluated. Utilizing a rubric delineating Bloom's Taxonomy for questioning, the number of knowledge level questions and comprehension level questions for each quiz was tallied. Accelerated Reader quizzes were then disaggregated by grade levels. Results of the ANOVA support rejecting the null hypothesis.

Table 3

Analysis of the Variance for Knowledge Level Questions as compared to Comprehension Level Questions

Variable	F	p	results
Knowledge level			
	19244	<.0001*	reject
Comprehension level			

Note: * significant at the $\alpha = .05$ level

Table 3 displays inferential statistical supporting the rejection of the null hypothesis.

Summary

The central purpose of this study was to determine if Accelerated Reader quizzes were more knowledge level or comprehension level in their questioning. Descriptive statistics delineate Accelerated Reader quizzes for third, fourth, fifth and sixth grade were heavily composed of knowledge level questions. Over 20% of the quizzes evaluated at each grade level were composed entirely of knowledge level questions. Inferential statistics, in the form of an ANOVA supported rejecting the null hypothesis delineating a difference does exist when evaluating the percentage of

knowledge level questions contained in quizzes as compared to comprehension level questions. Null hypothesis: There will be no significant difference in the number of knowledge level questions utilized as compared to the number of comprehension questions utilized in each individual Accelerated Reader quiz, was rejected at the $\alpha = .05$ level.

CHAPTER V

SUMMARY, FINDING, CONCLUSIONS AND RECCOMENDATIONS

Summary

The utilization of Learning Information Systems (LIS) technologies within the elementary classroom for evaluating students' reading comprehension is in its infancy. Current research is limited in scope. The most significant study completed to date was a meta-analysis completed by Topping (1999). This research revealed a strong relationship between teachers use of LIS technologies and an increase in students' standardized test scores in reading comprehension. Prior to this study, no research had been completed evaluating the level of knowledge level questions as compared to comprehension level questions contained in Accelerated Reader quizzes based on grade levels.

Finding

Analysis of the data revealed the following finding of this study as it related to Accelerated Reader quizzes, in terms of knowledge level questions as compared to comprehension level questions based-on grade level:

There was a statistical difference in the number of knowledge level questions as compared to comprehension

level questions, in grade levels three through six, on the Accelerated Reader quizzes.

Conclusions

The following conclusions were developed from an analysis of this study.

1. Accelerated Reader quizzes contained more knowledge level questions at the third grade level than the fourth, fifth and sixth grade levels.
2. Sixth grade Accelerated Reader quizzes contained more knowledge level questions than fourth and fifth grade quizzes.
3. Based on Bloom's Taxonomy, Accelerated Reader quizzes evaluate students primarily at the knowledge level.
4. Based on Bloom's Taxonomy, Accelerated Reader third through sixth grade quizzes do not measure higher order thinking ability.
5. Prior knowledge of a reading selection influences the evaluation of "why" questions as either knowledge level or comprehension level.

Recommendations for the Profession

1. Teachers should receive appropriate training delineating the actual capabilities of Accelerated Reader as a tool for assessing reading comprehension skills.

2. A more appropriate use of Accelerated Reader in the classroom would be as a reading motivational tool rather than a reading assessment tool.
3. Before implementing Accelerated Reader school-wide, administrators and teachers should read selected books and complete Accelerated Reader quizzes to fully understand the extent of quizzes evaluations.
4. Before implementing Accelerated Reader teachers need to understand the difference between literal comprehension and reading comprehension.

Recommendations for Further Study

The following recommendations were a result of the outcomes of this study:

1. Based on the following descriptive statistics (Table 4) it is recommended further studies be completed to evaluate if significant differences exists at other grade levels.

Table 4

Knowledge Level Questions as compared to Comprehension Level Questions in AR Quizzes

Questions	3rd	4th	5th	6th
Composed entirely of (10/10) Knowledge Level Questions	39%	22%	23%	29%
Quizzes containing 8 or more Comprehension Level Questions	0%	0%	.09%	1%

Note: Table 4 displays descriptive data delineating the percentage of Accelerated Reader quizzes, which were composed wholly of knowledge level questions. Further, Table 4 displays the percentage of Accelerated Reader quizzes, which were composed of eight or more questions. No Accelerated Reader quizzes contained more than eight comprehension questions.

2. Further inquiry to determine whether sixth grade AR quiz quizzes have a greater number of knowledge level questions than fifth grade quizzes and does the number

of knowledge level questions increase as grade levels increase.

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APPENDIX

DATA COLLECTION SHEET

DATA COLLECTION SHEET

Title, A.R. Quiz # and Grade Equivalent (If you have a working knowledge of this title or story place an asterisk next to the title.)	Knowledge Items Place a "w" over "why " questions	Total Items	Comprehension Items Place a "w" over "why " questions	Total Items

VITA

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