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A correlational study on how reading scores are affected by complementing learning and teaching styles in multiple kindergarten settings

Leslie-Ann D. Monforto
Rowan University

A CORRELATIONAL STUDY ON HOW READING SCORES ARE AFFECTED BY COMPLEMENTING LEARNING AND TEACHING STYLES IN MULTIPLE KINDERGARTEN SETTINGS

By
Leslie-Ann D. Monforto

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ABSTRACT

Leslie-Ann D. Monforto
A CORRELATIONAL STUDY ON HOW READING SCORES ARE AFFECTED BY COMPLEMENTING LEARNING AND TEACHING STYLES IN MULTIPLE KINDERGARTEN SETTINGS
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Dr. Randall Robinson
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The purposes of this correlational study were to (a) observe the learning styles of groups of kindergarten students and the teaching styles of their corresponding teachers; and (b) determine the effects that the matching of similar learning and teaching styles had on students' reading performances. It was hypothesized that students whose learning styles matched that of their teachers' teaching styles would do significantly better on their reading scores than those students whose learning styles did not match that of their teachers' teaching styles. Teacher and students were assessed using an adaptation of Howard Gardner's Multiple Intelligences Test to determine their teaching and learning styles, respectively.

According to the results, most students demonstrated that they were linguistic learners. However, reading scores were not drastically affected when students were not paired with a teacher whose teaching style matched that of their learning style. Thus, the study rejected the hypothesis.

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TABLE OF CONTENTS

LIST OF TABLES

Table Page

Chapter One

The Scope of the Study

Introduction

John Lennon once said, "People like me are aware of their so-called genius at eight, nine, ten...I always wondered, 'Why has nobody ever discovered me?' In school, didn't they see that I'm more clever than anybody in this school? That the teachers are stupid, too? That all they had was information I didn't need? It was obvious to me. Why didn't they put me into art school? Why didn't they train me? I was always different. Why didn't they notice me?" (Hopper and Hurry, 2000).

Lennon's quote illustrates how many students feel about school simply because they do not understand the way in which something is being taught. However, it is not always the student's misunderstanding. Research has shown that all students have different styles of learning affecting the way in which they interpret material. Oftentimes, the student's style of learning is not compatible with the teacher's teaching style, making student learning even more difficult. Perhaps Lennon simply learned different than most of his teachers taught (Hopper and Hurry, 2000).

To combat the dilemma of leaving students out or making them feel "stupid," teachers must be aware that learning styles differ greatly from one student to the next. They must also recognize that their own personalities and styles of teaching have an effect on student learning (Hopper and Hurry, 2000). Most importantly, teachers need to be familiar with both learning and teaching styles to acknowledge the differences in themselves, as well as in their students, as well as how to successfully differentiate their

instructional styles so that all students may equally benefit from their various teaching practices.

How are teachers able to recognize the differences in learning styles among themselves and their students? They must first determine the definition of learning styles. According to the online encyclopedia Wikipedia, learning styles is defined as "different ways that a person can learn" (2005). Similarly, a group of leading theorists in the education field, sponsored by the National Association of Secondary School Principals, added a more comprehensive definition to the term, stating that learning styles are "the composite of characteristic cognitive [referring to a person's typical mode of perceiving, thinking, remembering and problem-solving], affective and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with and responds to the learning environment" (Griggs, 1991). Restated more simplistically by Griggs and Dunn (2000), they define learning styles as "the biological uniqueness and developmental changes that make one person learn differently from another" (Bellon, 2004).

One of the reasons there are multiple definitions of learning styles is that there are many different inventories used to assess them–seventy-one to be exact. Most of the inventories used, although some assess intelligence, some personality and some learning styles, have one major similarity among them: They agree that students with learning styles similar to that of their teacher's teaching style have better success rates in school. This has been proven by a number of learning style inventories conducted in secondary education and college settings and thus has become a main purpose in their use (Wikipedia, 2005).

Kolb's Experiential Learning Model created by David A. Kolb (1984) in 1976 suggested that learning and development is grounded in experience and that learning is a continuous process, resulting from a combination of perceiving and processing information (Bellon, 2004). Kolb believes that learners prefer one of four styles (convergent, divergent, assimilation and accommodation) which best allows them to perceive and process information, but that some combination of all four abilities are required for "effective learning" to take place (Bellon, 2004).

Much research has revealed the positive effects of using Kolb's Experiential Learning Model of matching teaching style to learning styles. In one case study at Purdue University, an entire course was designed around Kolb's Learning Style Model of matching teaching and learning styles "to help the academically disadvantaged" (Larkin-Hein and Budny, 2000). Results of the assessment showed the instructor differentiating his style of teaching and provided students with the opportunity to teach themselves while still allowing for interaction and supervision from the instructor (Larkin-Hein and Budny, 2000). The assessment "[played] a critical role in the learning process," as it prepared approximately 20% of the entering students to move on to more advanced courses (Larkin-Hein and Budny, 2000). In another case study, Kolb's Learning Style Inventory was used for six years due to students in technical communication classes and a senior chemical engineering laboratory revealing consistent positive results (Felder, 1996). This was due to the various assignments given to students to appeal to all types of learners within the classes. In using Kolb's Inventory, the teacher discovered found teaching to students' learning styles help them better learn course material as well as "develop interpersonal skills that are critical to success in any professional career"

(Felder, 1996).

The Myers-Briggs Type Indicator (MBTI) was developed for personality testing by Katherine Briggs and her daughter Isabel Briggs Myers in the early 1940s. This tool stresses personality in learning and is based on the human personality theories of Carl G. Jung (Bellon, 2004). In the MBTI, introversion versus extroversion, sensing versus intuition, thinking versus feeling and judging versus perception are measured to determine learning style (Griggs, 1991).

A case study in which the MBTI was used to match teaching and learning styles was conducted at Indiana University-Purdue University at Indianapolis. There, Charles Yokomoto, an electrical engineering professor, used the MBTI to identify students having academic difficulties and work with them to capitalize on their strengths based on the test's results (Felder, 1996). He "[added] strategies based more on a fundamental understanding of the concepts" to improve a student's performance (Felder, 1996). In addition, Yokomoto worked with another student to address his learning style needs and, over time, improve his overall performance as well (Felder, 1996).

Howard Gardner's Theory of Multiple Intelligences has had a catalyzing effect on education. It supports areas in educational practice related to the construct of creativity as well as motivation in students. Gardner first constructed his theory of Multiple Intelligences at Harvard University in 1983, identifying seven distinct intelligences, or learning styles. These intelligences include linguistic, logical, spatial, kinesthetic, musical, interpersonal and intrapersonal (Denig, 2004). Gardner has since become one of the leading scholars in this area.

There have been numerous case studies in which the use of Howard Gardner's

theory has helped students become more successful in school. One of the most successful case studies was by a tenth grade science teacher (Hopper and Hurry, 2000). To draw on a range of intelligences, as revealed by administering an adaptation of Gardner's theory, the teacher let her students decide how they were going to work through the topic (Hopper and Hurry, 2000). The results revealed success in those students who used the particular skills they were good at to complete their assignments (Hopper and Hurry, 2000). Similarly, students performed better because they were having fun and capitalizing on their strengths (Hopper and Hurry, 2000).

The Dunn and Dunn Model was created in 1967 by Rita and Kenneth Dunn, directors of the Center for the Study of Learning and Teaching Styles at St. John's University in Jamaica, NY. The strongest portion of the Dunn and Dunn Model is the Learning Style Inventory (LSI), which identifies twenty-one unique learning styles that may affect student abilities if limited in schools.

There are numerous successful case studies in which the Dunn and Dunn Model was used to determine the benefits of matching teaching styles to learning styles. Despite skepticism from her colleagues, Debbie Garner, a sixth grade teacher-turned principal implemented the Dunn and Dunn Model at her elementary school in Oklahoma in 1990 to help her students better perform on their state-wide exams (Emde, 2002). Results of students' 1997 Iowa Test of Basic Skills (ITBS) for third graders showed math and language scores had increased 86%, reading had increased 61% and the core totals for subjects had increased 82% (Emde, 2002). Another case study of the Dunns' Learning Style Inventory was conducted in a regular eleventh grade English class and an accelerated English class in Thomasville, NC. The participating teacher, Denise

Stephenson, discovered that acknowledging and teaching around her students' learning styles caused her regular students to outscore her accelerated students in class (Dunn, 1996). Finally, children in grades three through twelve at a St. Louis, MO school also showed improvements in their grades after implementation of the Dunns' Learning Style Inventory. They went "from D's and F's to A's after using tactile and kinesthetic materials" (Dunn, 1996). At the same school, achievement scores rose and the school has continued to see improvement every year since its start in 1988 (Dunn, 1996).

According to Rita Dunn, many other case studies in which the Dunn Model was used also report "statistically higher standardized achievement test scores and grade point averages for students [who have] transferred from traditional classrooms to learning style classrooms at the elementary, secondary and college levels" (Dunn, 1996). Improved achievement is also apparent after about six weeks of learning styles instruction; and, after one year, students earn much higher standardized achievement and attitude test scores (Dunn, 1996).

Statement of the Problem

Studies have revealed that students differ greatly in the way they learn (Kolb, 1984; McCarthy, 1990) and that "the closer the match between students' learning styles and their teachers' teaching styles, the higher the grade point average" (Emde, 2002). Packer and Bain (1978) reported that students whose learning styles are matched with the teacher's approach to teaching will have greater ease of learning than will students whose styles are mismatched (She, 2005). Likewise, Thorndike, as cited in Hergenhahn & Olson, 1993, reported that there are individual differences in learning and, thus, "student learning preferences [should] receive much attention as a consideration in designing

effective instructional practices for a wide variety of students." This thought was also suggested in Herrmann, 1988; Kolb, 1984; McCarthy, 1990; and Wilkerson & White, 1988 (She, 2005). Hilgersom (1987) advocated that teachers be familiar with their students' learning preferences and with teaching and learning strategies that are most effective in dealing with those preferences (She, 2005). Finally, Dunn and Griggs (1989) suggested that when students are taught through their learning strengths, "they internalize more, retain knowledge longer and enjoy the process better than when they are taught through their weaknesses" (She, 2005).

Hypothesis

It is expected that kindergarten students whose learning styles match that of their teachers' teaching styles will do significantly better in reading than those students whose learning styles are not matched to that of their teachers' teaching styles.

Limitations

A limitation of this study included the grade level to which the theory has been tested. For instance, most of the tests conducted within the relevant research were conducted at a secondary level or higher, not at the elementary level. This was one of the first studies conducted at the elementary level in this area of research.

Another limitation was the assumption that teaching styles were comparable to learning styles. Variations of the assessment tool were given to each participating child and adult, teachers having taken the teacher assessment and students, the student assessment. The results of both tests produced the same results, which then determined both teaching and learning style, respectively.

Another limitation of this study was that the participating students could not yet

read, as they were in kindergarten. Thus, the test was administered verbally and required the researcher to ask expressive, open-ended questions, rather than simple yes-or-no questions. This was important because participants answered the questions depending on how the teacher worded them. Leaving the questions open-ended required participants to provide a 'why' or 'how' answer, rather than just a 'yes' or 'no.'

Finally, kindergarten teachers used limited grading systems on their students' report cards. Students did not receive number grades or even various letter grades in reading. Rather, they received "S" for Satisfactory, "U" for Unsatisfactory or "TA" for Teacher Assistance (TA is the lowest score a student may receive on a report card). Thus, measuring student success in reading on their report cards was limited to considering only "S" for those who were successful. Students who received an "S" represented those who showed the greatest benefits from the matching of teaching and learning styles. Those who received "U" or "TA," on the other hand, represented students who were unsuccessful, or who do not benefit from the matching of teaching and learning styles. Five letter grades (A-F) or number grades (0-100) would have better revealed how poor or well a student did in comparison to others, and was preferred in this study. However, given the circumstances, the grades S, U and TA were those considered.

Definition of Terms

The following terms were used within the study and are defined as:

Howard Gardner's Theory of Multiple Intelligences: a psychological and educational theory suggesting that seven kinds of traits exist in people, each relating to a different sphere of human life and activity (Wikipedia Online Encyclopedia).

Learning Style: the different way in which a person can learn (Wikipedia Online Encyclopedia).

Reading Grade: the letter score a student receives on his/her report card. Reading grades

reflect how poor or well a student performed in areas including reading, writing and phonics during the current quarter. Grades include 'S' for satisfactory, or passing; 'U' for unsatisfactory and 'TA' for teacher assistance represents a non-passing grade.

Chapter Two

Review of the Literature

Introduction

A multitude of literature revealed the importance of determining teaching and learning styles for teaching purposes. In addition, each source showed the validity of the hypothesis in various secondary and collegiate settings. Whether learning styles or intelligences were determined using Kolb's Learning Style Inventory, the Myers-Briggs Type Indicator, Howard Gardner's Multiple Intelligences Theory or Dunn and Dunn's LSI, all showed positive effects on student academics.

Inventory Investigation

Four of the most popular learning style inventories currently used in determining learning and teaching styles are David Kolb's Leaning Style Inventory, The Myers-Briggs Type Indicator, Howard Gardner's Theory of Multiple Intelligence and Rita and Ken Dunn's Learning Style Inventory. These inventories, along with a multitude of others, have been used worldwide to, not only determine styles of teaching and learning, but to figure out ways to alter instructional styles or environmental factors to successfully reach all learners.

According to David A. Kolb's Experiential Learning Model, there are four basic types of learning styles (She, 2005). The Myers-Briggs Type Indicator (MBTI), created to validate psychiatrist Carl Jung's work on psychological types, believes there to be eight preferences and a total of sixteen learning styles (Know Your Type). Howard Gardner's Theory of Multiple Intelligence also "advocates that there are at least eight

different intelligences that need to be considered" when testing learning and potential in humans (Denig, 2004). Finally, the Learning Style Inventory created by Dunn and Dunn acknowledges five main categories of learning and a total of twenty-one factors in considering a learning style preference. Many variations of these four inventories exist and have been conducted and implemented in classrooms throughout the world. Thus, they validate the importance of teachers recognizing their teaching and students' learning styles and suggest that obtaining this knowledge can benefit students academically. Furthermore, implementations of these inventories allow educators to reflect on their teaching patterns and determine ways to alter their teaching styles to meet the needs of all learners.

Inventory I

Kolb's Experiential Learning Model created by David A. Kolb (1984) in 1976 suggests that learning and development is grounded in experience (Bellon, 2004). Kolb believes that learning is a continuous process and results from a combination of perceiving and processing information (Bellon, 2004). The four basic learning styles this model suggests are convergent, divergent, assimilation and accommodation. Kolb believes that learners prefer one of these four styles, which best allows them to perceive and process information, but that some combination of all four abilities are required for "effective learning" to take place (Bellon, 2004).

The first of the four learning styles in Kolb's Model is convergent, which means the "learners rely on the dominant learning abilities of abstract conceptualization and active experimentation" (She, 2005) and enjoy being involved in new experiences (Bellon, 2004). Next in Kolb's Model are divergent learners, who rely on concrete experience and reflective observation and tend to be "imaginative, emotional and feeling-oriented" (She,

2005). Third in his model are assimilation learners. These types of learners who tend to learn through "abstract conceptualization and reflective observation" and use models and reasoning to "assimilate disparate observations into an integrated explanation (She, 2005). Finally, accommodation learners favor concrete experience and active experimentation, enjoy carrying out experiments and plans and prefer getting involved in new experiences and taking risks (She, 2005).

In a research study conducted in 2000, Teresa Larkin-Hein and Dan D. Budny proved the positive effects of matching teaching style to learning styles. At Purdue University's School of Engineering, Budny assessed a course that was created "to help the academically disadvantaged become calculus-ready" (Larkin-Hein and Budny, 2000). The course, designed around Kolb's Learning Style Model of matching teaching and learning styles, was organized to acknowledge learner diversity through recognizing individual learning styles and to prepare students for entrance into a more advanced math class (Larkin-Hein and Budny, 2000). Results of the assessment showed the instructor differentiating his style of teaching to meet all learners as described in Kolb's Model. He acted as "an authority figure" to assimilators, a "motivator" to divergers, an "evaluator and remediator" to accommodators and stepped back to allow convergers "to take a more active role in the learning process" (Larkin-Hein and Budny, 2000). Doing this provided students with a much needed opportunity to teach themselves while still allowing for interaction and supervision from the instructor (Larkin-Hein and Budny, 2000). It proved that "acknowledgment of students' individual learning styles [played] a critical role in the learning process," as it prepared approximately 20% of the entering students to move on to more advanced courses (Larkin-Hein and Budny, 2000).

In another application of the Kolb Model, the Learning Style Inventory was

administered to technical communication classes and a senior chemical engineering laboratory course for six years because of the positive results seen in the students (Felder, 1996). The cooperating teacher implemented presentations that were designed to appeal to all types of learners in addition to journals, which allowed students to describe their conflicts and accomplishments and relate them to their group members' learning styles. In using Kolb's Inventory, the cooperating teacher found that teaching to students' learning styles not only helped them to learn the course material, because they become aware of their thinking processes, but also helped them "develop interpersonal skills that are critical to success in any professional career" (Felder, 1996).

Inventory II

The Myers-Briggs Type Indicator (MBTI) was developed for personality testing by Katherine Briggs and her daughter Isabel Briggs Myers in the early 1940s. This tool stresses personality in learning and is based on the human personality theories of Carl G. Jung (Bellon, 2004). There are six different kinds of self-report forms used in administering the MBTI, but the most commonly used is Form G (Bellon, 2004). In this test, dichotomous scales are used to measure introversion versus extroversion, sensing versus intuition, thinking versus feeling and judging versus perception (Griggs, 1991). Extroversion and introversion are referred to as attitudes, examining what motivates people to learn, either outside people and things or inner ideas and concepts. Sensing and intuition determines the way in which people perceive information, whether it be focusing more on facts and relying on the five senses or seeking out patterns in the facts and looking at the big picture. Thinking and feeling are the judging functions, revealing one's preference in the decision-making process. Thinkers are more logical in thought while feelers focus on values and needs. Finally, judging and perceiving reveal the

specific attitudes of the functions and focus on one's orientation toward the world. People who prefer judging tend to be decisive while those who prefer sensing are more spontaneous (Bellon, 2004). These preferences result in sixteen potential learning styles, or types of combinations.

Results from applications of the MBTI have also found that students at higher educational levels benefit greatly from matching teaching to learning styles. Charles Yokomoto, an electrical engineering professor at Indiana University-Purdue University at Indianapolis, uses the MBTI to identify students having academic difficulties. He not only administers the inventory to his students, he also works with them to capitalize on their strengths based on the test's results (Felder, 1996). One of his students, an ISTJ (introvert, sensor, thinker, judger), was failing the introductory course in electrical circuits. Yokomoto persuaded his student to "add strategies based more on a fundamental understanding of the concepts" and the student's performance improved (Felder, 1996). By the student's senior year, he was earning A's and received a master's degree in electrical engineering. In another case, Yokomoto found that an ENTJ (extrovert, intuitor, thinker, judger) student was having difficulty with every homework assignment and test problem. Thus, Yokomoto worked with the student, addressed his learning style needs, and improved his overall performance (Felder, 1996).

Inventory III

Howard Gardner developed his Theory of Multiple Intelligences in 1983 and has since become one of the leading Harvard scholars in the area of matching teaching and learning styles (Bellon, 2004). According to Gardner and Avery (1998), Gardner's theory has had a catalyzing effect on education. Not only has valuing cultural diversity been pushed in general education, the lens of multiple intelligences has also validated that

"intelligence is a culturally constructed construct." Gardner's work with multiple intelligences has also supported other areas in educational practice related to the construct of creativity as well as motivation in students. Through the implementation of his inventory, he endorses the value of real-world applications subject to expert judgment and his insights give strength to the "fostering of habits of mind and the importance of intrinsic motivation" (InTime website).

Gardner first constructed his theory of Multiple Intelligences at Harvard University in 1983, identifying seven distinct intelligences, or learning styles. These intelligences include linguistic, logical, spatial, kinesthetic, musical, interpersonal and intrapersonal (Denig, 2004). However, in 1991, he added another intelligence–naturalistic. His theory contradicts the prevailing "psychometric perspective" and, according to Gardner, enables the individual to "perform transformations and modifications of one's perceptions [and] recreate aspects of one's experiences" (InTime website). According to Wikipedia, intelligence is defined as "the ability to solve problems [using] the ability to reason, plan, solve problems, think abstractly, comprehend ideas and language, and learn" (2005). Similarly, Gardner defines intelligence as "'biopsychological potential to process information that can be activated in a cultural setting to solve problems or create products that are of value in a culture'" (Denig, 2004). Through both definitions, it is clear that intelligence cannot be measured in school by one traditional, standardized test and that teaching strategies must vary to meet the needs of each individual intelligence. Gardner's theory does just that. "It serves as an impetus of reform in schools" and challenges educators to find ways that Gardner believes will work for any student learning any topic (Denig, 2004).

Application of Gardner's Theory benefits teachers just as much as it does students.

It allows teachers to "plan educational programs that will enable children to realize desired end states [and] it helps [teachers] to reach more children who are trying to understand important theories and concepts in disciplines" (Hopper and Hurry, 2000). His test enables teachers to see their own teaching strengths and weaknesses and this self-awareness forces them to alter their styles of teaching to accommodate all learning styles. In the case study conducted by the ten primary and secondary teachers, several found they were able to reach more students through altering their teaching styles (Hopper and Hurry, 2000). Similarly, Campbell (1995), author of *Multiple Intelligences in Action*, emphasized the positive impact MI has had on teachers by stating "the teacher becomes more creative and multi-modal in his/her own thinking and learning. A teacher might well ask: 'Who is changing the most, students or teachers?'" (Hopper and Hurry, 2000). Other advantages for the teacher include more time to focus on important aspects of the students, more opportunities to help children develop their strengths to achieve mastery and more time for connecting the content areas and more provision for improving assessment (InTime website). One of Gardner's goals in applying the theory of Multiple Intelligences to the classroom is that, in time, all teachers will become aware of the importance of intelligence and teaching to foster these individual differences. In doing so, curricula will become organized around the seven capacities and benefit all learners (InTime website).

Applying Gardner's theory to the classroom has helped students become more successful in many ways. One of the most successful adaptations of Gardner's approach was made by a tenth grade science teacher who initiated Gardner's Theory as an eight month project with seven secondary teachers and three primary teachers, all unfamiliar with his work (Hopper and Hurry, 2000). The teacher began the study by telling her

students what they needed to know by the end of a series of lessons and let them decide how they were going to work through the topic, rather than teaching a new, surprise lesson each day. This was done to draw on a range of intelligences as defined in Gardner's Theory (Hopper and Hurry, 2000). The results revealed success as well as unlocked unknown resources for learning and understanding in some of her students (Hopper and Hurry, 2000). For instance, one boy in the class could not understand test questions or fully grasp what they were asking. In working on the project assigned through MI, he used particular skills he was good at, such as drawings and drama, to create a video for his final presentation. The teacher stated that "producing a video and allowing his [dramatic] skills to come through in his science has changed this boy. It has built up his confidence...[and] at the end of the year, tests proved that he had understood the assignment" (Hopper and Hurry, 2000). In another classroom during this study, one teacher reported "pupils didn't realize how much they were learning [because] they were having so much fun [and] it stimulated children to do their homework!" (Hopper and Hurry, 2000). She believed that Gardner's Multiple Intelligence Test was an excellent tool for motivating her students and allowed for changes to be made in both teaching and learning (Hopper and Hurry, 2000).

Inventory IV

Having similar positive effects on both teachers and students is an inventory known as the Dunn and Dunn Model. This model was created in 1967 by Rita and Kenneth Dunn, directors of the Center for the Study of Learning and Teaching Styles at St. John's University in Jamaica, NY. The strongest portion of the Dunn and Dunn Model is the Learning Style Inventory (LSI) which identifies learning preferences in grades three through twelve (Emde, 2002). It identifies twenty-one unique learning styles and,

although no one is influenced by all of them, "most students are affected by 6 to 14" learning styles (Denig, 2004). The twenty-one elements are classified into six variables: Environmental (sound, light, temperature, design), emotional (motivation, persistent, responsibility, structure), sociological (self, pair, peers, team, adult, varied), physiological (perceptual, intake, time, mobility) and psychological (global-analytic, hemisphericity, impulsive-reflective) (Learning Styles Network website). According to the Oklahoma Institute for Learning Styles website, the Dunn and Dunn model "is the single most researched educational model in the history of U.S. education" (Emde, 2002). And, similar to the other definitions of learning style, the Dunns define it as "the way in which each person begins to concentrate on, process, internalize and remember new and difficult academic content" (Denig, 2004). Like Gardner, they also believe that there are multiple styles of learning and that each person can be taught how to better study and concentrate by capitalizing on their learning style (Denig, 2004).

There are numerous successful applications of the Dunn and Dunn Model, which benefit both teacher and student participants. For instance, Debbie Garner, a sixth grade teacher-turned principal at Berryhill Elementary School in Tulsa County, OK, successfully implemented the Model in 1990 (Emde, 2002). Colleagues were skeptical at first about the immediate school wide change; however, after its implementation, the results of the 1997 Iowa Test of Basic Skills (ITBS) for third graders changed their minds. Math and language scores had increased 86%, reading had increased 61% and the core totals for subjects had increased 82% (Emde, 2002). Through other applications of the Dunns' LSI, many poor achievers' stress appeared to be sufficiently reduced after learning through their preferred style (Emde, 2002). In a regular eleventh grade English class and an accelerated English class in Thomasville, NC, teacher Denise Stephenson

found that acknowledging and teaching around her students' learning styles caused her regular students to outscore her accelerated students (Dunn, 1996). Children in grades three through twelve in a St. Louis, MO school also went "from D's and F's to A's after using tactile and kinesthetic materials." In addition, achievement scores kept rising and the schools have continued to see improvement every year since its start in 1988 (Dunn, 1996).

According to Rita Dunn, a number of practitioners of the Dunn Model in the United States report "statistically higher standardized achievement test scores and grade point averages for students transferred from traditional classrooms to learning style classrooms at the elementary, secondary and college levels" including Andrews 1990 and Koshuta and Koshuta 1993 at the elementary level, Elliot 1991 and Quinn 1993 at the secondary level and Clark-Thayer 1987 and Lenehan, Dunn, Ingham, Murray and Signer 1994 at the college level (Dunn, 1996). Also, improved achievement is often apparent after only six weeks of learning styles instruction and after one year, students earn much higher standardized achievement and attitude test scores (Dunn, 1996). One teacher in Chico, California, Larry Howie, reported an increase of 18 points on the math portion of his students' SAT scores in the first year of implementing learning styles (Dunn, 1996).

Chapter Three

Procedure

Introduction

Studies have revealed that students differ greatly in the way they learn (Kolb, 1984; McCarthy, 1990) and that "the closer the match between students' learning styles and their teachers' teaching styles, the higher the grade point average" (Emde, 2002). Most of the research suggests this is true at the secondary and collegiate levels, thus the hypothesis is to prove that kindergarten whose learning styles match that of their teachers' teaching styles will do significantly better in reading than those students whose learning styles are not matched to that of their teachers' teaching styles. Many professionals' tests have been used to determine the positive effects of this relationship, including Kolb, Myers and Briggs, Dunn and Dunn, and Gardner. The most effective results, however, have stemmed from the use of Howard Gardner's trait assessments on students. Thus, a version of his Multiple Intelligences Test was used to assess teacher and student participants in this study.

Description of the Subjects

At the time of the study, within the township's school district, located in Camden County, NJ, there were 1,671 students in the high school; 1,426 students in the middle school; 398 students in elementary school number1; 364 students in elementary school number 2; 510 students in elementary school number 3; 521 students in the participating school, elementary school number 4; 629 students in elementary school number 5; and 747 students in elementary school number 6. Of the total number of students within the

district, there were 40% Caucasian, 52% African American, 7% Hispanic, 1% Asian and .5% Native American. In the participating school, the total student population was made up of 36% Caucasian, 55% African American, 9% Hispanic and <1% Asian. The district also served all preschool-disabled, autistic and multiply disabled children (approximately 130 of the 521 total students) and twenty-five students within the district were in a gifted and talented program.

The township within the study had one of the largest school districts (58 square miles) in the state of New Jersey. It is centrally located between Philadelphia, PA and Atlantic City, NJ and, at the time of the study, included a total of twelve cities. The district was rapidly growing and was projected to increase in population another 20% within five years of the study.

The subjects that participated in this study included four female kindergarten teachers, ages twenty-nine to fifty, and 108 kindergarten students, ages five to seven. Genders of participating students included fifty girls and fifty-eight boys. Two of the four participating classrooms were inclusion classrooms, in which regular and special education students were taught together, while the remaining three classrooms contained regular education students only.

Among the 108 student participants, thirteen students were classified. Developmentally, all participating students were concrete learners, and could not yet think abstractly. Socially, participants were still learning to work together, either with partners or in groups, and were often encouraged to help fellow students. In a moral sense, participants established the difference between right and wrong, and what constitutes good and bad behaviors, but still required consistent reinforcement of these principles. Physically, the majority of students' fine and gross motor skills were more

developed than others, while a few (8 of 108) were still at early developing stages. Two students exhibited physical disabilities and one student had speech difficulties, as English was not the first-learned language in his household.

Procedure

The adult assessment of Howard Gardner's Multiple Intelligences Test (appendix A) was first administered to four elementary school teachers to determine their teaching styles (again, it was assumed that learning styles reflected teaching styles and vice versa). The child assessment of the inventory (appendix B) was then verbally administered to four classes of twenty-seven elementary students to determine their learning styles. Results of both sets of inventories (teacher and student) were then compared. Adult assessments were scored to reveal the teaching styles of the teacher subjects and the child assessments were scored to reveal the student subjects' respective traits.

The assessment results revealed which students had similar learning styles to that of their teachers' teachings styles and which students had learning styles differing from that of their teachers' teaching styles. It was hypothesized that the relationship played a significant role in the students' final reading scores, as well as other scores including math, science and social studies. Student report cards were then viewed to determine the relationship, if any, of the matching of teaching and learning styles to the academic success of student subjects in reading.

As students were graded on their report cards using Satisfactory (S), Unsatisfactory (U) and TA (Teacher Assistance), for the purpose of this study, only Satisfactory grades qualified as a student succeeding. Unsatisfactory and Teacher Assistance were considered underachievement, or non-passing. The data was expected to support the hypothesis, in that the matching of teaching and learning styles would improve students' reading scores.

Description of the Data Collection Instrument

In this study data was collected from both teachers and students using an adaptation of Howard Gardner's Multiple Intelligences Test obtained from www.mitest.com (appendices A and B). The inventory consisted of thirty-five statements that required a 'yes' or 'no' answer, as well as validation to some responses. When compiled together, the statements revealed Howard Gardner's seven suggested human traits-linguistic, math, musical, spatial, kinesthetic, interpersonal and intrapersonal learners, respectively. The statements to which participants responded 'yes' revealed which statements were most like them and in which category the participant best fit. The statements to which participants responded 'no' revealed those intelligences not like them.

Statements on the tests were divided into seven groups of five. The group of five responses to which participants responded 'yes' to revealed the intelligence that participant best fit. Similarly, the group of five responses with the most 'no' responses revealed the least likely intelligence for that participant. Each subject was then placed into one of the seven categories, with their highest rating as their primary intelligence, or preferred learning style.

Chapter Four

Analysis of the Study

Introduction

The adult assessment of Howard Gardner's Multiple Intelligences Test (appendix A) was administered to four elementary school teachers to determine their teaching styles. The child assessment of the inventory (appendix B) was verbally administered to four classes of twenty-seven elementary students to determine their learning styles. Results of both sets of inventories were then compared to reveal the teaching styles of the teachers and the learning styles of the students.

The data revealed which students had similar learning styles to that of their teachers' teachings styles and which students had learning styles differing from that of their teachers. Student report cards were also viewed to determine the relationship, if any, of the teaching and learning styles to the academic success of students in reading. Satisfactory (S), Unsatisfactory (U) and TA (Teacher Assistance) grades were used and only Satisfactory grades qualified as a student succeeding. Unsatisfactory and Teacher Assistance were considered underachievement, or non-passing. The purpose of the study was to determine whether or not kindergarten students whose learning styles matched that of their teachers' teaching styles did significantly better in reading on their report cards than those students whose learning styles did not match that of their teachers' teaching styles.

Tabulations of Raw Data

The following tables represent the percentages of passing and non-passing students

in a linguistically taught classroom, a mathematically taught classroom, a musically taught classroom and a kinesthetically taught classroom, respectively. In each classroom, the child assessment was administered to twenty-seven student subjects.

Because of the small size of the classrooms, results were calculated using 100 students per learning style. In other words, the raw data scores were applied to 100 students rather than only twenty-seven. Thus, the percentages shown reveal results based on 100 linguistic learners, 100 mathematical learners, 100 musical learners, and so on, for each of the four classrooms (total numbers for each classroom equal 700). This was done to keep numbers consistent among the different types of learners as well as to make generalizations with the raw data scores to a larger population.

Table 1 represents the percentages of passing and non-passing students who were placed in a classroom taught by a teacher with a linguistic teaching style. Again, it was assumed that numbers reflected 100 students per learning style.

table 1

Linguistic Teacher Style Classroom

	Passing Students*	**Non-passing Students**
Linguistic Learners	69%	31%
Mathematical Learners	100%	0%
Musical Learners	100%	0%
Spatial Learners	75%	25%
Kinesthetic Learners	67%	33%
Interpersonal Learners	100%	0%
Intrapersonal Learners	100%	0%

*Study reveals the percent of passing students specific to each learning style that studied under a Linguistic Style Teacher

Table 2 represents the percentages of passing and non-passing students who were placed in a classroom taught by a teacher with a mathematical teaching style. Again, it was assumed that numbers reflected 100 students per learning style.

table 2

Mathematical Teacher Style Classroom

	Passing Students*	**Non-passing Students**
Linguistic Learners	86%	14%
Mathematical Learners	71%	29%
Musical Learners	100%	0%
Spatial Learners	100%	0%
Kinesthetic Learners	75%	25%
Interpersonal Learners	100%	0%
Intrapersonal Learners	N/A	N/A

*Study reveals the percent of passing students specific to each learning style that studied under a Mathematical Style Teacher

Table 3 represents the percentages of passing and non-passing students who were placed in a classroom taught by a teacher with a musical teaching style. Again, it was assumed that numbers reflected 100 students per learning style.

table 3

Musical Teacher Style Classroom

	Passing Students*	**Non-passing Students**
Linguistic Learners	100%	0%
Mathematical Learners	71%	29%
Musical Learners	67%	33%
Spatial Learners	80%	20%

Kinesthetic Learners	86%	14%
Interpersonal Learners	0%	100%
Intrapersonal Learners	N/A	N/A

*Study reveals the percent of passing students specific to each learning style that studied under a Musical Style Teacher

Table 4 represents the percentages of passing and non-passing students who were placed in a classroom taught by a teacher with a kinesthetic teaching style. Again, it was assumed that numbers reflected 100 students per learning style.

table 4

Kinesthetic Teacher Style Classroom

	Passing Students*	**Non-passing Students**
Linguistic Learners	67%	33%
Mathematical Learners	100%	0%
Musical Learners	75%	25%
Spatial Learners	67%	33%
Kinesthetic Learners	100%	0%
Interpersonal Learners	78%	22%
Intrapersonal Learners	50%	50%

*Study reveals the percent of passing students specific to each learning style that studied under a Kinesthetic Style Teacher

Based on the raw scores and the assumption of how the results would affect a population size of 100 students per learning style, the researcher determined that the results were not significant. Thus, the researcher rejected the hypothesis.

Chapter Five

Conclusions, Implications and Recommendations

Introduction

A multitude of literature has revealed the importance of determining teaching and learning styles for student advancement. In addition, each has shown that it supports the hypothesis in various secondary and collegiate settings. Using four of the most widely used learning style inventories, Kolb's Learning Style Inventory, the Myers-Briggs Type Indicator, Howard Gardner's Multiple Intelligences Theory or Dunn and Dunn's LSI, results from all tests revealed positive effects on student academics at each of the higher levels of education.

Summary of the Problem

Many studies have been conducted to determine the benefits of matching teaching and learning styles in the classroom at both the secondary and collegiate levels. Studies have revealed that students differ greatly in the way they learn (Kolb, 1984; McCarthy, 1990) and that "the closer the match between students' learning styles and their teachers' teaching styles, the higher the grade point average" (Emde, 2002). In addition, it was been reported that students whose learning styles are matched with the teacher's approach to teaching will have greater ease of learning than will students whose styles are mismatched (She, 2005). Most of the research, however, has been conducted in the secondary and collegiate settings. Minimal research has been done in the elementary setting. Thus, based on positive findings at the higher levels, it was assumed that elementary students could also benefit greatly from having their learning style matched to

their teachers' teaching style. After all, if there is the potential for students to do better in school by simply being taught toward their learning styles, why should teachers not take the time to determine their students' learning styles? Dunn and Griggs (1989) suggested that when students are taught through their learning strengths, "they internalize more, retain knowledge longer and enjoy the process better than when they are taught through their weaknesses" (She, 2005).

Summary of the Hypothesis

The hypothesis stated kindergarten students whose learning styles match that of their teachers' teaching styles will do significantly better in reading than those students whose learning styles are not matched to that of their teachers' teaching styles within the elementary classroom.

Summary of the Procedure

An adult version of Howard Gardner's Multiple Intelligences Test (appendix A) was administered to four elementary school teachers to determine their teaching styles. A child version of his assessment (appendix B) was then verbally administered 108 kindergarten students to determine their learning styles. Results of adult and child assessments were then compared. The data revealed those students who had similar learning styles to that of their teachers' teachings styles and which students had learning styles differing from that of their teachers. Student report cards were then viewed to determine the relationship, if any, of the matching of teaching and learning styles to the academic success of students in reading alone.

Summary of Findings

The results were tabulated by calculating the raw scores per 100 students for each learning style. This revealed the percentage of each type of learning style within that

classroom. The numbers did not support the hypothesis, however, this is believed to be due to the small numbers to which the hypothesis was tested.

The most successful learning styles among kindergarten student subjects in the linguistically taught classroom were mathematical, musical, interpersonal and intrapersonal. However, the greatest number of students in the classroom were linguistic learners. For instance, there were thirteen linguistic learners, only nine of which passed in reading; and there were three musical learners, all of which passed in reading. Thus, the raw data scores were skewed in each classroom due to the fact that the population size was not large enough to show significant results. In the mathematically taught classroom, the most successful students in reading were found to have musical, spatial or interpersonal learning styles. In the musically taught classroom, linguistic learners revealed the best passing percentage in reading on their report cards. In the kinesthetically taught classroom, the hypothesis was supported in that kinesthetic learners were one of the most successful groups of learners who passed in reading. Again, this may be due to the fact that there were only three kinesthetic learners within the classroom, all of which passed in reading. However, there were nine interpersonal learners, seven of which passed, making up the largest number of one learning style, yet not the most successful in reading scores.

Conclusions

There was no correlation made within the findings that support the hypothesis. It was thus determined that the matching of student learning styles to teacher teaching styles within the elementary setting does not help students do better on their reading scores. Therefore, the researcher rejected the hypothesis.

Implications and Recommendations

Upon analysis of the data, it was clear that the small population to which the hypothesis was tested did not include enough subjects in order to make significant observations. Three of the four classrooms of student subjects proved the hypothesis incorrect, leaving only one classroom supporting it. Greater classroom sizes or greater numbers of subjects, for instance, testing the hypothesis on an entire school rather than one grade level, may have provided more data and more significant results.

The student subjects' ages also played a role in the insignificance of the results. Participating kindergarten students were too young to take the test themselves and many of the questions may not have applied to them specifically, although they still conjured up a response. In addition, the way in which the questions were verbally stated to the subjects may have caused them to answer inconsistently.

Because of the implications and results of this study, as well as the multitude of case studies conducted in higher educational settings on the topic, it would be beneficial to revisit this topic in the future. If the necessary changes are made, one may be able to determine whether or not significant results would arise for students who are matched by their learning styles to their teachers' teaching styles.

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Appendix A

Adult Version of Howard Gardner's Multiple Intelligences Test

Seven Intelligences Checklist

Quickly read the following statements and check each statement that applies to you.

☐ **1. I easily remember nice turns of phrase or memorable quotes and use them deftly in conversation.**

☐ **2. My library of books is among my most precious possessions.**

☐ **3. I can hear words in my head before I read, speak, or write them down.**

☐ **4. I get more out of listening to news on the radio and hearing books on cassette than I do from watching TV.**

☐ **5. I am a master when it comes to word games like Scrabble, Anagrams, or Password.**

☐ **6. I enjoy entertaining others with tongue twisters, nonsense, rhymes or puns.**

☐ **7. Other people sometimes have to stop and ask me to explain the meaning of words I use in my writing and speaking.**

☐ **8. English, social studies, and history were easier for me in school that math and science.**

☐ **9. When I drive down a freeway, I pay more attention to the words written on billboards than to the scenery.**

☐ **10. My conversation is peppered with frequent references to things that I have read.**

☐ **11. I have written something recently that I was particularly proud of or that earned me special recognition by others.**

☐ **12. I note other people's errors in using words or grammar, even if I don't correct them.**

☐ **13. I am fascinated by scientific and philosophical questions like "When did time begin?"**

☐ **14. I can easily double or triple a cooking recipe or carpentry measurement without having to put it all down on paper.**

☐ **15. Math and science were among my favorite subjects in school.**

☐ **16. I frequently beat my friends in chess, checkers, Go, or other strategy games.**

☐ **17. I like to set up little "what if experiments (e.g., what would happen if I double the amount of plant food that I feed to my plants at home?)**

☐ **18. People sometimes tell me that I have a very computer-like mind.**

☐ **19. I organize things in my kitchen, bathroom, and at my desk according to categories and in patterns.**

☐ **20. I believe that almost everything has a rational explanation.**

☐ **21. I wonder a lot about how certain things work.**

☐ **22. I like finding logical flaws in the things that people say and do at home and work.**

☐ **23. I sometimes think in clear, abstract, wordless, imageless concepts.**

☐ **24. I feel more comfortable when something has been measured, categorized, analyzed or quantified.**

☐ **25. I enjoy music and have favorite performers.**

☐ **26. People say that I have a pleasant singing voice.**

☐ **27. I can tell when a musical note is off-key.**

☐ **28. My collection of records, cassettes and compact discs is among my most treasured possessions.**

☐ **29. I play a musical instrument.**

☐ **30. My life would be impoverished if there was no music in it.**

☐ **31. I catch myself sometimes walking down the street with a television jingle or other tune running obsessively through my mind.**

☐ **32. I can easily keep time to a piece of music with a simple percussion instrument.**

☐ **33. I know the tunes to many different songs or musical pieces.**

☐ **34. If I hear a musical selection once or twice, I am usually able to sing it back fairly accurately.**

☐ **35. I often make tapping sounds or sing melodies while working, studying, or learning something new.**

☐ **36. I sometimes enjoy different sounds in my environment.**

☐ **37. I can remember in detail the layout and landmarks of places I've visited on vacations.**

☐ **38. I often see clear visual images when I close my eyes.**

☐ **39. I am usually sensitive to color.**

☐ **40. I have a camera or camcorder that I use to record what I see around me.**

☐ **41. I can easily solve jigsaw puzzles, mazes and other visual puzzles.**

☐ **42. I sometimes have vivid dreams at night.**

☐ **43. I can easily find my way around unfamiliar territory.**

☐ **44. People praise me for the drawings or doodles I create.**

☐ **45. Geometry was easier for me than algebra in school.**

☐ **46. When I do artwork I seem to know just how to arrange the parts of the picture or product.**

☐ **47. I can comfortably imagine how something might appear is it were looked down upon from directly above in a birds eye view.**

☐ **48. I prefer looking at reading material that is heavily illustrated.**

☐ **49. I regularly engage in at least one sport or physical activity.**

☐ **50. I can master new sports easily.**

☐ **51. I find it difficult to sit still for long periods of time.**

☐ **52. I like working with my hands at some concrete activity such as sewing, weaving, carving, carpentry, or model-building.**

☐ **53. My best ideas often come to me when I'm out for a long walk or jog.**

☐ **54. I like to spend my free time outdoors.**

☐ **55. I frequently use hand gestures or other forms of body language when conversing with someone.**

☐ **56. I need to touch things in order to learn more about them.**

☐ **57. I enjoy scary movies, dare devil amusement rides, or similarly thrilling experiences.**

☐ **58. I would describe myself as well coordinated.**

☐ **59. I need to practice a new skill by doing it rather than simply reading about it or seeing a video that describes it.**

☐ **60. I often can figure out how something works or how to fix something that's broken, without asking for help.**

☐ **61. When I meet new people, I often make connections between their characteristics and those of other acquaintances.**

☐ **62. I'm considered the local Dear Abby in my neighborhood and people often come to see me for help and advice.**

☐ **63. I can sense quickly how other people are feeling about things and themselves.**

☐ **64. I prefer group sports like badminton, volleyball, or softball to solo sports such as swimming and jogging.**

☐ **65. When I have a problem, I'm more likely to seek out another person for help rather than attempt to work it out on my own.**

☐ **66. I have at least three close friends.**

☐ **67. I prefer social pastimes like Monopoly or bridge to individual recreations such as video games or solitaire.**

☐ **68. I enjoy the challenge of teaching another person what I know how to do.**

☐ **69. People have called me a born leader.**

☐ **70. I feel comfortable in the middle of a crowd.**

☐ **71. I like to get involved in social activities connected with my work, church, or community.**

☐ **72. I would rather spend my evenings at a lively party than at home alone.**

☐ **73. I regularly spend time alone to meditate, reflect, or think about important life questions.**

☐ **74. I think about what I want from life and what I want to accomplish.**

☐ **75. I have attended counseling sessions to learn more about myself.**

☐ **76. I have intuitions about things that turn out to be true.**

☐ **77. People tend to see me as a loner.**

☐ **78. I have a special hobby or interest that I keep pretty much to myself.**

☐ **79. I have some important goals for myself that I think about on a regular basis.**

☐ **80. I prefer to spend a weekend alone in a cabin in the woods rather than go to a fancy resort with lots of people around.**

☐ **81. I usually know how I feel about something or about my feelings.**

☐ **82. I keep a personal diary or journal to record the events of my inner life.**

☐ **83. I am self-employed or at least have thought about starting my own business.**

☐ **84. I would rather spend my evenings at home than at a lively party. .**

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Appendix B

Child Version of Howard Gardner's Multiple Intelligences Test

Multiple Intelligence Test for Children

By Nancy Faris**

Answer the following questions by checking on the sentences that are most like you.

- ☐ **1. I am good at copying what people say.**
- ☐ **2. I really love books.**
- ☐ **3. I really like to listen to the radio.**
- ☐ **4. I really like to do "word searches" or crossword puzzles.**
- ☐ **5. I really like language arts and social studies in school.**
- ☐ **6. I really like to do experiments.**
- ☐ **7. I really like math.**
- ☐ **8. I really like science.**
- ☐ **9. I am good at making and figuring out patterns.**
- ☐ **10. I often wonder about how things work.**
- ☐ **11. I really like music.**
- ☐ **12. People tell me that I sing well.**
- ☐ **13. I would be very sad if there was no music in the world.**
- ☐ **14. I know a lot of songs by heart.**
- ☐ **15. I sing songs I've heard on TV to myself as I'm going somewhere.**

☐ **16. I am good at doing puzzles.**

☐ **17. I am good at reading maps.**

☐ **18. I hardly ever get lost or mixed up where I am going.**

☐ **19. I can pretend I am in the sky looking down on my house and know where everything is.**

☐ **20. I am good at drawing or making things with clay.**

☐ **21. I am good at sports.**

☐ **22. I really like to dance.**

☐ **23. I like to be outside a lot.**

☐ **24. I am good at learning new sports or dances.**

☐ **25. I can figure out how something works or how to fix something that's broken by myself.**

☐ **26. I feel sad when others are feeling sad.**

☐ **27. I feel happy when I am with others that are feeling happy.**

☐ **28. I like playing games with a group of people better than just one other person.**

☐ **29. I have more than three good friends.**

☐ **30. I really like being in the middle of a crowd.**

☐ **31. I really like to spend time alone to think by myself.**

☐ **32. I think a lot about the future and what I want to do when I grow up.**

☐ **33. I know right away when I am feeling "stressed out" and I spend time alone to feel better.**

☐ **34. I keep a diary or journal and write down my feelings.**

☐ **35. Most of the time I'd rather stay home than go out somewhere with a lot of people.**

**Based on Howard Gardner's Seven Intelligences/inspired by MI Test by Spencer Barnard -- MAT Program (ONU -- Kankakee, IL) siting this source: Dr. Howard Gardner, C. A. Armstrong, and the Boulder Center of Accelerated Learning. Also see Research and References.