Analysis of the Relationship of

Math Ability and Success in Accounting 1 and 2

At Sheboygan South High School

by

Todd Williams

A Research Paper
Submitted in Partial Fulfillment of the
Requirements for the
Master of Science Degree
in

Career and Technical Education

Approved: Two Semester Credits

Julianne Taylor

Dr. Julianne Taylor

The Graduate School

University of Wisconsin-Stout

December, 2009

The Graduate School
University of Wisconsin – Stout
Menomonie, Wisconsin

Author: **Todd Williams**

Title: **An Analysis of the Relationship of Math Ability and Success in Accounting 1 and 2 at Sheboygan South High School**

Graduate Degree/Major: **MS in Career and Technical Education**

Research Advisor: **Dr. Julianne Taylor**

Month/Year: **December, 2009**

Number of Pages: **40**

Style Manual Used: **American Psychological Association, 5th edition**

ABSTRACT

Previous research has been conducted to examine the relationship between college math courses and success in a college intermediate accounting course. However, little research has been undertaken to analyze the relationship between a high school algebra course and a high school introductory accounting course. This research project attempted to determine if there was a relationship between math ability in high school algebra and success in a high school introductory accounting course. Student proficiency levels were examined through a state standardized testing model to determine the relationship between state math test scores/proficiency levels and final grades in the introductory accounting course. In addition, student aptitudes and relationships were examined based on demographics. The resulting data supports the existence of a relationship between ability in a high school algebra course and the success in a high school introductory

accounting course. The relationship between the state math test scores/proficiency levels and the final grade in a high school introductory accounting course was supported by the data also. The study provided guidance for teaching and counseling staff when advising students on proper course selection.

Acknowledgements

First and foremost, I need to thank my wife for her patience for dealing with my procrastination. Without her support, love, and pushing, this research project would never have gotten done.

I also need to thank my sons, Ian and Joel, for having many Sunday afternoons at home without dad around because I was at the library doing research. Thanks for giving me the time to get this done. Thank you also for giving me "permission" to work on this project after school instead of taking you to soccer practice and games. Many days I wished I had been with you!

And finally, I need to thank Juli Taylor for her patience and guidance with me while I worked on this project. I really do appreciate all your guidance throughout this project. Thank you!

TABLE OF CONTENTS

LIST OF TABLES

Chapter I: Introduction

Background of the Study

"Business education is a vital part of our American educational system and has provided a solid foundation of knowledge and skills for over a century" (National Business Education Association, 2001). Accounting is one course offered through many high school business education curriculums. Looking at a high school accounting course, one could conclude that the ability to problem solve and to solve mathematical equations may be a requirement. This may be true. But to what degree? Math has an important role in business education and in the world of business (Doucouliagos, 1990). To understand this role, it is important to examine how students learn math and what relationship exists, if any, between success in math and success in a high school accounting class.

For many high school students, learning math is a series of memorizing facts and formulas that have no real meaning to their daily lives (Battista, 1999). Many topics are taught year after year, yet many students do not learn them (Battista, 1999). Students who utilize the memorization approach for learning math tend not to retain what is taught more often than those students who have developed firm understandings of math concepts (Lubienski, 2007). This has the potential to lead to serious deficiencies in learning math.

When examining student learning, experts often look at instructional methodologies utilized by teachers. In math, teachers often demonstrate a series of problems and then ask the students to practice this demonstration set through another set of problems and homework (Battista, 1999). The National Research Council (1989, p.44)

stated that this type of instruction is "mindless mimicry mathematics." Students do not understand the process; they are just doing what the teacher has instructed them to do (National Research Council, 1989). Heinrich et al. (2005) stated that high school math is often taught with little real world application. This may create issues for students as they take other high school or post-secondary courses that involve real world math applications.

On the contrary, high school accounting classes give students opportunities to apply math to the real world. Accounting is the language of business. High school accounting, or bookkeeping as it is sometimes called, is a business education elective that prepares students for a major in business or specifically accounting in college. "Courses in bookkeeping/accounting have increasingly become part of the college preparatory curriculum of many secondary schools" (Eskew & Farley, 1988. p. 137).

A high school accounting course uses a system of debits and credits as the basis for decision-making purposes (Hellmuth, 1991). Throughout a high school accounting course, students use logic and problem-solving skills to gather and analyze data. Because much of this analysis is centered on various mathematical calculations, a high school accounting course draws on and reinforces one's math skills (Hellmuth, 1991).

Roberts (1997) stated that accounting is nothing more than the utilization of Basic algebra applications. A student in a high school accounting course will utilize addition, subtraction, multiplication, and division. They may also perform fractions, ratios, and percentages calculations during a first-year accounting course. Accounting students use these algebraic applications to analyze and solve financial problems that simulate the real world (Roberts, 1997).

The accounting curriculum generally focuses on Basic education skills of reading, math, economics, and communications. Higher level thinking skills are also incorporated in a high school accounting class (Hoyt, 1993). A high school accounting class will integrate problem-solving skills, critical thinking, and analytical skills. These skills are also part of a Basic high school algebra class (Hoyt, 1993). During a high school accounting class, decision-making skills will be emphasized as students gather and analyze data (Hellmuth, 1991).

Students often struggle, however, transferring the skills learned in an algebra class to the skills needed to solve accounting problems. Roberts (1997) told of a homebound student who was meeting with his school counselor to review the results of a test the student had taken. The student had done well on the test question dealing with calculating interest on a loan. However, when asked to solve an accounting problem, the student had difficulty. The student could not transfer the knowledge of algebra to the accounting problem that was structured similarly to a story problem. This leads one to question if ability to solve algebraic equations and problems would help a student in a high school accounting class.

Research has shown that prior high school accounting experience has a positive impact on students taking a college introductory accounting course. Taking a high school accounting/bookkeeping course influenced the outcome of students in a college introductory accounting course (Eskew, cited in Smith, 1968). Eskew (cited in Smith) further explained that students with high school accounting experience could complete the introductory college accounting course in a shorter amount of time than those students who did not have a high school accounting course. Schroeder (1986) furthered

this study and stated that students who have more than one year of high school accounting exposure do better than those students with little or no high school accounting experience. Roberts (1997) emphasized that although the terminology used in accounting may be foreign to students, the Basic math skills needed in accounting are those used in a high school algebra class.

Sheboygan South High School is located on the western shores of Lake Michigan in Sheboygan, Wisconsin. It has a student population of 1350 students, of which approximately 40 % are minority status. Within Sheboygan South High School, the Business Education Department has two full-time staff members and one part time staff member. The Department offers fifteen different course selections, including three years of accounting. The accounting classes are taught by one teacher.

The first year accounting course at Sheboygan South High School has a yearly enrollment of approximately 25 to 35 students, sophomores through seniors. In an attempt to increase student enrollment, Accounting 1 & 2 can now be taken by freshmen as well. With this change, however, correct placement of students in this course is vital. One possible criterion for correct placement of students in Accounting 1 & 2 may be ability in math, algebra in particular.

Statement of the Problem

Previous research has shown success in a college introductory accounting course can be tied to a student's previous accounting experience. However, the correlation between ability in a high school math course – algebra in particular - and success in an introductory high school accounting course needed further research.

Purpose of the Study

Sheboygan South High School needed to determine if there was a relationship between ability in high school algebra and success in Accounting 1 & 2 among students at Sheboygan South High School during the three year period, September 2006 through June 2009.

Research Objectives

This study addressed the following research objectives:

1. Determine currently enrolled Accounting 1 & 2 student's math aptitude through the Wisconsin Knowledge Concepts Examination (WKCE).
2. Determine the relationship of students enrolled in Accounting 1 & 2 between their final letter grade and their math score on the Wisconsin Knowledge Concepts Examination (WKCE).
3. Determine the relationship of students enrolled in Accounting 1 & 2 final letter grade and their final letter grade in the Algebra 1 course.
4. Identify aptitudes and relationships based on demographics.

Significance of the Study

This study will be of interest to the Business Education department, the Guidance department, the Career and Technical Education supervisor, and the administration at Sheboygan South High School. The study will provide insight to the role success in mathematics plays in relation to success in Accounting 1 & 2.

1. This study will create an understanding of the relationship of student success in a high school Algebra 1 class to success in Accounting 1 & 2. This information

may be useful in any future collaborative curriculum efforts involving the Math department and the Business Education department.

2. This study will help Counseling Department staff advise students in course selection at Sheboygan South High School. The Guidance department may utilize this information for better placement of students in the Accounting 1 & 2 courses at Sheboygan South High School.
3. This information may also be utilized to examine the appropriate year in school a student can and/or should begin to register for the Accounting 1 & 2 courses.
4. This study will assist the Business Education staff in making decisions about marketing business education courses. The Business Education staff may utilize this information to promote the Accounting 1 & 2 courses to students and parents in the Sheboygan Area School District. This information may also be utilized by other Business Education staff members within the Sheboygan Area School District.

Limitations of the Study

The limitations of the study are:

1. Data was limited to students enrolled in Accounting 1 & 2 at Sheboygan South High School during the period September, 2006 through June, 2009.
2. Data was limited to students who took the Algebra 1 course in middle school or high school. Students enrolled in IMP math or ELL algebra were not part of the study.
3. Research was limited to examining the relationship between Algebra 1 and Accounting 1 & 2 at Sheboygan South High School.

Definition of Terms

The following terms are defined for better understanding of this study.

1. *Accounting*: the system of recording and summarizing business and financial transactions and analyzing, verifying, and reporting the results (Merriam-Webster.com, 2008).
2. *Algebra*: branch of mathematics in which arithmetical operations and formal manipulations are applied to abstract symbols rather than specific numbers (*Encyclopedia* Britannica, 2008).
3. *Business Education*: Primary mission is to prepare students for business occupations and to teach students about business. (Wisconsin Department of Public Instruction, 2008).
4. *Career and Technical Education*: focuses on exploration of the self in relation to the world of work. Students discover their interests, talents, abilities, and the niches where their talents and abilities might best be used (Wisconsin Department of Public Instruction, 2008).
5. *Grade Point Average*: the average obtained by dividing the total number of grade points earned by the total number of credits attempted (Merriam-Webster.com, 2008).
6. *Wisconsin Knowledge Concepts Examination (WKCE)*: These standardized tests are designed to measure Wisconsin academic standards. The WKCE measures achievement in reading, language applications, mathematics, science, and social studies using multiple-choice and short-answer questions (Wisconsin Department of Public Instruction, 2008).

Chapter II: Literature Review

Introduction

This chapter addresses prior accounting experience and the role it plays in student success in a college introductory accounting course. It will also address how math is traditionally learned in secondary schools. The chapter will conclude with an examination of how math impacts accounting.

Prior Accounting Experience

Prior research, Smith (1968) and Schroeder (1986), has been conducted regarding the relationship of accounting experience in high school as a predictor of success in a college introductory accounting course. Some of this research also examined other factors such as academic ability/aptitude through scores on the ACT and past and present academic performance and the impact each has on the success in a college introductory accounting course.

John Smith (1968) was one of the first to examine the relationship of high school accounting experience and success in a college introductory accounting course. Smith studied the success in a college introductory accounting class of students with high school accounting experience with the success of students who had not had previous high school accounting experience (Smith, 1968). The study determined that students who had previous high school accounting exposure significantly outperformed those students with no previous high school accounting exposure. The students started the college introductory accounting class with an advantage over the other students and concluded the class with a better understanding of accounting.

Students in a college introductory accounting course who have had accounting in high school may have an advantage over those students with no previous high school accounting experience (Schroeder, 1986). A college introductory accounting course may be viewed as a review course for those students who have had high school accounting. Schroeder stated that students with high school accounting experience will not be challenged when material previously learned is covered in the college introductory accounting course and that this may cause some problems. Schroeder also reported that, although the advantage may exist early in the course work, there is significant difference in overall performance of those students who had one year of high school accounting experience and those students who had no high school experience. He stated that students who have more than one year of high school accounting do perform better in a college introductory accounting course than those with no high school accounting experience.

Eskew and Faley (1988) continued this research. Not only did they study the affects of previous accounting experience, they also examined academic aptitude and past and present academic performance (Eskew and Faley, 1988). They concluded that academic aptitude, based on SAT scores, and past and present academic performance were directly related to the outcome of a college introductory accounting class. Interestingly, the results of the Eskew and Faley study conflicted with previous research regarding the impact previous high school accounting experience has on the outcome of a college introductory accounting class.

Freidlob and Cosenza's research contradicted the Eskew and Faley study. They found students who had previous high school accounting exposure did perform better

than students with no high school accounting experience (Friedlob & Cosenza, 1981). However, the higher performance level was only during the first quarter of the college level accounting class. During the second quarter of the college level accounting class, the study found no statistically significant performance level of the students with prior accounting exposure. The only relationship found was the student's performance during the first quarter and the student's performance during the second quarter.

Interestingly, when the college accounting students were surveyed, they revealed it was their belief that prior high school accounting experience had assisted them during the entire year (Friedlob and Cosenza, 1981). Approximately 75% of the accounting students surveyed expressed this feeling.

This level of confidence by those students with previous high school accounting experience has also been examined. Students with prior high school accounting experience may have felt overconfident going into the first college level accounting class (Baldwin and Howe, 1982). Many felt that they have learned the beginning material already and believed they will be able to "breeze" through the class. However, during the latter stages of the class, when the material becomes more difficult to process, the students with prior high school accounting experience felt unprepared and began to struggle as much as the students who had no prior high school accounting exposure. The study further outlined the need for additional research, did not examine the amount of exposure the student had to high school accounting. Therefore, a student who had more than one year of high school accounting may have the ability to outperform those students with no prior high school accounting experience for the entire year.

Math Education

The reform of mathematics education in the United States has been a discussion point since the mid-1980s (Battista, 1999). However, math continues to be taught as it has traditionally been taught: the students are given several examples of problems to solve, they practice them in class, and then they have homework assigned that involves similar problems. Battista stated that mathematics education in the United States is Basic memorization of procedures and the eventual forgetting of these procedures since the procedures make little sense to the students. Much of the same mathematic concepts are taught year after year, but students never seem to actually learn and understand the concepts. Too many times students simply memorize formulas that are quickly forgotten or not completely understood. Battista further explained that much of the mathematics taught in United States schools today is almost the same material that most adults learned when they were in school.

Making a personal and real world connection of what is being taught in mathematics classrooms is important. Classrooms that do well in international comparisons are designed with personal and real world connections (Hyde, 2007). Unfortunately, the personal and real world connections are missing from many mathematics classrooms in the United States. Blending mathematics, language, and cognition is what needs to be done to build a stronger personal and real world connection. Literacy strategies of connecting new material with background knowledge can help a students develop a stronger understanding of the math concepts; thus, making the necessary connections. What the student reads in the textbook must also relate with things in the real world.

To make the changes to higher level thinking and to greater achievement in the mathematics classroom, the traditional way of teaching mathematics must change (Hyde, 2007). Hyde believed this is possible by creating classrooms and curriculum that imbed language and thought into mathematics. In other words, teachers need to ask students relevant questions so students can make the necessary personal and real world connections.

Accounting and Math

The ability to compute complex mathematical equations may be an advantage to a student studying accounting. Prior research by Clark and Sweeney found a relationship between college math grades and success in Intermediate Accounting (Clark and Sweeney, 1985). The study found that college math and calculus were very important areas of mathematics for accounting students to study. Clark and Sweeney found statistically significant evidence that a student's grade in college mathematics was a solid predictor in the student's success in later accounting classes.

Mathematical skills were also examined as performance measures of Black students in accounting classes. Gist (1996) studied the relationship of math/algebra/calculus performance of Black students to the success in introductory accounting classes. The study revealed that students who had received a grade of "C" or better in calculus did better than other students in an introductory level accounting course. However, the study concluded that success in algebra and on a math pretest did not significantly increase the performance in an introductory accounting class.

In summary, research, Smith (1968) and Schroeder (1986), on prior accounting experience as a predictor of success in a college introductory accounting course has been

contradicting; with some studies showing a strong relationship, while other studies showing a not so strong relationship. Research on math education United States, Battista, (1999) and Hyde (2007) has reported that the personal and real world connections are missing from most math classrooms. Many times students memorize procedures with little understanding. Understanding complex math equations and process may be an advantage to a student studying accounting. Clark and Sweeney (1985) found that college math and calculus are important areas for accounting students to study. However, little research has been done on the relationship of high school math and high school accounting.

Chapter III: Methodology

Introduction

The purpose of this study was to determine the relationship between ability in high school math and success in Accounting 1 & 2 among students at Sheboygan South High School during a three year period, September 2006 through June, 2009. This chapter includes subject selection and description, instrumentation, data collection, data analysis, and limitations.

Subject Selection and Description

Participants in this study consisted of students who were enrolled in Accounting 1 & 2 at Sheboygan South High School during the 2006 through 2009 academic years. There were total of 75 participants in this study; 35 females (or 47 percent) and 40 males (53 percent) in the study (see Table 1).

Table 1

Demographics - Gender

Gender	Frequency	Percent
Female	35	47
Male	40	53
Total	75	100.00

The year in school demographics are listed in Table 2. During the study period, freshmen were not allowed to take Accounting 1 & 2. Of the study participants, there were 16 sophomores (or 21 percent), 33 juniors (or 44 percent), and 26 seniors (or 35 percent) represented in the study (see Table 2).

Table 2

Demographics – Year in School

Year in School	Frequency	Percent
Sophomore	16	21
Juniors	33	44
Seniors	26	35
Total	75	100.00

Ethnicity representation of the study participants was as follows: 56 Caucasian (or 75 percent), 13 Asian (or 17 percent), 3 Native American (or 4 percent), 2 Hispanic (or 3 percent), and 1 African-American (or 1 percent) (see Table 3).

Table 3

Demographics - Ethnicity

Ethnicity	Frequency	Percent
Caucasian	56	74.67
Asian	13	17.33
Native American	3	4.00
Hispanic	2	2.67
African-American	1	1.33
Total	75	100.00

Instrumentation

The Wisconsin Knowledge Concepts Examinations (WKCE) was one tool utilized to gather data on participants. The mathematics portion of the WKCE was used to determine student performance level. Performance indicators for the WKCE are broken into four proficiency categories: Advanced, Proficient, Basic, and Minimal (Wisconsin Department of Public Instruction, 2009). At the Advanced level, students demonstrate a complete understanding of the material being tested at that grade level. Students at the Proficient level are able demonstrate competency of skills and knowledge at that grade level. The Basic level category demonstrates some knowledge of the material being tests, while the minimal level indicates limited ability in the subject area (Wisconsin Department of Public Instruction, 2009).

The WKCE data was obtained from the Sheboygan Area School District Department of Student and Instructional Services on December 17, 2008. The data set contained all tenth grade students who had completed the WKCE. Study participant performance indicators were gathered from this data set and the performance indicators were rated on a scale of 1 through 4, with 1 being minimal and 4 being Advanced.

Algebra grades were gathered from student transcripts through the assistance of the Sheboygan South High School Registrar during the fall semester of the 2009 – 2010 school year. The Sheboygan South High School Math Department's grading scale for Algebra 1 is recommended by the textbook series. Student's Algebra 1 grades were obtained from individual student transcripts for analysis purposes. Letter grades were then rated on a scale of 0 through 4, with 0 being an F and 4 being an A.

Accounting letter grades were gathered through the researcher's accounting grades. Letter grades were then rated on the same 0 through 4 scale as the Algebra 1 grades. Table 4, *Algebra and Accounting Grading Scales,* outlines the grading scales for the Sheboygan South High School Math Department Algebra 1 course and the Business Education Department Accounting 1 & 2 course.

Table 4

Algebra and Accounting Grading Scales

Letter Grade	Math Department Algebra 1 Grading Scale	Business Education Accounting 1 & 2 Grading Scale
A	85% – 100%	93% – 100%
B	72% – 84%	85% – 92%
C	60% – 71%	77% – 84%
D	50% – 59%	70% - 76%
F	49% & below	69% & below

Data Collection

Permission to conduct this study was granted in June, 2008 from the Sheboygan Area School District and Sheboygan South High School. Data used in this study was gathered from the Sheboygan Area School District Department of Student and Instructional Services and Sheboygan South High School Registrar. All data used in this study was gathered with the highest level of confidentiality. Only the researcher had access to the raw data.

Data Analysis

The data in this study was analyzed to determine the relationship between ability in high school math and success in Accounting 1 & 2 among students at Sheboygan South High School during a three year period, September 2006 through June, 2009. Listed in Table 5, are the research objectives for the study and the statistical techniques used to analyze them.

Table 5

Research Objectives and Statistical Analysis

Research Objective	Statistical Technique	Results Analyzed
Determine currently enrolled Accounting 1 & 2 student's math aptitude through the Wisconsin Knowledge Concepts Examination (WKCE)	Frequencies and Descriptive Statistical Analysis	Mean and Standard Deviation for the WKCE, Algebra 1, and Accounting 1 & 2
Determine the relationship of students enrolled in Accounting 1 & 2 between their final letter grade and their math score on the Wisconsin Knowledge Concepts Examination (WKCE)	Pearson's Correlation	Correlation analysis between Accounting 1 & 2 final letter grade and the score on the WKCE
Determine the relationship of students enrolled in Accounting 1 & 2 final letter grade and their final letter grade in the Algebra 1 course	Pearson's Correlation	Correlation analysis between Accounting 1 & 2 final letter grade and the final letter grade in Algebra 1.
Identify aptitudes and relationships based on demographics	Independent samples t-test	Mean and Standard Deviation and t-test analysis for the WKCE, Algebra 1, and Accounting 1 & 2 based on demographics

Limitations

The following are limitations of the study relative to the methodology used:

1. Data was limited to students enrolled in Accounting 1 & 2 at Sheboygan South High School during the period September, 2006 through June, 2009.
2. Data was limited to students who enrolled in Algebra 1 during middle school or high school. Students enrolled in IMP math or ELL Algebra were not part of the study.
3. The differences in the grading scales for Accounting 1 & 2 and the Algebra 1 course may have caused some statistical variance.

Chapter IV: Results

Introduction

This study addressed final letter grades in Accounting and Algebra, as well as the level of proficiency on the Wisconsin Knowledge Concepts Examination (WKCE) of 75 Accounting 1 & 2 students at Sheboygan South High School. The purpose of the study was to determine if a statistically significant relationship between success in Accounting 1 & 2 and final letter grades in Algebra 1 at Sheboygan South High School.

Findings

Although analyzing the demographic complexion of the population was not one of the research objectives, ethnicity demographic analysis revealed a great deal. Sheboygan South High School has an approximate 40% minority student population. When the ethnicity demographic data for the Accounting 1 & 2 was analyzed, only 25% of the students enrolled in Accounting 1 & 2 were minority (see Table 3). The Hispanic and African-American student Accounting 1 & 2 population had the lowest percentages represented at 3% and 1% respectively.

The first research objective was to determine currently enrolled Accounting 1 & 2 student's math aptitude through the Wisconsin Knowledge Concepts Examination (WKCE). Final letter grades in Accounting 1 & 2 and in Algebra were rated on a scale of 0 to 4, with an F equaling a 0 and an A equaling a 4. The WKCE proficiency levels were rated on a scale of 1 to 4, with minimal proficiency equaling a 1 and advance proficiency equaling a 4. As shown in Table 6, *Frequency and Descriptive Analysis*, the mean ranges from 3.09 in Algebra to 3.33 on the WKCE. With the WKCE, the mean of 3.33 was the highest mean of the three areas analyzed. On average, students performed at a proficient

level. The WKCE analysis produced the lowest standard deviation at .553. The analysis of the final letter grades in Algebra revealed the lowest mean at 3.09. The Accounting final letter grade mean was 3.16. The standard deviation for the Accounting final letter grade was the highest of the three areas at 1.139 (see Table 6).

Table 6

Frequencies and descriptive analysis

	N	Mean	Standard Deviation
Accounting	75	3.16	1.139
Algebra	75	3.09	.791
WKCE	75	3.33	.553

The WKCE scores were analyzed for the frequency of each of the proficiency levels. A notable item in this analysis is that 72 (or 96 percent) of the participants scored Proficient and Advanced on the Wisconsin Knowledge Concept Examination, while only 3 (or 4 percent) scored in the Basic range (see Table 7). The majority of the students, 44 (or 59 percent), were in the Proficient range.

Table 7

Distribution of WKCE Proficiency Levels

Proficiency Level	Frequency	Percent
Basic	3	4
Proficient	44	59
Advanced	28	37
Total	75	100

Final letter grades in Algebra were also analyzed. Of the 75 students studied, 61 students (or 81 percent) earned a letter grade of a B or better, with 37 (or 49 percent) earning a B and 24 (or 32 percent) an A respectively (see Table 8). When looking at gender, the percentage of females who received an A or B in Algebra 1 was higher than that of the males, 30 (or 86 percent) as compared to 31 (or 78 percent). More males, 9 (or 22 percent) earned a C or D than females, 5 (or 14 percent).

Table 8

Distribution of Algebra Grades by Gender

	Overall		Female		Male	
Grade	Frequency	Percent	Frequency	Percent	Frequency	Percent
B	37	49	21	60	16	40
A	24	32	9	26	15	38
C	11	15	4	11	7	17
D	3	4	1	3	2	5
Total	75	100	35	100	40	100

The final letter grades in Accounting range from an A to an F. Six students, (or 8 percent) earned an F as a final letter grade, while 37 students (or 50 percent), earned a final letter grade of an A, as Table 9 shows. Males, who earned an A in Accounting 1 & 2, outperformed the females by 17.5 percentage points. Twenty-one (or 60 percent) of females earned a B letter grade, while 16 (or 40 percent) of males earned a B letter grade. Females, as a percentage, earned a C letter grade almost three times more often than their male counterparts, 14 percent of females compared to 5 percent of males.

Table 9

Distribution of Accounting Grades by Gender

	Overall		Female		Male	
Grade	Frequency	Percent	Frequency	Percent	Frequency	Percent
A	37	50	14	40	23	58
B	25	33	14	40	11	27
C	7	9	5	14	2	5
F	6	8	2	6	4	10
Total	75	100	35	100	40	100

The second research objective addressed the relationship of students enrolled in Accounting 1 & 2 between their final letter grade and their math proficiency level on the Wisconsin Knowledge Concepts Examination (WKCE). To analyze this objective, a Pearson r correlation analysis was calculated. Table 10, *Correlation/Statistics,* shows the data was found to be statistically significant at the .001 level ($r = .364$; $p = .001$). A strong relationship was identified between the final letter grade in Accounting 1 & 2 and the math proficiency level on the WKCE for the 75 students in the study.

Research objective three was to determine the relationship of student enrolled in Accounting 1 & 2 final letter grade and their final letter grade in the Algebra 1 course. Pearson r was performed to answer research objective number three. The data in Table 10, *Correlation/Statistics,* was found to be statistically significant at the .001 level ($r = .358$; $p = .002$).

Table 10

Correlation/Statistics

		WKCE	Algebra	Accounting
WKCE	Pearson Correlation	1	.391**	.364**
	Sig. (2-tailed)		.001	.001
	N	75	75	75
Algebra	Pearson Correlation	.391**	1	.358**
	Sig. (2-tailed)	.001		.002
	N	75	75	75
Accounting	Pearson Correlation	.364**	.358**	1
	Sig. (2-tailed)	.001	.002	
	N	75	75	75

** Correlation is significant at the 0.01 level (2-tailed).

The fourth research objective was to identify aptitude and relationships based on demographics. The first demographic analyzed was ethnicity. The participants were divided into two groups: Caucasian and non-Caucasian. There were 56 (or 75 percent) Caucasian students and 19 (or 25 percent) non-Caucasian students.

The aptitude of each group was analyzed. As shown in Table 11, *Ethnicity Frequencies and Descriptive Analysis,* the mean ranges from 3.02 for Caucasians in Algebra to 3.39 for Caucasians on the Wisconsin Knowledge Concepts Examination (WKCE). The mean for non-Caucasian students in Algebra and Accounting was higher than Caucasian students, while the Caucasian students had a higher mean on the WKCE (see Table 11).

Table 11

Ethnicity Frequencies and Descriptive Analysis

	Ethnicity	N	Mean	Standard Deviation
Algebra	Caucasian	56	3.02	.842
	Non-Caucasian	19	3.32	.582
Accounting	Caucasian	56	3.13	1.266
	Non-Caucasian	19	3.26	.653
WKCE	Caucasian	56	3.39	.562
	Non-Caucasian	19	3.16	.501

The relationship of final letter grades in Algebra and Accounting 1 & 2, as well as the proficiency level on the WKCE, was also analyzed. For analysis, an independent samples t-test for equality of means was conducted. Table 12, *Ethnicity t-Test*, shows the data was found to have no statistically significant differences.

Table 12

Ethnicity t-Test

	t	df	Sig. (2 tailed)
Algebra	-1.428	73	.158
Accounting	-.454	73	.651
WKCE	1.710	34.543	.096

95% confidence interval

The second demographic analyzed was gender. There were 40 (or 53 percent) males and 35 (or 47 percent) females. The aptitude for each group was analyzed. The lowest mean was a 3.09 for females in Algebra and Accounting. The males on the WKCE had the highest mean at 3.38 (see Table 13). The standard deviation of 1.230 for

males in Accounting was the high, while females had the lowest standard deviation, .519, on the WKCE.

Table 13

Gender Frequencies and Descriptive Analysis

	Gender	N	Mean	Standard Deviation
Algebra	Male	40	3.10	.871
	Female	35	3.09	.702
Accounting	Male	40	3.23	1.230
	Female	35	3.09	1.040
WKCE	Male	40	3.38	.586
	Female	35	3.29	.519

An independent samples t-test for equality of means was conducted to determine statistically significant differences. The results revealed no statistically significant differences between males and females (see Table 14).

Table 14

Gender t-Test

	t	df	Sig. (2 tailed)
Algebra	.077	73	.938
Accounting	.526	73	.601
WKCE	.695	73	.490

95% confidence interval

Chapter V: Summary, Conclusions, and Recommendations

Introduction

In this chapter, the results from the study are discussed as they relate to the research objectives.

Summary and Conclusions

The first research objective was to determine currently enrolled Accounting 1 & 2 student's math aptitude through the Wisconsin Knowledge Concepts Examination (WKCE). The WKCE math proficiency levels descriptors are minimal, Basic, Proficient, and Advanced. The results indicated that only 3 (or four percent) of the 75 students in the study were below the Proficient level.

In addition to the WKCE data, final letter grades for Accounting 1 & 2 and Algebra 1 were analyzed. The results revealed that 62 (or 83 percent) of the participants earned an A or B as a final letter grade in Accounting 1 & 2. Sixty-one (or 81 percent) of participants earned an A or B as a final letter grade in Algebra 1.

Research objective two was to determine the relationship of students enrolled in Accounting 1 & 2 final letter grade and their score on the Wisconsin Knowledge Concepts Examination (WKCE). Pearson r correlation analysis was conducted to analyze the data. The data was found to have a statistically significant relationship at a .001 level, thus showing a statistically strong relationship between the student's final letter grade in Accounting 1 & 2 and their score (level of proficiency) on the WKCE. Thus, showing the students who performed well on the WKCE math test also performed well in the Accounting 1 & 2 course and students who did not perform so well on the WKCE math test did not perform so well in the Accounting 1 & 2 course

The third research objective was to determine the relationship of students enrolled in Accounting 1 & 2 final letter grade and their final letter grade in the Algebra 1 course. The data showed a strong relationship between these two variables. Pearson r correlation analysis was conducted with the results indicating a statistically significant relationship at the .001 level. The information gained from the results indicated a student who performed well in Accounting 1 & 2 also performed well in Algebra 1. These results parallel what Roberts (1997) stated that basic math skills needed for Accounting 1 & 2 are also needed in a high school algebra course.

Research objective four was to identify aptitudes and relationships based on demographics. An independent samples t-test analysis was conducted. Although there were differences in means based on ethnicity, the differences were not statistically significant. The analysis based on gender also produced differences in means, but were not statistically significant.

Recommendations

The following recommendations for the Guidance/Counseling Center Staff were made for the research in this study.

1. The demographic breakdown revealed low numbers of minority students, 19 of the 75 (or 25 percent) participants, taking Accounting 1 & 2. The Guidance/Counseling Center Staff, along with the Business Education staff, can use the results for recruitment of minority students in the Accounting 1 & 2 class.
2. Use the results for placement of students in the Accounting 1 & 2 class when students are registering for classes.

3. Promote the Accounting 1 & 2 course to students who do well in Algebra 1 and score Proficient or Advanced on the Wisconsin Knowledge Concepts Examinations (WKCE). Staff should use the results to encourage students to enroll in Accounting 1 & 2 as a way to utilize math aptitude in a business world application.

The following recommendations for the Business Education Department were made for the research in this study.

1. The demographic breakdown revealed low numbers of minority students, 19 of the 75 (or 25 percent) participants, taking Accounting 1 & 2. This percentage is below the school minority population. The Business Education staff, along with the Guidance/Counseling Center Staff, can use the results for recruitment of minority students in the Accounting 1 & 2 class.
2. Share the results with the Math department and begin to collaborate with the Math department to create applied content activities/project that will add more real world meaning for students in Algebra 1. Making a personal and real world connection of what is being taught in mathematics classrooms is important. Classrooms that do well in international comparisons are designed with personal and real world connections (Hyde, 2007). Staff should present the relationship between Algebra 1 and Accounting 1 & 2 to the Math Department in an effort to show how the two departments help learners answer the "why do we need to know this?" question.
3. Share the results with parents of students at Sheboygan South High School to encourage students who perform well in Algebra 1 to register for the Accounting

1 & 2 course. Throughout a high school accounting course, students use logic and problem-solving skills to gather and analyze data. Because much of this analysis is centered on various mathematical calculations, a high school accounting course draws on and reinforces one's math skills (Hellmuth, 1991). Staff should present Accounting 1 & 2 as an alternative for students to continue math education.

References

Baldwin, B., and K. Howe, (1982, July). Secondary-level study of accounting and subsequent performance in the first college course. *The Accounting Review*, 619-626.

Battista, M. (1999, February). The mathematical miseducation of America's youth. *Phi Delta Kappan, 80*(6), 424. Retrieved February 9, 2008, from: Academic Search Elite database.

Clark, R., and Sweeney, R. (1985, July). Admission to accounting programs: using a discriminant model as a classification procedure. *The Accounting Review*, 508-518.

Doucouliagos, C., (1990, January) Mathematics requirements for business studies. *The Australian Mathematics Teacher*

Encyclopedia Britannica (2008). Retrieved February 9, 2008, from www.britannica.com/eb/article-9111000/algebra.

Eskew, R., and Faley, R. (1988, January). Some determinants of student performance in the first college-level financial accounting course. *The Accounting Review*, 137-147.

Friedlob, G., and Cosenz, R., (1981, April). Assessing the value of high school accounting for the college bound. *Business Education Forum*, 14-15.

Gist, W. E., Goedde, H., Ward, B. E. (1996). The influence of mathematical skills and other factors on minority students in principles of accounting. *Issues in Accounting Education,* 49-60.

Hellmuth, S. (February, 1991). What high school accounting students can do. *Business Education Forum* 12-16.

Heinrich, G., Jordan, K., Smalley, A., Boast, S. (2005, October). Prepare students for technical careers. *Quality Progress,* 33-38.

Hyde, A. (2007, November). Mathematics and Cognition. *Educational Leadership*, 65(3), 43-47. Retrieved February 9, 2008, from Academic Search Elite database.

Hoyt, W.B. (1993, February). Accounting: A diamond in the secondary curriculum. *Business Education Forum,* 39-41.

Lubienski, S. (2007, November). What we can do about achievement disparities. *Educational Leadership*, *65*(3), 54-59. Retrieved February 9, 2008, from: Academic Search Elite database.

Merriam-Webster.com, Retrieved February 9, 2008, from: www.merriam-webster.com/dictionary/Accounting.

Merriam-Webster.com. Retrieved February 9, 2008, from: www.merriam-webster.com/dictionary/grade%20point%20average.

National Business Education Association. Retrieved February, 9, 2008, from: www.nbea.org/curriculum/no_71.pdf.

National Research Council. (1989) *Everybody counts: A report to the nation on the future of mathematics education.* Washington, D.C.: National Academy Press

Roberts, S. (1997, February). Accounting equals applied algebra. *Business Education Forum,* 26-28.

Schroeder, N. (1986, Spring). Previous accounting education and college-level accounting exam performance. *Issues in Accounting Education,* 37-47.

Smith, John W. (1968) Articulation of high school bookkeeping and college elementary accounting. Unpublished doctoral dissertation, University of Oklahoma, Norman, OK.

Wisconsin Department of Public Instruction. Retrieved February 9, 2008, from: www.dpi.state.wi.us/cte/letbuspg.html (2008)

Wisconsin Department of Public Instruction. Retrieved February 9, 2008, from: www.dpi.state.wi.us/oea/wkce.html (2008)

Wisconsin Department of Public Instruction. (2008). Retrieved February 9, 2008, from: www.dpi.state.wi.us/cte/index.html

Wisconsin Department of Public Instruction. (2009). Retrieved September 27, 2009, from www.dpi.state.wi.us/oea/profdesc.html