AN EVALUATION OF THE
SUMMER BRIDGE PROGRAM’S
DELIVERY OF MATHEMATICS INSTRUCTION
TO CAREER ACADEMY STUDENTS:
AN URBAN SCHOOL DISTRICT’S APPROACH

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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ABSTRACT

Research into the delivery of mathematics instruction indicates that the implementation of a constructivist approach can help improve deep learning of concepts and application skills. However, the use of such an approach commonly requires more time than is available in a typical school schedule. With the introduction of the “No Child Left Behind Act” (reauthorization of ESEA) accountability in education through standardized testing has become a primary vehicle of assessment used by most local and state education agencies. The additional pressure placed upon each school district for test performance has forced educators to develop a variety of methods for the additional delivery of instruction. The Summer Bridge Program was one such method that targeted students attending a career academy. The academic focus of the program was to improve learning in mathematics by increasing time on task.

The study’s focus was to determine if additional time in mathematics did improve student knowledge and to identify the characteristics of students that may have benefited most from participation in the Summer Bridge Program. A quasi-experimental, nonequivalent control group design was used for the study. The Ohio Ninth Grade Proficiency Test (NGPT) was used for the pretest and posttest. The comparison group included students that did not attend the Summer Bridge Program. The treatment group
included the students who did attend the Summer Bridge Program. Analysis of variance (ANOVA) was used to determine if there was a statistical significance at the .05 alpha level and multiple regression was used to identify the characteristics of students that could benefit most from the treatment.

The researcher found little difference between the comparison and treatment group and concluded that participation in the Summer Bridge program did not result in a difference in mathematics preparation for the Ohio NGPT. The researcher was unable to identify any specific characteristics of students that explain their scores on the Ohio Ninth Grade Proficiency Test.
DEDICATION

To my family and friends who have supported my efforts to complete my education and have accepted the fact that it would mean that I would have less time to spend with them. To my mother, my brothers and sisters, and my wife who have taught me so much about hard work, and persistence. And to my first wife and the many other cancer fighters whose daily examples have taught me to stay positive despite being faced with continued difficulties and that you should “Never Give UP”.
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The help and support of friends is always critical in an undertaking of this proportion. I would therefore like to thank Dr. John Soloninka who provided me with assistance in the understanding of statistics for my general exam. Pete Maneff who provided me with the inspiration for this study, Bob Selikson, Karen Gohringer, and Sandy Brennan for the data, and last but not least, my wife who spent several hours proof reading of this dissertation.
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CHAPTER 1

INTRODUCTION

The evolution of vocational education in Ohio from the enactment of the Smith-Hughes Act of 1917, to the Carl D. Perkins Vocational and Technical Education Act of 1998 (Perkins III), has been directly tied to federal legislation and its program/funding stipulations. A common method for the delivery of vocational education training in Ohio from the 1960s to the present has been a traditional two-year skill training program. In many programs, the emphasis was on laboratory training with little attention being paid to the instruction of academic skills. The primary focus of federal legislation and funding in the late 1960s, 1970s and 1980s was on expanding vocational education and providing services for various special populations of students, such as: disadvantaged, handicapped, males or females in non-traditional occupations, adults, and single parents (American Vocational Association [AVA], 1998). Accountability and funding expectations placed upon school districts by the Ohio Department of Education (ODE) focused on student job placement, and programs maintaining the minimum student enrollment. ODE’s accountability to the federal government for the funds they received was primarily based on the federal government’s examination of the state’s vocational plan.
With the changes in federal legislation, the explosion of computer/information technology, and the changes in workforce needs in the 1980s, vocational schools began to infuse more applied academic skills into the vocational education curriculum. Some vocational centers developed specific programs in which a certified academic teacher worked directly with the vocational program instructor and the students in order to improve academic competency. The shift in federal funding emphasis in the Carl D. Perkins Vocational and Technical Education Act of 1990 (Perkins II), the Carl D. Perkins Vocational and Technical Education Act of 1998 (Perkins III), and the School-to-Work Act of 1994, led many states to re-evaluate their vocational education systems to emphasize many of the aspects of past legislation plus the integration of academics into vocational education, support for technology preparation (tech prep) and the development of closer links between school and work (AVA, 1998). Perkins III provided for improved flexibility to develop programming and delivery methods but required firm expectations of accountability for the federal funds (AVA, 1998). Perkins III also required state departments of education to develop performance levels in several areas: student attainment of vocational, technical, and academic skills, acquisition of degrees or credentials, placement and retention, and completion of programs that led to nontraditional training and employment (AVA, 1998).

Realizing that changes in vocational education were necessary, Ohio’s Division of Vocational Education (later named the Office of Career-Technical and Adult Education) began a process of reviewing its existing programs and priorities in order to meet the needs of Perkins legislation and a changing workforce beyond the year 2000. As a part of their review, a strategic plan for action was developed that reflected changes in
workforce education and emphasized the importance of *career-focused education for all learners*. The *Ohio’s Future at Work: Beyond 2000* (Ohio Department of Education, 1996) strategic plan was significant because it provided for flexibility in the delivery of vocational education and developed new priorities for vocational education.

One of the priorities was to “*Strengthen teaching and learning,*” which included curriculum based on the Occupational Competency Analysis Profiles (OCAPs) and a focus on industry certification standards; a career cluster concept; lifelong learning; and integrated academic, occupational, technological and employability competencies (Ohio Department of Education, 1996). Since Perkins II and III, the Office of Career -Technical and Adult Education has been working to reshape vocational education into a comprehensive career-technical delivery system. At the local level, many new initiatives such as the development of identifiable pathways for students to follow, correlation of academic skills with career-technical programs, tech prep, career academies, and reform initiatives such as High Schools That Work (HSTW) have been implemented. For some districts the refocusing and redesigning of their traditional vocational education delivery system into a comprehensive career-technical system was relatively easy. For others, like Columbus Public Schools, it was more difficult.

In the 1999-2000 school year Columbus Public Schools (CPS), was classified by the Ohio Department of Education as a district in “academic emergency,” because they met only four of the 27 state performance standards for elementary and secondary education. Fourteen of the standards were directly related to high school attendance, proficiency test results, and graduation rates. The Ninth Grade Proficiency Test (NGPT) was designed to measure academic content at the end of the eighth grade, yet fewer that
25% of CPS eighth grade students passed all sections of the test before entering ninth grade and fewer that 50% of females, Hispanic and Black students passed the mathematics portion of the NGPT during high school. Although those percentages were similar to the state of Ohio averages with the exception of females, they were still significantly below the state standard of 75% in mathematics.

On March 7, 2000, CPS adopted the Columbus Pathways to Success Initiative (CPSI) as a comprehensive reform initiative that transformed five of the district’s 20 high schools into Career Academy High Schools. Various components of the CPSI initiative were designed to address the gaps in student achievement, attendance and school climate at the career academies. Students that attended the career academies were required to enroll in a Freshmen Success Academy (9th grade) before being accepted into the career academy in the 10th grade. The Freshmen Success Academy schedule included a common core of college preparatory academic subjects with a double block of Algebra 1, a career exploration course, and an introductory technology course (Columbus Public Schools, 2002a).

Problem Statement

The CPS Superintendent’s goal of all students being ready for Algebra 1 in ninth grade, in addition to the CPSI goal of students needing to have prerequisite academic skills necessary to understand technical material, was the focus of the Freshmen Success Academy. The students in the Freshmen Success Academy were expected to take Algebra 1; yet only 25% of eighth grade students had passed the NGPT. It was apparent to the district that there was a gap between the goals and the performance level of the
incoming freshmen student. Thus, the need for an intervention program was clear. Built into the Freshmen Success Academy were several safety net provisions that included extra tutoring help after school, an advisor/advisee monitoring system, and a Summer Bridge Program. The Summer Bridge Program’s academic focus was to better prepare incoming ninth grade students to pass the NGPT and to enter Algebra 1. The Summer Bridge Program was the district’s attempt to improve mathematics achievement in a very short period of instructional time, thus paving the way for students to meet the superintendent’s and the Career Academy’s goal. However, evidence that the Summer Bridge Program actually resulted in improved mathematics skills and an increased chance of passing the NGPT was not available.

**Purpose and Objectives**

The purpose of this study was to determine if the Summer Bridge Program was effective in increasing student achievement in mathematics for those who attended, as compared to the students who were not enrolled in the Summer Bridge Program. More specifically, the study determined the extent to which the additional time on mathematics could improve a student’s understanding as measured by the NGPT. The specific objectives of this study were as follows:

1. To determine if there was a significant difference between the pretest scores on the NGPT (mathematics) for students who participated in the Summer Bridge Program and the students who did not.
2. To determine if there was a significant difference between the posttest scores on the NGPT (mathematics) for students who participated in the Summer Bridge Program and students who did not participate.

3. To determine the proportion of variance in the students’ pretest scores on the NGPT (mathematics) that could be explained by gender, ethnicity, and free and reduced lunch status.

4. To determine the proportion of variance in the treatment group (Summer Bridge Program) students’ posttest scores on the NGPT (mathematics) that could be explained by gender, ethnicity, free and reduced lunch status, and mathematics pretest score.

Significance of the Study

The need for educators to infuse increased academic skill training into career technical programs was paramount to the success of both Columbus Public Schools (CPS) and the Ohio Office of Career-Technical and Adult Education’s efforts to modernize their programs. Without empirical evidence, educators have not known if they were making decisions in the best interest of their career-technical programs or the students that they were trying to assist. The CPS Department of High School/Career Education Curriculum Development & Instructional Support developed the Summer Bridge Program with the hope of increasing academic and career success for students who were entering the Career Academies. With an already strained budget, finding the funding for a summer school program was difficult. It was important that the district’s educators know the impact of the Summer Bridge model on the delivery of academic
education for these students. If the program was effective, then it would be worth replicating for students attending career centers and traditional high schools. This study provided information for educators to use in making more informed decisions regarding the effectiveness of the Summer Bridge Program and answered two basic questions concerning the preparation of students that will be attending a career academy, career center or traditional high school:

1. Were the pretest and posttest mathematics scores higher for students that attended the Summer Bridge Program than for the students who did not attend?

2. To what extent did gender, ethnicity, free and reduced lunch status, contribute to the NGPT (mathematics) test scores?

Definitions

This section contains definitions of terms used throughout this study.

**Career Academy Model:** The Career Academy Model was introduced in 1981 and supported by the University of California at Berkeley through the Career Academy Support Network in conjunction with business and industry. The model promoted the development of smaller learning communities in urban districts with a career focus. (CPS- Smaller Learning Communities Grant, February 19, 2002)

**The Career Academy Support Network (CASN):** CASN was housed within the Graduate School of Education at the University of California at Berkeley. The project fostered the growth and improvement of career academies and other small learning
communities. The CASN project provided web-based information on Career Academy theory and research, academy structures, college preparation, career-related curriculum and partnerships with employers/community (The Career Academy Support Network, 2003).

**Columbus Pathways to Success Initiative (CPSI):** This reform initiative began during the 2000-01 school year with four Columbus Public high schools. In 2001-02 an additional high school was added. The CPSI was based on the High Schools That Work (HSTW) model, and also integrated components of the Talent Development and Career Academy Models. The initiative’s focus was to increase student academic achievement, to close the gaps in achievement among students, and to build capacity among educators for standards-based educational programs. (CPS-Smaller Learning Communities Grant, February 19, 2002)

**Freshmen Success Academy:** The academy freshmen year (9th grade) component of the Columbus Pathways to Success Initiative. In preparation for students to enter a Career Academy program in the sophomore year, they took a core of college preparatory academics, along with a career exploration class and an introductory technology class. (CPS-Smaller Learning Communities Grant, February 19, 2002)

**High Schools That Work (HSTW):** This reform model was initiated in 1987 by the Southern Regional Educational Board (SREB) and has been adopted by over 1,000 sites nationwide. The HSTW focus was on research-based instructional practice implementation in the high school. The HSTW themes were: the need to increase student academic achievement, to close the gaps in achievement among students, and to build
capacity among educators for a standards-based educational program. (CPS-Smaller Learning Communities Grant, February 19, 2002)

**Instructional Learning Software (ILS):** Software that was developed specifically for the instruction of students. It usually included computerized drill and practice tutorials, and an evaluation system that measures student performance. Some software was aligned with standardized tests.

**Integrated Technical and Academic Competencies (ITAC):** ITAC competencies served as the curricular framework for career-focused education in Ohio. ITACs were used as a resource for program planning and the basis for curriculum, instruction and assessment. The development of the ITACs began in 1998. They were developed in Ohio for career-technical education programs by Ohio’s Office of Career-Technical and Adult Education in cooperation with The Ohio State University and the Center on Education and Training for Employment (CETE).

**Learner Gain:** For the purpose of this study, gain in learning was identified as the measurement of cognitive growth in mathematics (positive change in cognitive knowledge) between administration of the pretest (March NGPT) and posttest (July or October NGPT). The measurements were not intended to validate long term cognitive effects of student learning.

**Occupational Competency Analysis Profile (OCAP):** Competency lists were developed in Ohio for career-technical education programs by Ohio’s Office of Career-Technical and Adult Education in cooperation with The Ohio State University and the Center on Education and Training for Employment (CETE). The OCAPs were
developed in the early 1990s by bringing in business and industry experts in over 60 occupational areas together in focus groups to develop the competency lists.

**Ohio Ninth Grade Proficiency Test (NGPT):** The original four ninth-grade proficiency tests (mathematics, citizenship, writing, and reading) were given for the first time in November 1990; ninth-grade science was added in March 1996, but passage of the science test was not required if the student graduated before September 2000.

**PLATO:** This instructional learning software (ILS) was used by Columbus Public Schools in over 20 of its high schools, middle schools and career centers to provide individualized academic instruction in reading and writing comprehension, mathematics and science. CPS had used this software for over five years to provide individualized instruction based on a pre-assessment of each student’s ability. PLATO Learning INC. is one of the larger vendors of ILS software for public schools.

**Summer Bridge Program:** The Summer Bridge Program was one of the safety net components of Columbus Pathways to Success Initiative (CPSI) designed to help prepare students who were behind academically. The program was designed for incoming freshmen with specialized help in reading, mathematics, study skills and introductory experiences in computer technology and career awareness. The program was designed to be four hours per day from 8:00 a.m. until noon for 19 days (76 hours). This time did not include the career exploration/job shadowing component in which some, but not all students participated. The shadowing occurred several afternoons each week.

**Talent Development High Schools (TDHS):** Initiated in 1994 by Johns Hopkins University and Howard University in Baltimore, Maryland, this program focused on problems of large urban high schools, and consisted of specific changes in school
organization and management that resulted in a safe and secure climate for learning. The components of the Columbus Pathways to Success Initiative model that reflected the Talent Development High School initiative were the Freshmen Success Academy and the safety net programs: the Summer Bridge Program and Acceleration Academy (Columbus Public Schools, 2002).

Limitations of the Study

A complete analysis of all areas of instruction in the Summer Bridge Program was not feasible. This study focused on the primary area of instruction that all students were required to take (mathematics) and whether the additional time in mathematics was an aid to students’ understanding of mathematics. This study did not attempt to measure the impact of any other academic instruction or the internship component. Several, but not all of the teachers were licensed and experienced in the instruction of mathematics. Some students had a different teacher at the beginning and end of the program. Instructional support material was developed by the Career Education Department for mathematics, but site observations by the researcher indicated that not all the teachers used the material. Site observations also indicated that there were a variety of instructional methods used and that the amount of time that students used the PLATO Instructional Learning System varied. Therefore, teacher licensure, experience and instructions methodologies were not factored in as a part of the study. The analysis of data was further limited to students that took the mathematics NGPT in March (pretest) and failed the test (below a score of 200) thus requiring the student to again take the test in July or
October (posttest). Students in the Summer Bridge Program needed to be in attendance at least 78% of the time in order to be a part of the study. 78% equaled 15 days of attendance out of possible 19 days. This study did not attempt to measure retention of knowledge over the long-term. Nor did this study attempt to measure application of knowledge in a laboratory or a work based setting.

Assumptions

Being an ex post facto study, not all the process factors were controlled by the administrators and teachers of the middle schools, career academies, and Summer Bridge Program. Therefore, as a premise for conducting this study, the following assumptions were made:

- Information on each student’s March, July (special testing) and October proficiency test scores were reported and recorded accurately. The information was provided to the district’s Department of Evaluation Services by the Ohio Department of Education (ODE).
- Student attendance in the Summer Bridge Program was accurately recorded by the classroom instructor.
- The change of mathematics knowledge between the administration of the March 2002 NGPT when the students in eighth grade took the test, and June of 2002 when the school year ended was the same for the students who enrolled in the Summer Bridge Program and those who did not enroll in the program.
CHAPTER 2

REVIEW OF LITERATURE

This literature review examined various views of educators related to constructivism theory and instruction, standards and assessments of students, issues that affect student achievement, changes in workforce education, and the Columbus Pathways to Success Initiative (CPSI). The literature review concluded with a description of the Summer Bridge Program and a conceptual framework for the study.

Constructivism Theory and Instruction

“According to the National Research Council, 60% of college mathematics enrollments are in courses ordinarily taught in high school, and the business sector spends as much on remedial mathematics education for employees as is spent on mathematics education in schools, colleges, and universities combined” (Battista, 1999, p. 426). This statement was made by the National Research Council in 1989, despite American education experiencing several reform movements such as “New Math” and “Back to Basics.” A commonly expressed concern has been that educators often subscribe to
moderately successful methods of teaching and learning, in part because of their limited knowledge of teaching and learning theory, and in part because they need methods that are easy to implement within a limited amount of class time. According to Battista, (1999) “for most students, school mathematics is an endless sequence of memorizing and forgetting facts and procedures that make little sense to them. Though the same topics are taught and retaught year after year, the students do not learn them” (p. 426).

In the mid 1980s and into the early 1990s, the National Council of Teachers of Mathematics (NCTM), realizing there was a serious problem with mathematics achievement, studied various past practices of mathematics education, and as a result, NCTM recommended the following five major shifts for reform: (a) toward classrooms as mathematical communities and away from classrooms as simply a collection of individuals; (b) toward logic and mathematical evidence as verification and away from the teacher as the authority for right answers; (c) toward mathematical reasoning and away from merely memorizing procedures; (d) toward conjecturing, inventing, and problem solving and away from an emphasis on mechanistic answer-finding; and (e) toward connecting mathematics, its ideas, and its applications – away from treating mathematics as a body of isolated concepts and procedures (NCTM, 1991). These NCTM reform statements emphasized much of the theoretical foundation that is expressed in a theory called constructivism. Support for the basic tenets of the "constructivist" view comes from the noted psychologist Jean Piaget and, more recently, from scientists attempting to connect brain function to psychology. For instance, Nobel Laureate Francis Crick (1994) stated, seeing is a constructive process, meaning that the brain does not passively record the incoming visual information. Constructivism actively
seeks to interpret that information. According to Battista (1999), all current major scientific theories describing students' mathematics learning agree that mathematical ideas must be personally constructed by students as they try to make sense of situations.

In fact, according to Battista (1999, p. 432), “through a broad spectrum of studies, the constructivist view of learning and teaching has been scientifically established; "Constructivism" has become the dominant theoretical position among mathematics education researchers.” Yet, there is a concern that most educators have no substantive understanding of the research-based constructivist theory. A videotape study of eighth-grade mathematics classes revealed that teaching styles remain basically the same as they were two generations ago: review of previous material and homework, problem illustration by the teacher, drill on low level procedures, and supervised seat work (U.S. Department of Education, 2000). Some writers take constructivism to be synonymous with "discovery learning" from the era of "new math," and still others even see it as a way of teaching that focuses on using manipulative or cooperative learning (Battista, 1999). Bereiter and Scardamalia (1996) stated that constructivist learning was a name attached to a very large range of classroom activities that had little in common except for the absence of direct instruction. Bereiter and Scardamalia further identified several activities including hands-on learning, learning through problem solving, and curiosity-driven inquiry as common activities under the umbrella of constructivism.

Brooks and Brooks (1999) offered the following strategies for teachers to become constructivists:

- Encourage and accept student autonomy and initiative.
- Use data/primary sources, with manipulative, interactive, and physical materials.
• Use cognitive terminology such as 'classify,' "analyze," "predict," and "create" when framing tasks.

• Allow student responses to drive lessons, shift instructional strategies, and alter content.

• Inquire about students' understanding of concepts before sharing their own understandings of those concepts.

• Encourage students to engage in dialogue, both with the teacher and with one another.

• Encourage student inquiry by asking thoughtful, open-ended questions and encouraging students to ask questions of each other.

• Seek elaboration of students' initial responses.

• Engage students in experiences that might engender contradictions to their initial hypotheses and then encourage discussion and allow wait time after a question.

• Provide time for students to construct relationships and create metaphors.

• Nurture students' natural curiosity through frequent use of the learning cycle model (discovery, concept introduction).

The constructivist theory supports the learning activities described above, but it may take more time due to the increased attention given to mathematical reasoning and problem solving, justifying ideas, and making sense of complex situations. Kerna (1997) suggested that the use of the constructivist approach for cognitive apprenticeship and situated learning was appropriate for workplace learning. In cognitive apprenticeship, experts model the strategies and activities needed to solve problems, and learners approximate doing the activity while articulating their thought process. The rationale is
that activity is a key factor in knowledge construction and participation in everyday work activities forces learners to access higher-order knowledge. Elements of constructivist, situated learning may be seen in recent developments such as tech prep, school to work, and integrated vocational and academic education. Lynch (2000) stated that cognitive science research has major implications for teaching and learning in career and technical education, as well as for some important changes that need to be made relative to its teaching force of the 21st century.

One way to understand new iterations of research and applications to career and technical education is to contrast them with the traditional view of vocational education. The following figure contrasts the historical literature and philosophy in vocational education (Prosser's essentialism) with the contemporary research and theory most closely identified with constructivism (which builds on the writings of John Dewey) in four areas: clientele and its relation to community, curriculum, teachers, and methods of teaching.

<table>
<thead>
<tr>
<th>Comparison Area</th>
<th>Essentialism (Prosser)</th>
<th>Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methods of teaching</td>
<td>Vocational learning should correspond to reality. Basic skills and technical knowledge are to be learned and applied exactly as they would be in a real employment situation. Lecture and demonstrations are particularly efficient. Teach single concepts and skills.</td>
<td>Facilitate individual, personal learning. Learning is social, experiential, and active, thus emphasis on discussion, collaboration, negotiation, and shared meanings. The use of multiple representations of concepts. Broker much of learning with other persons, tools, and symbolic and physical environments.</td>
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Figure 1: Contrasts in historical literature and philosophy in vocational education
Source: Lynch (1997)
<table>
<thead>
<tr>
<th>Vocational education's clientele and relation to community</th>
<th>People who want, need, and can benefit from vocational education should be given the opportunity to do so. Vocational education is closely related to the business, industrial, and economic aspects of the community. Its relations to other social institutions, such as academic education, are less clearly defined. Students should be trained for jobs, not culture.</th>
<th>Interdependence among individuals, and the larger world around them. Learners always bring their own personal, social, cultural, work and political histories, purposes, and interpretations with them to the situation, whether they are aware of it or acknowledge it or not. Learning occurs in social situations. Learning occurs best in the community where skills and knowledge will be practiced.</th>
</tr>
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<tbody>
<tr>
<td>Curriculum</td>
<td>Curriculum contains the essential core of skills and knowledge required for employment. Courses should be built as an orderly sequence leading to successful and predetermined job placement. Newly emerging jobs whose competency requirements are ambiguous ought to be avoided or approached on a risk-management basis.</td>
<td>The most important single factor influencing learning is what the learner already knows; build on prior knowledge. Integrated subject matter focusing on themes and how different content areas address that theme to assist students in making connections. Integration of academic and vocational education. Attention to metacognition and strategic self-regulation. Awareness of the importance of social context such as the difference between vocational (applied) math and formal math with an attempt to use the applied to teach the formal.</td>
</tr>
<tr>
<td>Teachers</td>
<td>Master of the occupational skills. Primarily trades people. Should be fact oriented with latest technical developments in their area of expertise. Teacher &quot;training&quot; to include only the essentials to meet immediate needs of beginning teachers.</td>
<td>The focus of teacher education is not just teachers' knowledge of the subject matter and pedagogy, but teachers' beliefs, conceptions, personal theories, experience related to subject matter, teaching, and learning. Teachers are facilitators of students who are building their own knowledge. The teacher is viewed as a coach who provides more direct instruction at first, which gradually fades as students become more proficient at problem solving. Teachers model, mediate, and scaffold. Teachers engage in diagnostic teaching and attempt to remedy learner errors and misconceptions.</td>
</tr>
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</table>
Many educators have considered the quality of the interactions between teachers and students to be at the heart of student learning. There has also been a belief that learning can be enhanced in a classroom when teachers know their students well and have the expertise to diversify instruction, meet student needs, foster problem solving, and support student inquiry. Sternberg, (Sternberg, Grigorenko, Sternberg & Torff, 1998) asserted that teachers often don’t know how to implement the theories in the classroom, and often believe that certain interventions hurt rather than help scores on standardized tests that emphasize memory more than they do more sophisticated kinds of thinking.

All too often, teachers feel pressured to ensure that students pass the high stakes tests which include many topical areas of mathematics. Teachers are often expected to cover the mathematical procedures at a pace that a student may not be able to understand in any meaningful way. This often impedes the development of higher order thinking skills that are an essential part of the constructivism theory. If more time is not allocated for instruction, the end result is often an abandonment of the theory and a “teach to the test” mode. The Third International Mathematics and Science Study (TIMSS) data indicated that Japanese students significantly outperform United States students in mathematics and spend much more time delving deeply into mathematical ideas (Battista, 1999). It is essential to provide adequate teacher/student contact time in order to develop higher order thinking skills, and it is important to provide adequate preparation time. A review of research revealed that United States teachers have only three to five hours weekly for class preparation, whereas, teachers in many other countries have as much as 15 to 20 hours per week for joint planning and learning (Darling-Hammond & Falk, 1997). Schools have learned that in an age of accountability, they cannot afford to let
students fall behind. Realizing that teachers need to increase a child’s time on task, school administrators often turn to summer school instructional programs as way to bring students up to a predetermined academic level. Despite this common strategy, it is difficult to find research that indicates the effectiveness of a summer school program. What is clear however is that there have been enormous expenditures by school districts in the hope that there is some learner gain. Some districts claim success, whereas some claim poor results from the summer programs. New York City and Brower County, Florida schools are phasing out summer school due to budget cuts and poor results (Education Week: June, 2002). Yet the Leon County, Florida school district stated that 77% of the 4,500 students in summer school last year were promoted.

Efforts in the past two decades to develop curriculum and instruction based on a strong theoretical foundation such as constructivism, educators have failed to achieve the desired results on a large scale through the nation. If constructivism is a preferred learning theory among mathematics educators, more information is needed on how it fits into the current realities of standards base education and norm-referenced assessment. Taylor and Walton (1997, p. 66) stated that a “constructivist approach to learning calls into question the adequacy of norm-referenced, multiple-choice tests for assessing student learning”. The tests, with their format of single right answers, have assumed learning to be a collection of discrete skills and bits of knowledge. These tests have been the primary method of student assessment and school adequacy evaluation under “No Child Left Behind Act.” “The reality is that the question, how do we teach Tracy the things she needs to know? is now being forced aside by the far less important question, How do we improve Tracy’s scores on the high-stakes test that she will be taking?”
“Educators need to face the troubling reality that neither the public nor our elected officials trust us when we say, we’re doing a great job!” (Popham, 2001, p. 126) So the key question for educators and the test developers according to Popham (2001, p.80) was “Can this potentially assessable content standards actually be taught by most teachers, using non-Herculean instructional approaches, in the teaching time that’s available to them?” If it can be done, then maybe elements of constructivist theory could be incorporated into the classroom in a way that will result in both a deeper learning of mathematics material and a student’s score could also improve on the high-stakes test.

Standards and Assessment of Students

Business leaders, college faculty, and others complain that too many young people graduate from high school without a solid foundation of academic knowledge and skills. The Center on Education Policy (2002), indicated that, more than 7 in 10 employers and professors said that the young people they see have fair or poor skills in grammar, spelling, and writing, and more than 6 in 10 said that young graduates’ skills are only fair or poor in basic mathematics. According to a survey of year 2000 graduates, young people agreed they should have worked harder (74 %), and 66% said their school should have required them to meet higher academic standards (Center on Education Policy, 2002). Some say this is an indication that American schools have become too easy, or that we now have higher expectations for schools and students than in the past.
Digest of Education Statistics, 2000) shows that in 1960, only 41% of adults 25 years old and older had completed high school and only eight percent had finished four or more years of college. In 1999, 83% of adults had completed high school, and 25% had finished four or more years of college. Some schools may be too easy at least when measured by our current educational standards, but for the most part the needs of society for a well educated workforce are increasing our expectations for better schools and better educated students.

In the 1960s the development of instructional techniques, educational standards, curriculum guides, and assessment instruments were primarily the responsibility of the school district with guidance and assistance from state government. After all, it was the community’s and state’s responsibility to educate their citizens. The federal government’s role, if any, was limited to collection of data and specialized funding. But the realization that the United States is part of a global society required the recognition that each state and our country is connected to the world, and to realize that the education level of its citizens is a key to United States competitiveness. The concern of America losing its competitive edge in technology and business was reflected in several national reports such as; A Nation at Risk and Goals 2000, which emphasized our need to reform our educational system. The belief that United States must be competitive in a global economy and that we should have a national system for measurement, stricter state standards, and exit exams that are tied to graduation from high school has been gaining momentum for several years. This concern prompted the United States Government and the National Science Foundation to spend 30 million dollars to participate in TIMSS. The study has provided a wealth of information for educators to analyze the status of
mathematics and science education in America and given us the ability to compare the results with schools in other countries. With this information, educators may now have clearer answers to the following questions: What knowledge and standards are reasonable expectations for all students to learn? Should standards be written with high expectations for students, or the minimum requirements that students must meet? Can students meet the standards no matter what their background (i.e., special needs, gender, race, socio-economic status)?

Federal Accountability – A Brief Historical Perspective

Prior to the Elementary and Secondary Education Act (ESEA) of 1965, the amount of federal dollars flowing to schools was relatively modest. With ESEA the federal government began dispensing significant amounts of money to school districts for the support of a child’s learning. In the early days of ESEA, it was not that important whether a program’s evaluation was positive or negative, just conducting the evaluation and submitting the required reports was all that was necessary to justify the spending (Popham, 2001). Since the 1980s, the United States Department of Education has become a major policy force in primary, secondary, and higher education. Supporting this development has been an increased interest in education by presidents, American industry, and society. With the establishment of the U.S. Department of Education cabinet level status by President Carter in 1979, the federal government formally recognized that education should be a national issue and a high priority. This recognition seemed short lived however when President Carter lost the 1980 election to Ronald
Reagan. Reagan appointed Terrel Bell as the Secretary of Education and charged him with the task of dismantling the department because he saw it as another example of federal intrusion on local and state control of education. But as the importance of a federal role in education became clearer, President Reagan grew more supportive of preserving the department. During this era, the department published “A Nation at Risk.” This report described a national education system that was responsible for a "rising tide of mediocrity" in our classrooms. “A Nation at Risk” is often credited with the beginning of a reform and standards effort in many states (Stallings, 2002).

As a result of the National Governors' Association (NGA) Education Summit in 1989, President George H.W. Bush and the governors developed a list of six national education goals for the year 2000. The President and the governors not only agreed to establish national education goals but to undertake a state-by-state restructuring of the public education system that would include improved flexibility and accountability. The goals to be reached by the year 2000 were:

1. That every child should start school ready to learn. That all disadvantaged and disabled children have access to high-quality preschool programs, that parents be involved as a child's first and continuing teacher, and that children receive the nutrition and health care necessary to arrive at school ready to learn.
2. To increase the high school graduation rate to at least 90% (then about 76%).
3. For students to demonstrate competency in challenging subject matter, including English, mathematics, science, history, and geography. It required schools to emphasize active thinking and problem-solving skills.
4. To take American students beyond competence and to make them first in the
world in mathematics and science achievement. At that time our students scored at the bottom in mathematics and near the bottom in science when compared to their peers in other industrialized nations.

5. To ensure that every adult American be both literate and prepared for the lifelong learning that would be required for participating in the modern global economy and for exercising responsible citizenship.

6. That every school is free from drugs and violence and that a disciplined classroom environment conducive to learning is created (Cavazos, 2002).

President Clinton completed the work begun by the governors and former President George H.W. Bush at the National Education Summit in 1989. The result was “Goals 2000.” The purpose was: to promote the achievement of the national education goals by the year 2000; to raise - with the aid of high standards - expectations for parents, teachers, and students; and to give state and local reform efforts greater flexibility and more support. President Clinton appointed former South Carolina Gov. Richard Riley to be Secretary of Education. Riley’s first item on the agenda was to prepare and implement the administration's plan to encourage nationwide standards-based education (Stallings, 2002). Many educators viewed “Goals 2000” as idealistic and something that could not be achieved. The belief that we could simultaneously raise academic standards while increasing the graduation rate in itself seemed impossible in many urban school districts.

In 2001, George W. Bush became President. He selected Rod Paige to be the seventh Secretary of Education. Under Paige, the identified goals were: (a) to close the achievement gap between white and minority students, as well as underprivileged
students, (b) to reauthorize the Individuals with Disabilities Education Act (IDEA) and (c) to developing a voucher plan for school choice (Stallings, 2002). Perhaps the most significant response to these goals was the recently enacted educational legislation titled the “No Child Left Behind Act” that encompassed several parts of the primary goals.

No Child Left Behind Act

With the passage of the No Child Left Behind Act in January of 2002 (reauthorization of ESEA), the United States Department of Education developed stronger accountability and measurement requirements, increased flexibility and local control, expanded options for parents and students, and stressed dependence on proven teaching methods. One of the most significant components of the reauthorization plan was the requirement that all states develop "challenging state standards." These standards would be measured annually (by state testing), and in turn, would be measured against a national benchmark test. The following are primary components of the Act, described by the United States Secretary of Education that pertained to this study.

Schools that improve student achievement were to be rewarded and failures would be sanctioned. Parents were to know how well their child was learning, and schools will be held accountable for their effectiveness using annual state reading and mathematics assessments in grades three through eight. States, school districts, and schools were to be accountable for ensuring that all students, including disadvantaged students, meet high academic standards. States were to develop a system of sanctions and rewards and hold districts and schools accountable for improving academic achievement.
In addition, a sample of students in each state were to be assessed annually using the National Assessment of Educational Progress (NAEP) fourth and eighth grade assessments in reading and mathematics (U.S. Department of Education, 2001).

Federal dollars were to be spent on effective, research based programs and practices with a focus on what works. Funds were to targeted to improve schools and enhance teacher quality. Additional funding flexibility was to be provided to states and school districts. Parents would have more information about the quality of their child's school. In order to hold schools accountable for improving the performance of all students, these results must be reported to the public, disaggregated by race, gender, English language proficiency, disability, and socio-economic status. This reporting was to hold schools and districts accountable for improving the performance of disadvantaged students and to help educators, parents and others discern whether achievement gaps were closing (U.S. Department of Education, 2001).

In order to improve mathematics and science instruction, three problems were to be addressed: too many teachers teaching out-of-field, too few students taking advanced coursework, and too few schools offering a challenging curriculum and textbooks. Research universities were encouraged to participate fully in state partnerships in order to strengthen K-12 mathematics and science education. The success of partnerships between states and institutions of higher education were to be linked to accountability goals that measure important indicators such as student performance on state assessments, increasing participation of students in advanced courses in mathematics and science and passing advanced placement exams, and increasing the numbers of teachers that major in mathematics or science (U.S. Department of Education, 2001).
Ohio’s Accountability System

The Ohio Ninth Grade Proficiency Tests (NGPT) in mathematics, reading, writing, and citizenship were given for the first time in November 1990; ninth-grade science was given for the first time in March 1996. Anyone graduating after September 15, 2000, was required to pass the four original NGPT and science test and meet various district course passage requirements in order to receive an Ohio high school diploma and graduate.

Senate Bill 55 phased out the five NGPT in favor of a new series of tests in the same content areas later to be called the Ohio Graduation Tests (Ohio Department of Education, 2001a). In January 2000, a “Governor’s Commission for Student Success” was formed in order to recommend solutions to improve Ohio’s schools. The commission reviewed Ohio’s academic content standards, assessment, and accountability system. It was interesting to note that under the topic of academic content standards, the commission stated that students, parents, educators, schools and communities know what they are being held accountable for, including but not limited to, test scores (Ohio Department of Education, 2001b). Although it was true that the state school report card is not totally based on student performance as measured by the proficiency test, most of the report card deals with student performance. During the 2002-03 school year, the report card based school performance on 20 testing indicators of 22 total indicators (Ohio Department of Education, 2003). Such heavy emphasis often places school administrators and teachers in a role of compliance technicians for state mandated testing.
Senate Bill 1 named the new tests that replaced the NGPT the “Ohio Graduation Tests.” The legislation called for students to pass new graduation tests that are aligned to academic content standards and reflected learning through the end of tenth grade. All tenth graders will take the Ohio Graduation Tests in reading and mathematics in March 2003 and March 2004. Scores from March 2003 and March 2004 were not to count as a graduation requirement for students or for the school districts. The first class of students responsible for passing these new graduation tests will be the class of 2007 (Ohio Department of Education, 2002a). These new tests were developed by a cross section of the state’s teachers and teaching experts from all fields of study similar to the NGPT. The tests were based upon a detailed content analysis and a formation of standards. All test questions were to be field tested and a bias review panel was to scrutinize the test materials, looking for content or format that could adversely affect one group as compared with another. Ohio was one of only three states to receive a grade of “A” by the Fordham Foundations in its appraisal of math standards in 1998. Ohio’s model mathematics standards also have had the highest rating by the American Federation of Teachers, and a grade of B+ for the level of rigor in a review of state standards in 1998 by the Council of Basic Education (Watts, 2000).

Student assessment was just one part of the accountability movement. According to ODE, Ohio is ahead of many other states in having a sophisticated school accountability system and is in a good position to comply with the “No Child Left Behind Act”. ODE has indicated that the new federal requirements are merely a continuation of the standards-based educational reforms that ODE has been working on for several years. (Ohio Department of Education, 2002c) ODE’s standards-based reform includes creating:
• Clear, challenging academic standards.
• Curriculum and instruction designed to ensure that all students meet the state’s academic standards.
• Teacher preparation and professional development systems designed to ensure that teachers are prepared to teach the content of the state’s academic standards to all students.
• High-quality assessments that measure how well students have met the standards.
• An accountability system that will determine if schools and districts are making adequate yearly progress toward getting all students to meet the standards.

As an example, under the “No Child Left Behind Act,” ODE (Ohio Department of Education, 2002b) is required to create a plan to ensure that all teachers of core academic subjects are "highly qualified" by the end of the 2005-2006 school year. Elementary teachers must have a bachelor's degree and pass a rigorous state test of subject knowledge and teaching skills. Middle and secondary school teachers must have a bachelor's degree and demonstrate competence by passing a rigorous state test in each teaching area, completing a graduate degree in each teaching area or obtaining advanced certification or credentials in each teaching area. Ohio schools in need of improvement must make at least a 2.5 percentage point gain in reading and mathematics at the fourth- and sixth-grade levels for two consecutive years. If the overall passage rate is below 42%, the school will be placed in its first year of school improvement status.

Ohio’s major initiative is to close the achievement gap between the highest and lowest performing students and schools. This means closing the gap between minority and non-minority students, between the disadvantaged and the advantaged, and between
those living in low-wealth and high-wealth districts. This is also one of the intents of the “No Child Left Behind Act.” Now, both federal and state laws hold school districts and individual school buildings accountable for children’s academic achievement. Educators at the ODE stated that, “demographics are not destiny. We should not be able to predict how well a student will perform based on any demographic characteristic” (Ohio Department of Education, 2002c).

The “No Child Left Behind Act” clearly stressed the use of yearly standardized assessments that measure student performance at the state level. Many states have had a form of standardized testing in place for several years. According to Popham (2001) most state tests are built by the same companies that developed the five national standardized achievement tests. Most states now frame their curricular goals in the form of content standards—that is, the knowledge and skills students are expected to master. The state customized version is commonly called a criterion-referenced test, while the nationally distributed tests are described as norm-referenced tests. (Popham, 2001)

One of the main components in Ohio for analyzing student performance and the performance of each school district and school building will be the new criterion-referenced graduation test. Although standardized tests such as this use such basic techniques as multiple-choice questions, Hoachlander (1998, p.15) stated that “this type of assessment is well suited for assessing students’ recall of factual knowledge and their ability to solve problems that have a unambiguous right answer.” He also contended that although their fairness is a topic of constant concern, identifying bias in these exams can be easier than using other forms of assessments. These tests are useful when combined with a variety of demographic data in order to determine success rates for specific
groups. One of Hoachlander’s concerns, however, was that multiple-choice tests probably have the weakest resemblance to the kinds of problems and practices encountered in everyday living and working. This weakness is especially a concern to educators in the career and technical education field since one of their primary focuses is the application of knowledge and training for the workplace.

Issues that Affect Student Achievement

TIMSS (Baker, 1997), an immense study of mathematics and science achievement, sampled thousands of fourth, eighth, and twelfth graders in 41 countries. The results revealed that American students were nowhere near achieving the national goal of being first in the world in mathematics and science achievement by the year 2000. For eighth-grade mathematics, TIMSS indicated that the United States was among 14 second-tier countries along with the countries of Germany, England, and Israel. America student scores were below 20 countries in the top group that include Japan, Korea, Canada, Hong Kong, and France. This was close to the same ranking as in the early 1980s with the Second International Math and Science Studies (SIMS) (Baker, 1997). Baker’s review of the TIMSS study that compared fall-to-spring gains of 13-year old American and Japanese students during the 1980-81 school year revealed that Japan, with the highest mean score in that study, had a narrow distribution of gain scores. By contrast, the United States, with a lower mean, had a much wider distribution. Baker contended that, the overall shape of the United States distribution reveals that there are really two groups of classrooms: one clustered around the Japanese mean, and the other
well below the Japanese mean. A study of 24 countries by the United Nations Children’s Fund (UNICEF) using TIMSS and Program for International Student Assessment (PISA) data, reported, almost 40% of American 8\textsuperscript{th} graders were unable to use basic mathematics knowledge in straightforward situations (Borja, 2002). This compared with 12% in South Korea and Japan, and 23% in Canada. The UNICEF study also ranked countries on the achievement gap between middle achievers (50\textsuperscript{th} percentile) and low achievers (5\textsuperscript{th} percentile). They estimated that the students in the low percentile are approximately five years behind their middle-achieving peers. These studies illustrated that the United States had some classrooms that were successful and some that were very poor in mathematics instruction. Many explanations have been given regarding why there are two performance groups and why the lower group continues to perform more poorly than our economic competitors. The explanations for students in the poor performance group usually fell into the following categories: instruction and educational standards (previously discussed), school funding, and student demographic characteristics that are commonly described by a student’s social economic status, ethnicity or gender.

\textit{School Funding}

Educators have often been asked to make sure that all students can reach the performance benchmarks that are set for achievement in mathematics, science, and other subjects. While some may believe that all children can learn, many educators feel that some students and schools may be at a disadvantage and therefore need extra assistance
in reaching the required benchmarks set forth in the standards. Research evidence, although sometimes controversial, suggests that there are strong correlations between student achievement and school funding. According to Biddle (1997), levels of school funding and rates of child poverty in the United States are strongly associated with differences in eighth-grade mathematics achievement. Biddle suggested that if schools are to be improved, Americans must ignore nonsensical arguments about higher standards and face up to the real problems of education, that being funding and poverty. Biddle further stated that, based upon his review of SIMS, TIMSS, and NAEP data, large per pupil funding disparity exist between states. For example, based on 1995 figures, New Jersey funded public schools at an average annual rate of $8,118 per student (adjusted for differences in cost of living), whereas Arkansas, the state with the lowest spending figures, spent $3,599 per year. He also contended that large funding disparities appear within many states. A difference of this magnitude generates tremendous disparities in the quality of school buildings, facilities, curricula, equipment for instruction, teacher salaries, and student/teacher ratios. According to Biddle (1997), nearly 100 studies have been published on the impact of funding on student achievement with some of the effect sizes reported in these studies concluding that the net impact of school funding is "substantial."

In studying the effects of poverty within unspecified districts, Biddle (1997) and one of his students explored predictors of eighth-grade achievement scores for public schools using the American data from the Second International Mathematics Study (SIMS). “The results from the study revealed statistically significant net effects for both school funding and child poverty. These effects persisted even when controls were
entered for such potent variables as race and level of curriculum to which students had been exposed (Biddle, 1997, p 12).” Using 1996 NAEP data for mathematics achievement, Biddle also explored the effects of state level funding and child poverty using a breakdown of average eighth-grade achievement scores for public schools in 40 of the 50 states. By comparing information from these three data sets, he discovered that state differences in school funding have a moderation association (Davis convention) with mathematics achievement whereas the child poverty/achievement has a very strong association. Biddle also examined funding and poverty as joint predictors of achievement in a regression analysis, and learned that the net effects of both factors remain statistically significant for school funding and for child poverty. “These two factors predict an astounding 55% of the variance of state differences in average achievement. The district-level differences in school funding and child poverty explained more than 25% of the variance in mathematics achievement” (Biddle, 1997, p 12).

Indeed, the impact of child poverty seems to be stronger at the state level than at the district level. Biddle contended that the results of these studies “helped us understand why setting higher standards have so little impact on achievement. If schools in America are poorly funded and must contend with high levels of child poverty, then their problems stem not from confusion or lack of will on the part of educators but rather from lack of badly needed resources” (Biddle, 1997, p 12). The analysis also indicated that not only do differences in school funding and child poverty matter at the state level, but that they are major predictors of state-level averages in mathematics achievement. Biddle contended that the level of school funding is correlated with family advantage, and that family advantage (one measure of SES status) is also presumably tied to achievement. Many
educators have agreed that even if school funding was not proven to be directly correlated to student achievement, it still would be considered a factor that affects their ability to help struggling students. After all, funding does affect teacher pay, class sizes, technology, and support services including the availability of instructional assistants in the classroom.

Social Economic Status (SES)

Socioeconomic status (SES) is generally defined as a person’s relative standing in society and is measured by such indicators as income, occupation, education, access to health coverage, community resources, political power and prestige (Schreiber, 2002). SES is therefore, a collection of indicators that can provide researchers an insight into a person’s environment. The UNICEF study stated that home environment plays a crucial role in children’s education. No matter what country, the more educated, career-oriented, and wealthy the parents, the further their children’s education tended to progress. The reverse was also true, that the poorer and less educated the parents, the fewer educational opportunities their children tended to have (Borja, 2002). SES factors seemed to be prevalent for low and high achieving students. Schreiber (2002) examined advance mathematics achievement with 1,839 students from 162 schools and found that gender and economic disparities (parent education as an indicator of financial resources) existed even within the most advanced group of mathematics students. Jacobson’s (2002) review of an early childhood longitudinal study indicated that children living in poverty were less likely than those from higher-income families to be adding and subtracting by late in
the first grade. According to Schwartz (2002), studies consistently showed that high quality child care providing early learning interventions, particularly for poor children, improved both school readiness and later learning. Participation in after-school and summer programs also enhances student academic achievement. Poor children and adolescents were less likely to spend time engaged in structured activities than other children because their parents lacked the funds for private enrichment programs and poor communities lacked sufficient public programs (Schwartz, 2002).

These poverty issues, combined with the reality that many poor children are raised by a single parents, means that poor children may have a much harder time in school due to the lack of an adequate support structure. Cavazos, (2002) believed that the single most important predictor of a child's educational achievement was parental involvement. Clearly there are additional factors, but a parent's concern for his or her child's education can make all the difference even if they do not have strong academic skills. Goldberg (2000) contended that on eighth-grade mathematics scores, social class was twice as predictive of variation as race, and about 45% of the variation was predicted on the national assessment scores without knowing anything about race if the income level and education level of the parents were known.

With evidence indicating that SES plays a factor in student learning, how could it be such a factor in the United States? After all the United States is the richest, most powerful nation in the world. The Luxembourg Income Study (LIS) reviewed income distributions in Western nations for more than a decade. The LIS papers on child poverty reported data from roughly 1990 and compared 18 industrialized countries. Their figures show that the rate of child poverty in the United States is more than 50% higher than for
all other nations studied and five to eight times greater than the rates for some nations with which we are often compared with in regard to educational achievement (Biddle, 1997). This study clearly pointed out that America truly is a land of both wealth and poverty. The data collected by the Center on Education Policy (2002) indicated exit exam passage rates were lower for poor students, students with disabilities, and English language learners. In Minnesota, for example, where 80% of all students passed the reading exit exam on the first try, only 59% of poor students, 40% of students in special education, and 30% of English as a second language learners passed the first time. The report also indicated that African American and Hispanic students were much less likely to pass on the first attempt than white and Asian students (Center on Education Policy, 2002).

Although more studies may be needed to fully understand the effects of both school funding and poverty, it is not hard to believe that poverty can affect a child’s access to books, writing materials, computers, and other means of support that are normally present in affluent homes. Some educators have called for more detailed indicators of performance with an emphasis on reporting a student’s opportunity to learn.

Ethnicity and Gender

Cavazos (2002, p. 694) stated that “Nowhere is America's diversity reflected more accurately than in our schools.” Minorities constitute over 30% of total public school enrollment with the 10 largest school districts in the United States reporting 70% African American and Hispanic enrollment. He estimated that, by the year 2010, minorities
would make up more than 50% of the enrollment of public schools in 12 states. Today, there are about 25 million Hispanics in the United States. While there are Hispanics in every state, 66% are concentrated in Texas, New York, and California. From 1980 to 1989, the Hispanic population grew 39%, versus eight percent for the non-Hispanic population. Data suggest that poverty and low income are directly related to student achievement. Minorities and economically disadvantaged children are still not reaching their full academic potential. The poor elementary and secondary education provided to many minorities and economically disadvantaged students is reflected in their low enrollment and graduation rates at colleges and universities. With almost three-quarters of a million students dropping out of secondary school each year, they face a lifetime of low wages and a low standard of living.

Achievement gap analysis based on ethnicity is now a standard component of data collection at the state and school district level in Ohio. On the Ohio performance tests, Ohio’s African-American and Hispanic students have consistently performed at lower levels than Asian and white students. The gaps in achievement occurred at all grade levels, but Ohio has made some progress in the last few years. In the 2001-02 school year, all ethnic groups of fourth grade students did better in citizenship, closing the gap between the highest and lowest performing students by 6.4 percentage points. Each ethnic group improved by at least 7.7 percentage points over last year in reading. However, between the highest and lowest ethnic groups the gap is still 38.8 percentage points (Ohio Department of Education, 2003). Over a six year period between 1997 and 2002, passage rates on state wide exams have gone up 6% in reading, 3% in citizenship, and 7% in mathematics. Among 8th grade black students, they progressed 13% in reading, 10% in
citizenship, and 5% in mathematics while Hispanic students progressed 16% in reading, 12% in citizenship, and 9% in mathematics. Despite the progress, the ethnicity gap is still quite large. As an example, the difference between white and black students as measured on the Ohio NGPT for the 2000-2001 school year is 41% in mathematics, and 39% in science (Center on Education Policy, 2002, August).

According to Jacobson’s review of an early childhood longitudinal study with some 22,000 children and 1,000 programs around the country, 30% of the boys in first grade mathematics were beginning to solve multiplication and division problems, compared with 24% of the girls (Jacobson, 2002). In a study conducted in Akron Public Schools, Clark (1997) found no significant difference between male and female student test scores in mathematics on the NGPT. Clark did however find a significant difference between black and white student test scores. Gender gaps have been reported by the National Assessment of Educational Progress (NAEP). In writing, females outperformed males at the 4th, 8th, and 11th grade levels. Gender gaps favoring female students in reading at ages 13 and 17 were essentially the same in 1999 as in 1971, but the gender gap favoring female 9-year olds was smaller in 1999 than 1971. For mathematics scores in 1999, there was no statistical significant difference at any age and for science, males out performed females at ages 17 and 13, but not at age 9 (National Assessment of Educational Progress, 2003). Schreiber’s (2002) review of gender gap studies for students at the middle school level did not produce consistent indicators, some research favored girls and some favored boys, other research showed no difference. Research into SES and ethnicity has shown significant differences in mathematics achievement while gender differences have not yielded consistent conclusions.
In many ways, this new emphasis for collection of data and analysis of SES, ethnicity, and gender has pushed states, schools and communities to pay more attention to the needs of all students. There is a concern over what impact the accountability standards will have upon urban schools if they cannot show improvement for all students using the narrowly focused demographic indicators of success. “Today, this practice of singling out low-scoring schools to urge their instructional staffs to shape up “unacceptable” performances is incredibly widespread. Sometimes it’s done by publicly identifying low-scoring schools as weak in the hope that such a characterization will spur the school’s staff to do a better job. In other instances, district or state officials provide low-performing schools with additional support services, such as increased supervision or more staff development funds” (Popham, 2001). According to the current conception of accountability, teachers who work with a group of high-SES children will tend to receive higher evaluations of instructional effectiveness than will teachers who work with lower-SES children (Popham, 2001). The backlash could very well affect public education, especially in urban school districts where ethnic diversity and low SES students are most prevalent and the districts have to pay premium salaries to retain quality staff.

Changes in Workforce Education

For decades, American workforce education programs (previously referred to as vocational education) prepared students for work with little emphasis on the development of academic skills. But as manufacturing jobs continued to disappear in the 1970s and 1980s, employers realized that they needed workers who were more academically
prepared and able to learn new skills. With the rapidly changing workforce, it became apparent that if vocational education was to survive, it needed to adapt to the needs of a more modern society. This was especially true, in fields where technology and thus relevant cognitive and psychomotor skills change month by month, in those fields a curriculum that deals with specifics seems destined to be always behind (Gray & Herr, 1998). Part of the problem was that while expectations from the workforce for training was increasing in the 1980s and 1990s the proportion of special needs students verses general education students in vocational education was also increasing. Based on a study of 1992 graduates, the National Assessment of Vocational Education (NAVE) concluded that special populations were overrepresented in vocational schools; greater percentages of them each year were being “dumped” into vocational courses (Lynch, 2000). The terms “dumbing down the curriculum” and “dumping ground” were often used when describing image of high school vocational education. Too many, vocational education was generally viewed as dead end training for high school students who never plan on go to college; or for programs that were designed for educationally disadvantaged students in order to keep them in school and get them a diploma. Surveys of vocational educators for many years has continued to rank the “image problem” as high on the list of serious issues that plague vocational education. The 1994 NAVE concluded that an overall 33% decline in the demand for vocational education occurred between 1982 and 1994. Today, eight of the ten fastest growing jobs require postsecondary or extensive continuing education. And in a recent study by ACT, 77% of 1999’s 10th graders indicated that they planned to attend a four-year institution after graduation (Lynch, 2000). Although this college “wannabe” survey does not closely correlate with actual attendance or completion
In 1991, the Secretary’s Commission on Achieving Necessary Skills (SCANS) in their report entitled “What Work Requires of Schools” (U.S. Department of Labor, 1991) identified five competencies that schools should develop in students. The five areas of competency were: (a) identify, organize, plan, and allocate resources such as time, money, materials, and facilities; (b) work with others; (c) acquire and use information; (d) understand complex interrelationships; and (e) work with a variety of technologies” (Gray & Herr, 1998, p 199). Although it could be argued that many secondary vocational programs did provide instruction using the SCANS competency areas, they often provided instruction in a narrowly defined job skill context with limited academic instruction. A 1989 study conducted for Congress (NCES, 1995) reported that less than half of vocational education students were placed in related jobs as cited by Gray and Herr. This narrowly focused instruction often resulted in poor transferability of skills to other occupational areas and much workforce education currently labeled “education” on close examination, was really mostly training. The important distinction between training and educations was that the goal of training was to teach people to follow prescribed procedures and to perform in a standardized manner. Whereas, the goal of education was to create independent problem solvers who have sufficient depth of understanding to figure out what to do when the procedures break down. Education is preparation that can be generalized to the unexpected. Training is preparation designed to ensure standardized responses to predicted situations. In Ohio, the concept of narrowly focused occupational
training was reinforced by the state evaluation system that stressed immediate employment as a primary indicator of a program's success. According to Hoachlander, “We know that the traditional curriculum and the traditional way of instruction in elementary and secondary education have not succeeded in raising the levels of academic achievement for a substantial percentage of students—somewhere around 50% to 70% of students” (Lozada, 1999).

The Perkins Act amendment of 1990 (Perkins II) required integration of academic skills with vocational training and supported tech prep. The focus was to increase academic instruction in vocational education programs, therefore improving a student’s ability to perform in their chosen training area, and to improve transferability to related occupational fields. Tech prep’s objective was to prepare students to go on to postsecondary technical education after high school graduation instead of directly to work (Gray & Herr, 1998). Tech prep’s direction was a clear break from the traditional mode of vocational education “training for immediate employment.”

“The School-to-Work Opportunities Act provided for a school-based learning component, a work-base learning component, and a connecting-activities component. It introduced the term ‘career major’ to mean “a coherent sequence of courses” or a field of study that prepares a student for a first job and that: (a) integrates academic and occupational learning, integrates school-based and work-based learning, and establishes linkages between secondary schools and post-secondary educational institutions; (b) prepares the student for employment in a broad occupational cluster or industry sector; (c) provides the students, to the extent practicable, with strong experience in and understanding of all aspects of the industry the students are planning to enter; and (d)
may lead to further education and training, such as entry into a registered apprenticeship program, or may lead to admission to a two- or four- year college or university” (Gray & Herr, 1998, p. 225).

There are many ways by which schools can create improved career education services for students. The school-to-work initiatives are not necessarily a single event but rather, a process that has unfolded over the past two decades that include vocational and general secondary education reforms. Imel (2000) had several general recommendations for what should be done to improve high schools: (a) create small communities for learning that allow a group of teachers to work with the same students over a number of years; (b) contextualize teaching and learning in order to make learning relevant to students as a means to motivate students; (c) immerse students in the adult world by exposing students to the world beyond the school, including the world of work; (d) maintain high standards and eliminated the distinctions between academic and career-technical education; and (e) connect and collaborate both in and out of school using service projects, work-based learning and internships.

In the 1990s, vocational education programs began to respond to the need for a new direction by changing their emphasis and becoming less focused on single occupation training and immediate job placement. According to the American Vocational Association (AVA) there were as many as 200 different names used to describe vocational education. In 1998, the members of AVA voted to change the association name to the “Association for Career and Technical Education” (ACTE). ACTE also encouraged other organizations and government agencies to remove “vocational education” and replace it with “career and technical education” (Lynch, 2000).
As a part of this reform, vocational education became to know in many states as Career and Technical Education (CTE). CTE with a broader focus was designed to include more academics and to prepare students both for the workplace and for college or technical schools (Castellano, Stringfield, Stone, & Lewis, 2002). The foundation for the new career and technical education was in teaching children, youth, and adults to learn the importance of learning. A school system’s career education program will need to be comprehensive and developmentally age appropriate. It should start with career awareness from early childhood through about age 11, followed by career exploration usually in the middle school grades, and finally career preparation in the high school which includes more focused preparation for workplaces and or career related majors in college. An important feature was that career and technical education at the high school level cannot be reformed independently of other significant reforms in high schools. No longer can “vocational” be separate from “academic” in the organizational structure (Lynch, 2000). This meant that the 21st century career and technical education programs needed to be upgraded considerably to be appropriate for both the workplace and college. As a result of the reforms, students in career and technical education will need to have more challenging academics and more accountability for results.

It is not only important that vocational schools become involved in the transition to the new CTE but that high schools, especially in large urban school districts, begin to encompass CTE strategies, in order to improve their students’ typically low academic performance and college enrollment. Imel (2000) contended that urban students may not be motivated by extrinsic means such as grades and therefore may see tasks as pointless to them. For them, contextualized teaching and learning is especially important because
their interests and backgrounds are taken into consideration. When coupled with a focused curriculum and small learning communities, students have an increased chance of success in school. Career clusters, career academies, and tech prep programs are all appropriate vehicles for creating the small learning communities that are the foundation for high school reform. Gray and Herr (1998) stated that strong and comprehensive programs of workforce education have the promise of neutralizing the types of deficits that many persons from lower socioeconomic backgrounds experience as they consider educational possibilities and occupational options. This coupled with the belief that most high school sophomores or juniors are still in the exploratory career development stage and are best served by a cluster program. The need to provide increased academic instruction and integrated academics with vocational have produced several reform strategies. The most notable being: tech prep, curriculum integration, redesigned work-related experiences, High School That Work (HSTW), career academies, career magnets, and career pathways (Castellano et al., 2002). The Center for Occupational Research and Development (CORD) developed several applied academic and curriculum integration programs including Principles of Technology, a two-year applied physics curriculum. Schools have used such programs to provide exploratory experiences for students. Due to the special funding for tech prep in Perkins II, several traditional high schools started paying attention to CTE as an outcome for their “maybe college bound” students. About eight percent of students nationwide participated in something called tech prep in 1995 with a total of 737,635 students in 1,029 tech prep consortiums (high schools, community colleges, and business partnerships). This does not sound like much, but these consortia included about 70% of all school districts, which in turn served 88% of all American high
school students. About 58% of the 1995 tech prep graduates went on to postsecondary education. What is unclear is how many would not have gone on to postsecondary education without the tech prep curriculum. The assumption is that tech prep probably has contributed to the overall increase in college attendance especially by those that would normally be in CTE (Lynch, 2000). Part of tech prep’s challenges and problems are that it’s a consortia that often involves high schools, career technical centers, and community colleges each having their own views and interests in the development of technical training. Only about 10% created structured, career-focused, comprehensive programs that integrated academic and career and technical courses whereas, other tech prep consortia used federal funds primarily to enhance existing vocational programs or advanced just one ingredient of tech prep. It was concluded however that tech prep consortia do have important benefits such as strengthening local collaboration among educators, increased career guidance in schools, and focusing attention on applied forms of academic instruction (Lynch, 2000). The general perception seems to be that tech prep has improved the image of career and technical education and it has been instrumental in showing educators that CTE can be something more than a dumping ground.

In Ohio, tech prep, High Schools That Work (HSTW), and career academies have become very popular. These programs have stressed high achievement in both the academic and technical areas and are commonly referred to as dual concentrator programs. The Southern Regional Education Board (SREB), a compact of 22 states, has become well-known for its High Schools That Work (HSTW) initiative whose aim is to eliminate low-level academics from career and technical educations and boost overall achievement. In 1987, SREB started with 28 pilot sites. By 1999, there were more than
800 HSTW sites in 22 states (Lozada, 1999). The HSTW curriculum standards include three credits of college prep social studies, at least four credits in an academic or career-technical major and at least two credits in computer technology. Gene Bottoms (senior vice president of SREB), stressed that the career and technical coursework needs to be as rigorous as the academic coursework, and that they should be taught in context with each other (Lozada, 1999). Lynch contended (2000) that HSTW is one of only a few reform groups that have documented positive effects on student achievement through statistically valid and reliable measures. HSTW deserves increased attention by career and technical educators and the education community as a whole. It has advocated that teachers become more engaged with educating and teaching to high standards career and technical education.

The career academy concept is a school-within-a-school model that has been well received by many educators. By personalizing the learning and using projects, career academies support more constructive relationships between students and teachers. Statements that usually describe career academies are: small learning communities, teams of teachers working with a group of students, projects based learning, applied and integrated curriculum, and workplace internships. All of these instructional strategies are geared toward one goal-increasing the academic rigor of career-technical disciplines while at the same time teaching the most up-to-date, relevant technical curriculum they so that their students can succeed in the real world of work (Lozada, 1999).

There is some research indicating that participation in school-to-work programs can improve students’ attendance, grades, and graduation rates. An analysis of data from the 1997 National Longitudinal Survey of Youth showed that for black and Hispanic
youths, participation in at least one of a variety of school-to-work programs is linked to increased future course-taking in science and mathematics. The data also showed that career academy students originally considered to be “high risk” were less likely to be chronically absent from school than were randomly assigned control group students. (Bailey, Hughes, & Karp, 2002). Studies indicated that school-to-work students are just as likely to attend college as comparable other students. One study found that both college-bound and non-college-bound participants in school-to-work felt that their career exploration experiences were valuable in helping them clarify their career goals (Bailey et al., 2002). The Southern Regional Education Board reported that 72% of 2000 graduates from HSTW schools enrolled in postsecondary study. However, it was also reported that 34% had to take some remedial courses (Bottoms, 2002). Some educators contend that this dual career path is a necessity in today’s world of work, which demands lifelong learning, flexibility, and continuous skill upgrading. School-to-career programs such as career academies are designed to meet state standards and prepare students for 2- and 4–year college as well as employment (Kerka, 2000). According to the National Assessment of Educational Progress (NAEP Digest, 2002), over the past 12 years, the average number of science and mathematics courses completed by public high schools graduates has increased substantially. The mean number of mathematics courses (Carnegie units) completed in high school rose from 2.6 in 1982 to 3.4 in 1998. While the average number of courses in vocational areas completed by all high school graduates dropped gradually, from 4.6 units in 1982 to 4.0 units in 1998.

Shields and Knapp (1997, p. 289) stated, that “although the majority of school-based reform efforts purport to improve classroom practice, the classroom is not nec-
essarily their primary concern or even a major focus of activity.” In fact, their survey data indicated that nearly one in five school-based reform efforts focused on improving neither curriculum nor instruction, and fewer than half focus on both curricular content and teaching. Since most of these reforms have occurred in the last few years, limited research has been conducted on the changes in the classroom and effects of various reform movements on student learning. The 1998 Carl Perkins Vocational and Technical Education Act (American Vocational Association, 1998) identified student attainment of state established academic proficiencies as an outcome that will be measured for career and technical education. In Ohio, students are expected to pass the NGPT before they enter career and technical courses. Since the career and technical teacher often had not even met the student by the time they pass the test, this indicator would provide few clues as to how career and technical education in Ohio effects academic performance. Nonetheless, more and more schools are developing programs using the school-to-work and career and technical models.

The Vocational Education Standards Committee of the National Board for Professional Teaching Standards in 1997 recommended that the standards and assessment for highly effective teachers would include areas such as career development and discovery, and teaching employability skills that should be mastered by middle school students (Lynch, 2000). Increasingly, states have recognized the importance of the middle grades to high school transition and career and technical program implementation. If students come to the high schools academically behind, they must spend precious instructional time catching up before they can address the challenging, college-preparatory courses that all students should complete before entering a career and
technical program. SREB realized that working only with high schools without connections to the middle schools could result in the failure of the high school reform. Students who are struggling in the middle grades need interventions before the ninth grade to become successful in the HSTW initiatives. Because of this, three years ago, SREB launched a middle grades reform effort based on their extensive research on the status of middle grades (Bottoms, 2002).

Columbus Pathways to Success Initiative (CPSI)

On March 7, 2000, the Columbus Public Schools’ Board of Education adopted the Columbus Pathways to Success Initiative (CPSI) as a comprehensive reform initiative in four high schools in the district. The initiative began during the 2000-01 school year, and a fifth high school was added for the 2001-2002 school year. The design teams from the high schools involved in the Columbus Pathways to Success Initiative studied and evaluated nationwide reform movements. Elements from three initiatives, High Schools That Work, Talent Development, and the Career Academy Model were selected to comprise the foundation of the CPSI model for the selected high schools.
The Talent Development High School model developed by Johns Hopkins University and Howard University (1994) in Baltimore, Maryland has been adopted by 10 sites nationwide. The model focuses on the problems of large urban high schools. It consists of specific changes in school organization and management that result in a safe and secure climate for learning. The components of the CPSI model that reflect the Talent Development High School initiative are the Freshmen Success Academy, the Summer Bridge Program, and other safety net programs (Columbus Public School, 2002a).

The Career Academy Model was introduced in 1981 and supported by the University of California at Berkeley through research and their Career Academy Support Network (CASN) web site. The model is based on partnerships with business and promotes smaller learning communities in urban districts. According to the CASN web site, Philadelphia established the first career academy in 1969: an "Electrical Academy" at Edison High School, sponsored in collaboration with the Philadelphia Electric Company. The idea was later applied to other fields such as business, automotive, health, environmental technology, law, horticulture, tourism, and aviation. The separate
nonprofit organizations that had originally provided employer support for the academy concept came together in 1982 as one organization, which is now called Philadelphia Academies, Inc. Although the Philadelphia academies began as vocational training programs, today they send most of their graduates to college. In 1981 the academy idea was introduced in California, starting with a "Computer Academy" at Menlo-Atherton High School and an "Electronics Academy" at Sequoia High School, near Silicon Valley. Based in part on the program successes at these schools, California later passed legislation in 1984 and in 1987 supporting additional programs. The legislation was renewed again in 1993 and 1999, with continued expansion. Today, California’s academy programs include over 25 career fields. The nonprofit National Academy Foundation (NAF) started sponsoring academies in 1982, and now supports academies in more than 30 different states. Until the 1990s, career academies existed only as separate, small units within larger high schools. For example, a career academy might serve 200 students in a high school containing 2000. In the mid-1990s, however, a number of high schools decided to convert themselves entirely into career academies, or into various kinds of small learning communities some of which are career academies. Another academy-building network started in 1997 at the Center for Research on the Education of Students Placed at Risk (CRESPAR), which includes career academies as a major component of the Talent Development High School model in which every student in grades 10-12 belongs to a career academy. The total number of career academies operating in United States high schools in 2004 is unknown but almost certainly exceeds one thousand, and could well be two or three thousand.
CASN coined the term "career academy" in 1992 to encompass the Philadelphia academies, California partnership academies, and the National Academy Foundation (NAF) academies. According to CASN, a career academy is a type of school-within-a-school that provides a college-preparatory curriculum with a career-related theme. First and foremost, the career academies are small learning communities. An academy comprises a cluster of students who have some of the same teachers for at least two years, and who share several classes each year. A group of teachers from academic and technical disciplines are scheduled to have only or mostly academy students in their classes, meet with each other on a regular basis through common planning time, and share in decision-making related to administrative policies, curriculum content, and instruction. Second, career academies combine a college-preparatory curriculum with a career theme. Examples of common themes are health care, business and finance, communications media, and transportation technology. Academic courses that meet high school graduation and college entrance requirements are linked with technical courses that focus on the academy’s field of work. Third, academies embody partnerships with employers. An advisory group for the academy includes representatives from the local employer community, academy faculty, and the school district. Employer representatives may give advice on curriculum, appear as guest speakers in classes, assist with employability skill development, supervise student internships, provide financial or in-kind support, and some serve as mentors for individual students.

Career academies provide broad information about an industry, exposing students to a range of careers requiring various amounts of formal education, and building a foundation on which to add more advanced and specialized postsecondary preparation.
By linking academic coursework to career themes and workplace experience, it is claimed that academies motivate students to stay in school and attend to their studies (Career Academy Support Network, 2003).

The Columbus Public School district investigated the research on this model in cooperation with representatives from the Greater Columbus Chamber of Commerce by visiting sites in California to gain information that could apply to the district’s initiative. From these experiences, they learned that the smaller learning communities’ concept can and does work. The Career Academy Model serves as the basis for this component of the CPSI initiative. The district goals, the Columbus Pathways to Success initiative goals, and the expected student outcomes are presented in Figure 3.

<table>
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<tr>
<th>COLUMBUS PUBLIC SCHOOLS DISTRICT GOALS</th>
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<td>1. To increase student academic achievement.</td>
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<td>2. To operate the district more efficiently and effectively.</td>
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<td>3. To raise hope, trust, and confidence in the Columbus Public Schools.</td>
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<tr>
<td>COLUMBUS PATHWAYS TO SUCCESS (CPSI) GOALS</td>
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<td>------------------------------------------</td>
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<tr>
<td>1. To raise the mathematics, science, communication, problem-solving and technical achievement of more students through effective instruction which blends essential content of traditional college-preparatory studies with technical programs.</td>
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<td>2. To provide a seamless education path, including early career exploration, starting in secondary school and leading to a post-secondary degree or employment.</td>
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<td>3. To provide a continuous network of intervention and support services to students.</td>
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<td>4. To improve the quality of instruction through professional development and principal leadership.</td>
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Figure 3: CPS district goals relationship to CPSI goals
Source: (Columbus Public Schools, 2000a)
The Southern Regional Education Board that administers the High Schools That Work reform model is one of the primary supporters of the career academy model. Their focus on research-based instructional practices including the key practices of High Schools That Work was used for the CPSI initiative. The HSTW themes are: the need to increase student academic achievement, to close the gaps in achievement among students, and to build capacity among educators for a standards-based educational program. The HSTW components will assist in addressing the gaps in student achievement, attendance, and overall school climate. Figure 4 shows the alignment of the key practices to the strategies employed in the smaller learning communities’ initiative.

<table>
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<th>HSTW Key Practices/Strategies</th>
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<td><strong>Key Practice 1: High expectations for all students</strong></td>
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<td><strong>Key Practice 3: Strong academic studies</strong></td>
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<td>- Freshmen Success Academy for all 9th grade students; all students will have a double block of Algebra I, a technology course, a career connections course, and college preparatory academics</td>
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<tr>
<td>- Career academies for all 10th – 12th grade students, with a common core college preparatory curriculum</td>
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<td><strong>Key Practice 2: Challenging career-technical studies</strong></td>
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<td><strong>Key Practice 4: Academic core and career concentration</strong></td>
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<tr>
<td>- Career Academies for students in grades 10 through 12, with rigorous academic and technical curriculum, internships, and concurrent college credit</td>
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<td>- Meaningful exposure to technology through computer labs and technology in the classroom</td>
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<td><strong>Key Practice 6: Teachers working together</strong></td>
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<tr>
<td>- Common planning time and flexible scheduling for all teaching teams, with the establishment of interdisciplinary projects</td>
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Figure 4: HSTW key practices/strategies relationship to CPSI goals
Source: (Columbus Public Schools, 2002a)
Key Practice 9: Extra help boosting student achievement
- Summer Bridge Program for incoming ninth grade students that are at least two years below grade level in reading and/or math
- Extra Help in tutoring for students in the Freshmen Academy who fall below a C at any time in any core subject
- Acceleration Academy for academically deficient 8th graders and over age 9th graders

Key Practice 7: Students actively engaged
- 120 hours of meaningful internship experiences for all students before graduation

Key Practice 8: Student guidance with parents and teachers
- Advisor/Advisee Program that matches each group of 15 students with a teacher/advisor

Key Practice 10: Keeping score through data
- Use of data from Ninth Grade Proficiency Test, NAEP assessment, ACT/SAT scores, and State Report Cards to evaluation progress and plan for improvement

The staff works with community partners and post-secondary institutions to develop seamless pathways for students from high school through college to careers. Partnerships have been formed between the CPSI schools and post secondary institutions. The district has recently created the Office of Higher Education Partnerships, to serve as a clearinghouse for all programs in collaboration with higher education. The partnerships focus on providing internships, mentoring, tutoring, and on-campus experiences for students. Many college preparatory courses in the high schools are aligned to post-secondary requirements, so students can enter college prepared for academic success. The district currently has established agreements for Post Secondary Educational Options (PSEO) and articulated credit with Columbus State Community College, Ohio Dominican University, Ohio State University, and DeVry University. These partnerships will be expanded to include specific involvement with the curriculum teams at the CPSI.
high schools. Each career academy is supported by a business steering committee sponsored by the Greater Columbus Chamber of Commerce. The Chamber’s commitment to this initiative includes providing business mentors for students, a guarantee of paid internships for students between grades eleven and twelve, and job placement for student graduates of the CPSI program.

Staff and student surveys are used to determine needs of the school and students. A team of teachers work with the district and building coordinators to collect data. Formative and summative data are collected each school year to measure student progress and the success of the CPSI initiative. Figure 5 indicates the types of data collected.

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Formative</th>
<th>Summative</th>
</tr>
</thead>
</table>
| **Outcomes** | • PLATO individual scores  
• Quarterly class grades  
• Attendance records  
• Discipline records  
• HSTW site visit recommendations  
• Classroom observations | • 9th grade OPT scores  
• ACT/SAT scores  
• NAEP assessments  
• End of course exams  
• Passage rate by grade level  
• Graduation rate  
• End of course grades  
• State Report Card  
• Dropout rate |
| **Processes** | Quarterly  
• Staff workshop attendance  
• Parent meeting attendance  
• Student after school tutoring attendance | Yearly  
• Staff workshop attendance  
• Parent meeting attendance  
• Student after school tutoring attendance  
• Staff, student, and parent satisfaction level |

Figure 5: CPSI data collection indicators of success and performance
Source: (Columbus Public Schools, 2000a)
Reports on student achievement, attendance, and school discipline will be published in three-year intervals. Figure 6 identifies some of the performance indicators that are assessed for the purpose of program adjustment at both six and twelve month intervals.

<table>
<thead>
<tr>
<th>6 MONTHS</th>
<th>12 MONTHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Classroom observations</td>
<td>• Classroom observations</td>
</tr>
<tr>
<td>• Staff participation in workshops/seminars</td>
<td>• Staff evaluations of workshops and seminars</td>
</tr>
<tr>
<td>• Student proficiency test scores</td>
<td>• State Report Card</td>
</tr>
<tr>
<td>• Student quarterly grades</td>
<td>• Student proficiency test scores</td>
</tr>
<tr>
<td>• Student attendance rates</td>
<td>• Student end of year grades</td>
</tr>
<tr>
<td>• Student discipline referrals</td>
<td>• Student attendance rates</td>
</tr>
<tr>
<td>• Numbers of parent contacts</td>
<td>• Student discipline referrals (cumulative)</td>
</tr>
<tr>
<td>• Parent conference attendance</td>
<td>• Numbers of parent contacts (cumulative)</td>
</tr>
<tr>
<td>• Student internship participation</td>
<td>• Parent attendance at conferences and open houses</td>
</tr>
</tbody>
</table>

Figure 6: CPSI data collection indicators for program adjustment
Source: (Columbus Public Schools, 2000a)

The Greater Columbus Chamber of Commerce has also commissioned the Center on Education and Training for Employment (CETE) to do a seven year study on the curriculum enhancement activities. The following are components of the CPSI initiative at each of the high schools:

*Freshmen Success Academy*

All ninth grade students are enrolled in a Freshmen Success Academy and receive a college preparatory core of courses, including a double block of Algebra I. In addition,
each student takes a technology course and a career exploration course to help them select a career pathway for the tenth grade. During the freshmen year, students and teachers are assigned to teams of less than 100 students per team. The team includes smaller class structures, a teacher advisement program, and training opportunities to address individual student needs. All programs have curriculum guides created by the district that are aligned with state standards and the district exit exams. This insures that all students are focusing on the learning competencies that both the state and district expect students to master. The main priority is to improve the nature of teacher/student interaction leading to improving the teaching/learning process through a more personalized approach (Columbus Public Schools, 2000a).

**Career Academies**

Upon completion of the Freshmen Success Academy, all tenth-grade students select a career academy pathway from the following choices: (1) Information Technology, (2) Business, (3) Arts and Communications, (4) Health Technologies, (5) Architecture Construction Engineering, and (6) Technology Engineering and Manufacturing. Students are grouped into academies that are located in their own area of the building. Students take a career foundations course in their selected career pathway, and continue with college preparatory core academics.

In grades eleven and twelve, the career focused academy courses are offered as articulated credits with Columbus State Community College (CSCC). The district has signed agreements with the post secondary institution that guarantees students college
credit after they complete at least 10 hours of courses. If students pass the CSCC enrollment exam, they may also begin taking classes on campus during the summer following their tenth-grade year. It is possible for a student to complete high school with up to 30 quarter hours of college credit. Another option available to the student is to take CTE courses in their chosen career academy specialization during the junior and senior year at one of the CPS career centers (Columbus Public Schools, 2000a).

Safety Net Programs

CPS developed several special support programs that were intended to assure that all students that entered the freshmen success academy and career academy had the needed assistance in order to become successful. These support programs are described below.

The Advisee/Advisor Program

All students in the Freshmen Success and Career Academies will be assigned an advisor. The program with a teacher-pupil ratio of one to fifteen provides students with an opportunity for more personal guidance with educational development, career planning, personal growth, and life skills. This program also assists students in making the connection between their educational experiences and the world of work. Teachers serve in the capacity of advisor to provide an ongoing relationship with a caring adult as well as a resource person if a student should need social or community services. Special
activities are planned for weekly meetings with the student including large group, small
group, and individual advisement.

The Acceleration Academy

High schools have traditionally been poor at providing adequate support for
incoming freshmen students. Many of these students have not been successful in passing
core academic subjects, have poor attendance, and show marked social adjustment
problems. The Acceleration Academy presents an alternative to suspension for students
having difficulty functioning in the Freshmen Success Academy Program. Acceleration
Academy sessions meet each week-day from 2:30 – 5:45 p.m., and provide additional
instruction to students in two academic classes and one study skills class. The goal of the
Acceleration Academy is to provide academic instruction as well as social service
intervention, and to prepare students to be successful when they return to the regular day
program at the Freshmen Success Academy.

Extra Help Component

This initiative is a proactive approach to help any student in the Freshmen Success
Academy or Career Academy that falls behind in any class. Extra Help is a tutoring
service that can take place during the school day or immediately after school. This
component contributes to decreasing the achievement gap by monitoring students and
identifying difficulties early before a student can fail. It also contributes to the school
climate by showing students that their success is important to the teachers and to the success of the program.

Taken together, these program components provide all students enrolled in CPSI with a network of support and intervention that hopefully will prevent the attrition and failure rates that students experienced in the past. It is anticipated that many of the students that will need these safety net services were actually having difficulties in middle school. Realizing that support would be needed before students attended the Freshmen Success Academy, the district committed resources for a summer intervention program that would help incoming CPSI students “bridge the gap” between where their academic level is at in the middle school and where it should be as freshmen at the academy (Columbus Public Schools, 2000a).

**Summer Bridge Program**

The Summer Bridge Program was designed to serve between 600 and 800 incoming academy students from the middle schools. The general purpose of the program was to provide additional time and academic acceleration for lower functioning students in reading, mathematics, and career enhancement skills in order to prepare them for the rigors of academy classes. It was expected that 95% of students that still needed to pass the mathematics or reading portions of the NGPT would participate in the Summer Bridge Program. The anticipated outcomes for students who attended at least 90% of the Summer Bridge Program were: (a) 82% of students would show at least one grade level increase, in mathematics based on the PLATO evaluation tool and (b) 82% of...
students would increase reading scores based on an SRI evaluation instrument
(Columbus Public Schools, 2002b).

Although it was not a requirement, students would likely attend the same building
for the Summer Bridge Program as their chosen career academy. The middle schools that
feed into the academy high schools are: Barrett, Buckeye, Champion, Clinton, Hilltonia,
Medina, Mifflin Alternative, Starling, Wedgewood, and Westmoor. The students were
evaluated at the end of their eighth grade year at these middle schools based upon NGPT
scores, standardized reading tests, Target Teach scores, as well as attendance. Those
students identified as being more than one grade level behind in reading and not ready for
Algebra I were selected for the program. Each teacher and administrator were hand
selected for the program. They received 35 hours of preparation, consisting of
instructional strategies and methods for teaching reading and mathematics, study skills
necessary to be successful in high school, career development information, and
information specific to each career academy.

The Summer Bridge Program was four hours per day for five weeks beginning at
the end of June and running through the month of July. The program started at 8:00 a.m.
and ended at noon each day with the exception of some career exploration activities.
Students were provided breakfast each morning before the start of class. Students who
qualified for the free and reduced lunch program were fed at no cost. Transportation to
and from the program sites as well transportation for field trips were provided. Students
also participated in a career exploration component and received instruction in a reading
component and a mathematics component. Some students participated in paid work
experiences.
Through the career exploration component, students received instruction on time management, study skills, organization, test-taking skills, and orientation to high school. The career component included speakers from local businesses and industries. The speakers discussed communications skills, employability skills, career opportunities, and the importance of mathematics and reading in their respective career area. Students also received incentives for attendance and performance in the Summer Bridge Program. The incentives included certificates for perfect attendance, outstanding students, and most improved students. The work experiences for those students who were involved were coordinated by the Private Industry Council and the City of Columbus Cap City Kids Program.

The reading component of the program provided students with a high interest reading program with contemporary non-fiction material using Scholastic Read XL. Each student received a student anthology, textbook, CD ROM, and three shared novels. Read XL used Scholastic Reading Inventory (SRI) as an evaluation tool. SRI was given as a pre-test at the start of the Summer Bridge Program and throughout the five weeks in order to determine improvement in reading level. Teachers received in-service training on the implementation of Scholastic Reading XL as well as the administration of the SRI.

For the mathematics component, the length of instruction was one and one-half hours per day, four days a week for 19 days. Total instructional time on mathematics was 28.5 hours. The mathematics component of the program provided students with mathematics instruction using a combination of paper-pencil and computer based learning using PLATO software. This type of software is commonly referred to as
instructional learning software (ILS). The PLATO software is a part of each career academy program. PLATO is capable of providing instruction in mathematics at a variety of grade levels. Using this software, the student can work at his or her own mathematics level and at a pace more appropriate for each individual. The use of PLATO during the Summer Bridge Program allowed the students to become familiar with this software before they enter the freshmen success academy. PLATO is also used in the acceleration academies for students who fall behind throughout the school year and thus need further academic intervention. Teachers received training in various methods of instruction using PLATO in order to help students develop a constructive relationship between mathematics and the practical application problems that they experience on the NGPT and in career academy classes. In addition, specialized teachers and instructional assistants were trained to provide technical support in the use of the PLATO software and one Career Based Intervention (CBI) teacher was assigned at each site to provide extra mathematics tutoring.

Observations during the Summer Bridge Program indicated that instruction of students using the PLATO software was not provided in a consistent manner. For example, at one of the Summer Bridge sites, the researcher observed a mathematics teacher starting the class with students working on PLATO. He infused instruction with small group pullout time (dividing students into 3 pullout groups). Another teacher in the adjacent room started class with a review/lecture followed by students working individually using paper and pencil before being allowed to use PLATO for the last one-half hour. Both teachers were using the reference material (included worksheets) that was provided for them by the district and the PLATO software in a different way. The
researcher observed that the students who were allowed to enter the class and work on PLATO were more alert and motivated to do mathematics than the students who started class with a lecture, but it was unclear if they were actually learning more. Despite the inconsistencies in usage of PLATO in the 2002 Summer Bridge Program, the district decided that PLATO’s performance reporting features were the best vehicle for a quick estimate of learner gain during the Summer Bridge Program.

PLATO’s involvement with Columbus Public Schools can be traced back to the early 1990s when it was used in the district’s four career centers. In the past five years its use has been expanded to include all the high schools and many of the middle schools. Its primary components for mathematics instruction include user friendly computerized lessons displayed in a graphical format that most students can manipulate on their own. Follow up testing for each lesson, and a reporting capability that provides information in a variety of way are other advantages of PLATO. PLATO has taken the time to develop a curriculum alignment of the NGPT learning strands with their lessons/modules. PLATO’s general reports include student time on task, completion and mastery of a module. They have also developed customized Fastrack reports for the Summer Bridge Program that include PLATO pre-test/post-test in a grade level format for easier analysis of student gain during the program. According to PLATO, for the 2000 CPS Summer Bridge Program, 262 of the 472 students (55%) gained at least one grade level in mathematics. The 2001 CPS Summer Bridge Program reported that the average gain for 384 of the 557 students (69%) was two grade levels (Columbus Public Schools, 2002b). The PLATO Instructional Learning System dual capability of individualized student instruction in mathematics and estimation of learner gain is a useful tool for educators
when offering a short duration program such as the Summer Bridge Program. One of the
goals for the 2003 Summer Bridge Program was to expand the estimation of learner gain
that PLATO provided to include an analysis of student progress towards the passage of
the NGPT.

Summary

This literature review discussed several changes that are affecting educational
assessment of students and identified several factors that could affect student
achievement on the assessment instruments. Many of the driving forces for change in
student assessment were related to the federal government’s involvement in education,
specifically “ESEA,” the “No Child Left Behind Act” and the expectations that are being
placed on the states and schools. Research showed that student demographic issues,
especially social economic status and wealth of the community/school district may have
the most impact on student achievement. Mathematics education has gone through its
own transformation of what should be taught in schools, how this curriculum should be
taught, and what each student should be able to know and do. The mathematics
community has recognized a need to become more acclimated toward real-world
applications, which is evident in the strong support for the constructivist theory.

There are varying positions on which reform model will result in the best
integrated teaching and learning of academics and career and technical education.
Although large amounts of accountability data have been collected, there is little research
into the effectiveness of the reform models and the career and technical education to
improve student academic skills. Perhaps this is because of the lack of emphasis on uniform collection methods and the recent development of these models.

Figure 7 illustrates the conceptual framework for the study. The four primary topical areas (four upper circles) that were discussed in this literature review and were the titles of sections in chapter 2. The figure also illustrates the relationship of these four primary topic areas to the Columbus Public Schools Pathways to Success Initiative and overall student achievement.

Figure 7: Conceptual framework of study
CHAPTER 3

METHODOLOGY

Research Design

Chapter three describes the design and methodology for this research study. The student population is identified and the student demographic characteristics are described. The test instrument’s validity and reliability are presented and the methods of data collection, data analysis and control of variables are discussed.

The study was exploratory in nature and not intended to be predictive. A quasi-experimental, nonequivalent control group design (figure 8) was selected since it was not possible to randomly assign students to the groups. The treatment group was those students who self-selected the Summer Bridge Program and also self-selected the Freshmen Success Academy. The comparison group was composed of students who did not participate in the Summer Bridge Program and also self-selected the Freshmen Success Academy. Campbell and Stanley (1963) stated that this design is “one of the most widespread experimental designs in educational research.”
Approval to conduct this study was granted by The Ohio State University, Office of Responsible Research Practices, and the Columbus Public Schools, Research Proposal Review Committee. The study analyzed the data from the Columbus Public Schools 2002 Summer Bridge Program and the data from the March 2002, July 2002, and October 2002 administrations of the NGPT for students entering the five Freshmen Success Academies. The study focused on one component (mathematics) of the Summer Bridge Program. The Summer Bridge Program participants (treatment group) were provided mathematics instruction using a variety of approaches that combined computerized instruction, class presentations and individualized instruction. The length of instruction was one and one-half hours per day, four days a week for 19 days. Total instructional time on mathematics was 28.5 hours. NGPT data for the incoming Freshmen Success Academy students who did not participate in the Summer Bridge Program (comparison group) was also examined.

Population

Due to student transfers in and out of the academies (especially at the beginning of the school year), it was difficult to identify the exact student enrollment at any given time. During the 2002 -2003 school year, the five Career Academy High Schools
represented a freshmen population of approximately 1,591 of the reported 5,047 freshmen students enrolled in the 20 high schools as of June (Columbus Public Schools, 2003). The 1,591 population, however, represented students who may have transferred into the academy after October and students who were exempt from taking the October NGPT test for various reasons, including special needs or previous passage of the test administered in March of 2002. Student enrollment for the purpose of this study was based on the 1,160 students listed in the database for the October NGPT testing at the five Career Academy High Schools.

The focus of the Summer Bridge Program was the improvement of academic skills in order to pass the NGPT. For this reason, CPS decided that the program would be open to all students, regardless of the high school they planned to attend. Because extra funds were available, CPS added three additional Summer Bridge sites. These additional sites did not have any Freshmen Success or Career Academy programs in operation at their schools and were not focused on the academy concept. The three additional sites were Linden McKinley High School, Walnut Ridge High School and South High School. Of the 290 Summer Bridge students at these three sites, 10 students later attended an academy with only three qualifying for the study. Therefore, all 10 students were excluded from the study.

For the five Freshmen Success Academies, the total number of students attending the Summer Bridge Program equaled 659, with only 338, or 53.4% of the students later enrolling in one of the five academies. In order to be included in the study, these 338 student had to meet the following two requirements.
a) Taken and failed the March 2002 administration (pretest) and the July or October 2002 (posttest) in mathematics of the NGPT.

b) Attended for 15 days out of 19 possible days (78.9%).

The total number of students who met this requirement (treatment group) was 185.

The participation totals for the treatment group are provided in Table 1.

<table>
<thead>
<tr>
<th>Freshmen Success Academy</th>
<th>Total enrollment (NGPT based)</th>
<th>Attended Summer Bridge Program</th>
<th>Met participation requirements for the study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>% of total enrollment</td>
<td>f % of total enrollment</td>
</tr>
<tr>
<td>Briggs</td>
<td>242</td>
<td>43</td>
<td>18 7.4</td>
</tr>
<tr>
<td>East</td>
<td>205</td>
<td>71</td>
<td>36 17.6</td>
</tr>
<tr>
<td>Marion-Franklin Mifflin</td>
<td>258</td>
<td>79</td>
<td>49 19.0</td>
</tr>
<tr>
<td>West</td>
<td>206</td>
<td>74</td>
<td>48 23.3</td>
</tr>
<tr>
<td>Total</td>
<td>1160</td>
<td>338</td>
<td>185 16.0</td>
</tr>
</tbody>
</table>

Table 1: Participation of students in the treatment group.
Student demographic data for the students in the treatment group of 185 students who met this requirement are provided in Table 2.

<table>
<thead>
<tr>
<th>Academy</th>
<th>Y</th>
<th>N</th>
<th>M</th>
<th>F</th>
<th>W</th>
<th>B</th>
<th>H</th>
<th>A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Briggs</td>
<td>13</td>
<td>5</td>
<td>12</td>
<td>6</td>
<td>13</td>
<td>5</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>East</td>
<td>20</td>
<td>16</td>
<td>18</td>
<td>18</td>
<td>1</td>
<td>35</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Marion-Franklin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mifflin</td>
<td>25</td>
<td>23</td>
<td>21</td>
<td>27</td>
<td>1</td>
<td>47</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>West</td>
<td>19</td>
<td>15</td>
<td>19</td>
<td>15</td>
<td>21</td>
<td>11</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>80</td>
<td>97</td>
<td>88</td>
<td>52</td>
<td>130</td>
<td>3</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: W=White, B=Black, H=Hispanic, and A=Asian

Table 2: Demographics of students in the treatment group.

The abbreviations for the ethnicity coding are: W=White, B=Black, H=Hispanic, A=Asian. Students who did not enroll in the Summer Bridge Program totaled 822. To be included in the comparison group, students must have taken the March 2002 administration (pretest) and October 2002 (posttest) in mathematics of the NGPT. The total number of students who met this requirement was 452. The participation totals for the comparison group are provided in Table 3.
<table>
<thead>
<tr>
<th>Freshmen Success Academy</th>
<th>Total enrollment (NGPT based)</th>
<th>Did not attend summer bridge program</th>
<th>Met participation requirements for the study</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>% of total enrollment</td>
<td>f</td>
</tr>
<tr>
<td>Briggs</td>
<td>242</td>
<td>199</td>
<td>82.2</td>
</tr>
<tr>
<td>East</td>
<td>205</td>
<td>134</td>
<td>65.4</td>
</tr>
<tr>
<td>Marion-Franklin</td>
<td>258</td>
<td>179</td>
<td>69.4</td>
</tr>
<tr>
<td>Mifflin</td>
<td>206</td>
<td>132</td>
<td>64.0</td>
</tr>
<tr>
<td>West</td>
<td>249</td>
<td>178</td>
<td>71.5</td>
</tr>
<tr>
<td>Total</td>
<td>1160</td>
<td>822</td>
<td>70.9</td>
</tr>
</tbody>
</table>

Table 3: Participation of students in the comparison group.

Student demographic data for the students in the comparison group of 452 students who met this requirement are provided in Table 4.
<table>
<thead>
<tr>
<th>Freshmen Success Academy</th>
<th>Free / Reduced Lunch Status</th>
<th>Gender</th>
<th>Ethnicity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Y f</td>
<td>M f</td>
<td>W f</td>
</tr>
<tr>
<td></td>
<td>N f</td>
<td>F f</td>
<td>B f</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>H f</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A f</td>
</tr>
<tr>
<td>Briggs</td>
<td>60 f</td>
<td>49 f</td>
<td>65 f</td>
</tr>
<tr>
<td>East</td>
<td>47 f</td>
<td>40 f</td>
<td>0 f</td>
</tr>
<tr>
<td>Marion-Franklin</td>
<td>65 f</td>
<td>61 f</td>
<td>65 f</td>
</tr>
<tr>
<td>Mifflin</td>
<td>46 f</td>
<td>37 f</td>
<td>7 f</td>
</tr>
<tr>
<td>West</td>
<td>59 f</td>
<td>44 f</td>
<td>45 f</td>
</tr>
<tr>
<td>Total</td>
<td>277 f</td>
<td>231 f</td>
<td>182 f</td>
</tr>
</tbody>
</table>

Note: W=White, B=Black, H=Hispanic, and A=Asian

Table 4: Demographics of students in the comparison group.

The demographic data for the comparison and treatment groups combined equal 637 students, of which 382 (60%) received either free or reduced lunch, 328 (51.5%) were male, 234 (36.7%) were White, 373 (58.5%) were Black, 10 (1.6%) were Hispanic, and 20 (3.2%) were Asian. Students who received either free lunch or reduced price lunch were combined together into one category. The distribution of students in the treatment group and the comparison group was close to being even in the lunch status category and gender categories. In the ethnicity category, the treatment group had a much larger percent of black students, 70% versus 54% from the comparison group. There were also no Asian students in the treatment group versus 20 Asian students in the comparison group.
Instrumentation

The suitability or appropriateness of the mathematics portion of the Ohio NGPT as the instrument for completing the objectives of this study was determined to be acceptable because the academic focus of the Summer Bridge Program was to better prepare incoming ninth grade student to pass the NGPT and to enter Algebra 1. The validity and reliability assessments of the NGPT were developed several years ago, and large data banks of student performance on the test have been assembled.

Validity

“In recent years, validity has been defined as referring to the appropriateness, meaningfulness and usefulness of the specific inferences researchers make based on the data they collect. Validation is the process of collecting evidence to support such inferences (Ary, Jacobs, & Razavieh, 1996, p. 169).”

The NGPT was first implemented in November of 1990 by the ODE after a two year process. This process included four committees that were charged with the responsibility of ensuring content curricular validity, technical advice, test steering, and bias review (Mehrens, 1993). The NGPT was developed by IOX Assessment Associates of Los Angeles, California. Test items were reviewed by the content and bias committees before and after field testing. Test items were field tested using 50 Ohio schools (approximately 2,500 ninth grade students).
The mathematics test was based upon several learning outcomes that were adopted in 1988 by the State Board of Education for the content-related validation. The outcomes were:

1. Compute with whole numbers, fractions and decimals.
2. Compare, order, and determine equivalence of fractions, decimals, percents, whole numbers, and integers.
3. Solve and use proportions.
4. Round numbers to the nearest thousand, hundred, ten, one, tenth, and hundredth.
5. Solve problems and make applications involving percentages.
6. Select and compute with appropriate standard or metric units to measure length, area, volume, angles, weight, capacity, time temperature, and money.
7. Convert, compare, and compute with common units of measure with the same measurement system.
8. Read the scale on a measurement device to the nearest mark and make interpolations where appropriate.
9. Recognize, classify, and use characteristics of lines and simple two-dimensional figures.
10. Find the perimeters (circumference) and areas of polygons (circles).
11. Find surface areas and volumes of rectangular solids.
12. Read, interpret, and use tables, charts, maps, and graphs to identify patterns, note trends, and draw conclusions.
13. Use elementary notions of probability.
15. Solve simple number sentences and use formulas.


Each form of the mathematics test consisted of 40 multiple-choice items distributed over five strands, and reflected three levels of usage. Determining a single level of usage for each test item was difficult, because some questions may evaluate more than one level. Table 5 reflects the composition of a typical NGPT mathematics test.

<table>
<thead>
<tr>
<th>Level Of Usage</th>
<th>Mathematics Strands</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Arithmetic</td>
</tr>
<tr>
<td>Skill (25%)</td>
<td>f</td>
</tr>
<tr>
<td>Concept (25%)</td>
<td>3</td>
</tr>
<tr>
<td>Problem Solving (50%)</td>
<td>6</td>
</tr>
<tr>
<td>Total per Strand</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 5: NGPT mathematics test composition.

Each test (mathematics, science, etc) was designed to be two and one-half hours in length for regular students. Special needs students with Individual Educational Plans
(IEP) or English as a Secondary Language (ESL) may be given additional time. Provisions were made for some special needs students to be given the test orally. The administration of the tests must be by certificated instructors. The instructions for each test must be read aloud to the students following a prescribed script. The environment for testing must be comfortable with a minimum of distractions.

**Reliability**

Reliability is the extent to which the test is consistent in measurement. The reliability coefficient shows the extent to which random errors of measurement influence scores on the test. A reliability coefficient of 1.00 indicates the test would be perfectly reliable. Fraenkel and Wallen (2000) indicated that “for research purposes, a useful rule of thumb is that reliability should be at least .70 and preferably higher.”

One of the best known indexes of item consistency or homogeneity is the Kuder-Richardson formula 20, which is based on the proportion of correct and incorrect responses to each item on a test (Ary, Jacobs, & Razavieh, 1996). Rosch difficulty estimates (and fit statistics), p-values, KR-20 reliability estimates, and point biserial correlation coefficients were produced for the NGPT. The KR-20 reliability index provided information about internal consistency of test forms C and D for the class of 1995, and form A, B, C, and D for the class of 1994 (Mehrens, 1993). The data indicated that the KR-20 total sample results ranged from a low of .74 to a high of .89. The KR-20 for each sample group: male, female, white, and Hispanic were all similar.
The African American sample KR-20 was consistently lower by approximately .03 points. A summary of the reliability tests is presented in Table 6.

<table>
<thead>
<tr>
<th>Class</th>
<th>Reliability</th>
<th>Form A KR-20</th>
<th>Form B KR-20</th>
<th>Form C KR-20</th>
<th>Form D KR-20</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class of 1994</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Sample</td>
<td></td>
<td>.89</td>
<td>.75</td>
<td>.80</td>
<td>.74</td>
</tr>
<tr>
<td>Male Sample</td>
<td></td>
<td>.89</td>
<td>.76</td>
<td>.80</td>
<td>.75</td>
</tr>
<tr>
<td>Female Sample</td>
<td></td>
<td>.88</td>
<td>.74</td>
<td>.79</td>
<td>.73</td>
</tr>
<tr>
<td>White Sample</td>
<td></td>
<td>.88</td>
<td>.74</td>
<td>.79</td>
<td>.73</td>
</tr>
<tr>
<td>African American Sample</td>
<td></td>
<td>.82</td>
<td>.71</td>
<td>.78</td>
<td>.71</td>
</tr>
<tr>
<td>Hispanic Sample</td>
<td></td>
<td>.86</td>
<td>.75</td>
<td>.81</td>
<td>.73</td>
</tr>
<tr>
<td><strong>Class of 1995</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Sample</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>.89</td>
<td>.75</td>
</tr>
<tr>
<td>Male Sample</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>.89</td>
<td>.77</td>
</tr>
<tr>
<td>Female Sample</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>.89</td>
<td>.76</td>
</tr>
<tr>
<td>White Sample</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>.88</td>
<td>.75</td>
</tr>
<tr>
<td>African American Sample</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>.87</td>
<td>.72</td>
</tr>
<tr>
<td>Hispanic Sample</td>
<td></td>
<td>NA</td>
<td>NA</td>
<td>.88</td>
<td>.76</td>
</tr>
</tbody>
</table>

Table 6: KR-20 reliability estimates
Source: Table 5: Consistency of Mathematics Proficiency test scores, Mehrens, 1993, p.20
Data Collection

The NGPT data was collected from three testing periods. The pretest data was collected from the administration of the March 2002 NGPT, and the posttest data was collected from the administration of both the July and October 2002 NGPT.

The collection of data for this research study came from two CPS sources. All data concerning student enrollment in the Freshmen Success Academy and NGPT scores were collected from Columbus Public Schools, Department of Evaluation Services. Additional data including free and reduced lunch status, gender, ethnicity, middle school attended, and Freshmen Success Academy attended were assembled from the data provided by Department of Evaluation Services. The Columbus Public School, Department of High School/Career Education Curriculum Development & Instructional Support provided data on student participation and attendance in the Summer Bridge Program. The data from the Department of Evaluation Services were reported using a Microsoft Access table. The data from the Department of High School/Career Education Curriculum Development & Instructional Support was reported using a Microsoft Excel table for each Summer Bridge site. The Excel tables were combined and imported into Microsoft Access and then linked to the Department of Evaluation Services table. All students were given an identifier number and then the names were removed from the data before analysis. Hair, Anderson, Tathan and Black (1998) state that non-metric data can be transformed to metric using a dummy-variable coding technique. The non-metric independent variables (gender, ethnicity, and free and reduced lunch) in this study were transformed using this technique in order to make the data appropriate for analysis.
Data Analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 11.0 for Windows software. Only the student performance data for the mathematics NGPT were analyzed in this study. Since the data on all students who met the assessment and attendance criteria were used, the pretest (March, 2002) and posttest (July or October, 2002) analysis was based on the data collected for both the treatment and comparison groups. The NGPT data were analyzed using measures of central tendency (i.e., means, medians, and modes) and variability (i.e., standard deviation, and ranges). The magnitude of all relationships reported in this study used the conventions from Davis (1971). These descriptors are as follows:

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>.70 or higher</td>
<td>Very strong association (relationship)</td>
</tr>
<tr>
<td>.50 to .69</td>
<td>Substantial association (relationship)</td>
</tr>
<tr>
<td>.30 to .49</td>
<td>Moderate association (relationship)</td>
</tr>
<tr>
<td>.10 to .29</td>
<td>Low association (relationship)</td>
</tr>
<tr>
<td>.01 to .09</td>
<td>Negligible association (relationship)</td>
</tr>
</tbody>
</table>

Analysis of variance was used as a descriptive statistic to see if there was a significant difference between the treatment and comparison groups since a population of students rather than a sample comprised the groups of interest. No attempt was made to infer this would be the case in the population as a whole for either the pretest or posttest.
Multiple regression was also used as a descriptive statistic to see if the independent variables could be used to explain variance in the dependent variables. As was the case with the analysis of variance, no attempt was made to predict these differences in the population as a whole.

Objective 1: To determine if there was a significant difference between the pretest scores on the NGPT (mathematics) for students who participated in the Summer Bridge Program and the students who did not.

Analysis of Variance (ANOVA) was used to analyze pretest data between the Summer Bridge Program (treatment group) and those who did not attend the Summer Bridge Program (comparison group) in order to describe the groups’ similarities or differences prior to the treatment. Since the treatment and comparison groups were not equal in size, the ANOVA included the test of homogeneity of variance. The level of significance criterion was set at alpha = .05.

Objective 2: To determine if there was a significant difference between the posttest scores on the NGPT (mathematics) for students who participated in the Summer Bridge Program and students who did not.

ANOVA was also used to analyze the posttest data between the treatment group and comparison group in order to describe the groups’ similarities or differences after the treatment. Since the treatment and comparison groups were not equal in size, the
ANOVA included the test of homogeneity of variance. The level of significance criterion was set at alpha = .05. “Although specifying alpha establishes the level of acceptable statistical significance, it is the level of power that dictates the probability of ‘success’ in finding the differences if they actually exist (Hair et al., 1998, p. 11).” Power is the probability of correctly rejecting the null hypothesis when it should be rejected. The power estimate is based on a combination of the effect size, alpha, and sample size. According to Hair et al. (Table 1.1, p. 12), with over 500 cases, an ANOVA power estimate with a moderate effect size would be .99.

**Objective 3:** To determine the proportion of variance in the students’ pretest scores on the NGPT (mathematics) that could be explained by gender, ethnicity, and free and reduced lunch status.

Multiple regression was used to determine the proportion of variance in the NGPT mathematics pretest score (dependent variable) that could be explained by a linear combination of independent variables: gender, ethnicity, and free and reduced lunch status. Hair et al. (1998) indicated that the objective of multiple regression analysis is to explain or predict the changes in the dependent variables from the knowledge of one or more independent variables. The level of significance criterion was set at alpha = .05 for the multiple regression analysis. The sample included both the treatment and comparison group (N=637). Power in multiple regression refers to the probability of detecting as statistically significant a specific level of a regression coefficient at a specified significance level for a specific sample size. The size of sample has a direct impact on the
appropriateness and the statistical power of multiple regression. Using the table provided by Hair et al. (1998, p. 165) the power for three independent variables and a sample size of over 500 cases was found to be over .80.

Objective 4: To determine the proportion of variance in the treatment group (Summer Bridge Program) students’ posttest scores on the NGPT (mathematics) that could be explained by gender, ethnicity, free and reduced lunch status and mathematics pretest score.

Multiple regression was used to determine the proportion of variance in the NGPT mathematics posttest score (dependant variable) that could be explained by a linear combination of independent variables: gender, ethnicity, free and reduced lunch status, and mathematics pretest score. The level of significance criterion was set at alpha = .05 for the multiple regression analysis. The sample included only the treatment group (N=185). Using the table provided by Hair et al. (1998, p. 165) the power for four independent variables and a sample size of over 100 cases was found to be over .80.

Control of Variables

The quasi-experimental, nonequivalent control group design was a strong design. However, the lack of randomization of assignment was a concern. Campbell and Stanley (1963) indicated that there were only a few variables that could jeopardize internal validity with this type of design. Although “history” was not listed as one of them, it must
be pointed out that due to the structure of this study, history could be a factor because of the student experiences that may have occurred from the March pretest to the end of June in the classrooms at the middle schools, and the start of school to the October posttest in the Freshmen Success Academies. Since the student experiences during this time were not controlled or documented, changes in mathematic knowledge and skill may have been different for each student and therefore could affect the results of the study. It was assumed that the changes in student knowledge and skill were equivalent for both groups. Therefore, for the purpose of this study, history was not a factor influencing internal validity. Since the length of instruction time was only 28.5 hours over 19 days, the interaction of selection and maturation is not considered to have an effect on the treatment group. During the spring of 2002, and prior to enrollment in the Summer Bridge Program, students were identified by the middle school staff as in need of participation in the program therefore in effect creating the potential for self-selection and extreme Summer Bridge Program scores. The primary criteria used by the middle school staff were poor performance in class and on the NGPT during the March administration of the test. Campbell and Stanley (1963) point out that the interaction of selection and X may affect external validity, and that a difference in degree of shift from pretest to posttest between the two groups may well be a product of regression rather than the effect of X. Therefore, the assumption of uniform regression between the groups becomes less likely.
Summary

This chapter presented a discussion of the research design, student population, instrumentation, validity and reliability of the NGPT. Data collection and data analysis methodology were identified in order to clarify the process. The chapter also outlined the procedures of the study and the primary concerns over the control of variables as they relate to the application of the “Control Group” design discussed by Campbell and Stanley. The study was designed to assess the impact of the Summer Bridge Program on student achievement in mathematics. Allison (1999) contends that external validity questions can be generalized to other groups or populations but samples that are based upon convenience such as this study should be carefully reviewed prior to generalization. With such cautions in mind, the generalization of this study should therefore be limited to the population of students in the Columbus Public Schools that are attending the Freshmen Success Academies.
CHAPTER 4

FINDINGS

The purpose of this study was to determine if the Summer Bridge Program was effective in increasing student achievement in mathematics for those who attended, as compared to the students who were not enrolled in the Summer Bridge Program. This chapter includes the findings in the form of statistical data for each of the study’s objectives, tables, and a brief explanation of each table. Students who attended the Summer Bridge Program were considered the treatment group (N=185) and those who did not attend the Summer Bridge Program were considered the comparison group (N=452).

Examination of the data in Table 7 indicates the distribution of the mathematics pretest scores for the treatment and comparison groups. A test score of 200 or above excluded students from the study since they had passed the test. The treatment group had a higher percentage of students in the 160-169 range (17.8%) and the comparison group had a higher percentage in the 190-199 range (25.4%).
Table 7: Frequency distribution of the NGPT (mathematics) pretest means.

<table>
<thead>
<tr>
<th>Range</th>
<th>Treatment Group</th>
<th></th>
<th>Comparison Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>Percent</td>
<td>f</td>
<td>Percent</td>
</tr>
<tr>
<td>140-149</td>
<td>1</td>
<td>.5</td>
<td>2</td>
<td>.4</td>
</tr>
<tr>
<td>150-159</td>
<td>3</td>
<td>1.6</td>
<td>6</td>
<td>1.3</td>
</tr>
<tr>
<td>160-169</td>
<td>33</td>
<td>17.8</td>
<td>57</td>
<td>12.6</td>
</tr>
<tr>
<td>170-179</td>
<td>52</td>
<td>28.2</td>
<td>125</td>
<td>27.7</td>
</tr>
<tr>
<td>180-189</td>
<td>60</td>
<td>32.5</td>
<td>147</td>
<td>32.5</td>
</tr>
<tr>
<td>190-199</td>
<td>36</td>
<td>19.4</td>
<td>115</td>
<td>25.4</td>
</tr>
<tr>
<td>Total</td>
<td>185</td>
<td>100</td>
<td>452</td>
<td>100</td>
</tr>
</tbody>
</table>

Examination of the posttest data from Table 8 indicates that the comparison group had a larger percentage of students in the 160-169 and lower ranges (16.9%). The treatment group had a larger percentage in the middle ranges 170-199 (27.0%). Both the treatment group and the comparison group had approximately the same percentage of students score above 200 and passed the NGPT posttest.
Range   | Treatment Group | Comparison Group |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>f</td>
<td>Percent</td>
</tr>
<tr>
<td>140-149</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>150-159</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>160-169</td>
<td>6</td>
<td>3.2</td>
</tr>
<tr>
<td>170-179</td>
<td>50</td>
<td>27.0</td>
</tr>
<tr>
<td>180-189</td>
<td>58</td>
<td>31.3</td>
</tr>
<tr>
<td>190-199</td>
<td>36</td>
<td>19.6</td>
</tr>
<tr>
<td>200-209</td>
<td>26</td>
<td>14.1</td>
</tr>
<tr>
<td>210-219</td>
<td>7</td>
<td>3.8</td>
</tr>
<tr>
<td>220-229</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>230-239</td>
<td>1</td>
<td>.5</td>
</tr>
<tr>
<td>Total</td>
<td>185</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 8: Frequency distribution of the NGPT (mathematics) posttest means.

**Objective 1: To determine if there was a significant difference between the pretest scores on the NGPT (mathematics) for students who participated in the Summer Bridge Program and the students who did not.**

The statistical technique ANOVA was used to analyze the pretest data between the treatment group and comparison group. ANOVA compared two separate estimates of the variance for the dependent variable, one that reflected the general variability of the respondents within the groups (MSw) and another that represented the difference between
groups attributed to the treatment effects (MSb). For the ANOVA, the level of
significance criterion was set at alpha = .05.

The probability ($p$), commonly referred to as the $p$-value, is associated with an
obtained statistical result that could have been produced by chance (or random error). The
smaller the number, the greater the likelihood that the result expressed was not due to
chance (Vogt, 1999). If $p$ is > .05 it is tenable that both the treatment and comparison
groups are statically equal at a risk of making a Type-I error (probability of rejecting the
null hypothesis when it is actually true).

Table 9 presents the summary data (pretest) for the treatment and comparison
groups, and the ANOVA data. The mean for the treatment group was 179.94 (SD 10.43)
and the mean for the comparison group was 181.48 (SD 10.18), a difference of 1.54
points in favor of the comparison group. A review of the table shows an F-ratio of 2.99
($p=.08$). Since $p$ is > .05, the mean pretest scores are considered to be statistically equal.
That is, there was no significant difference between the scores on the treatment group’s
pretest and that of the comparison group.
Table 9: Summary data: NGPT (mathematics) pretest and analysis of variance.

<table>
<thead>
<tr>
<th>Source</th>
<th>ss</th>
<th>df</th>
<th>ms</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups (MS_b)</td>
<td>314.23</td>
<td>1</td>
<td>314.23</td>
<td>2.99</td>
<td>.08</td>
</tr>
<tr>
<td>Within Groups (MS_w)</td>
<td>66700.08</td>
<td>635</td>
<td>105.04</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>67014.31</td>
<td>636</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Objective 2: To determine if there was a significant difference between the posttest scores on the NGPT (mathematics) for students who participated in the Summer Bridge Program and students who did not.

The statistical technique ANOVA was used to analyze posttest data between the treatment group and comparison group. For the ANOVA analysis of the posttest, the level of significance criterion was set at alpha = .05. If p is > .05 it is tenable that both the
treatment and comparison groups are statically equal at a risk of making a Type-I error (probability of rejecting the null hypothesis when it is actually true).

Table 10 presents the summary data (posttest) for the treatment and comparison groups, and the ANOVA data. The mean for the treatment group was 187.32 (SD 12.11) and the mean for the comparison group was 185.33 (SD 15.04), a difference of 1.99 points in favor of the treatment group. A review of the table shows an F ratio of 2.56 ($p=.11$). Since $p$ is > .05, the mean posttest scores are considered to be statistically equal. That is, there was no significant difference between the scores on the treatment group’s posttest and that of the comparison group.

<table>
<thead>
<tr>
<th>Source</th>
<th>ss</th>
<th>df</th>
<th>ms</th>
<th>F</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups (MS$_b$)</td>
<td>519.47</td>
<td>1</td>
<td>519.47</td>
<td>2.56</td>
<td>.11</td>
</tr>
<tr>
<td>Within Groups (MS$_w$)</td>
<td>129078.07</td>
<td>635</td>
<td>203.27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>129597.54</td>
<td>636</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 10: Summary data: NGPT (mathematics) posttest and analysis of variance.
Objective 3: To determine the proportion of variance in the students’ pretest scores on the NGPT (mathematics) that could be explained by gender, ethnicity, and free and reduced lunch status.

Dummy coding was used to account for the effect that different levels of a nonmetric variable had in predicting the dependent variable (Hair et al., 1998). In analyzing the data, the coding method used for the three independent variables gender, ethnicity, and free and reduced lunch were as follows: gender (male = 0, female = 1), free and reduced lunch status (no = 0, yes = 1), and ethnicity was reduced from the original four categories of white, black, Hispanic and Asian to two categories (white =0, minority =1) due to the small number of minority students in the study from the Hispanic and Asian groups.

Multiple regression was used to determine the proportion of variance in the NGPT mathematics pretest score (dependent variable) that could be explained by a linear combination of independent variables: gender, ethnicity, and free and reduced lunch. The simultaneous method of entering variables into the regression was selected since this was an exploratory study. For multiple regression, the level of significance criteria was set at alpha = .05. The dependent and independent variables were examined to see if there were any intercorrelations that had moderate or higher associations. Table 11 presents the intercorrelations for gender, ethnicity, and free and reduced lunch status. None of the correlation coefficients reported a moderate or higher association.
### Intercorrelations

<table>
<thead>
<tr>
<th>Variables</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>Y</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (X1)</td>
<td>1.00</td>
<td>.04</td>
<td>.01</td>
<td>.05</td>
<td>.49</td>
<td>.500</td>
</tr>
<tr>
<td>Ethnicity (X2)</td>
<td>1.00</td>
<td>.14</td>
<td>.01</td>
<td>.63</td>
<td></td>
<td>.482</td>
</tr>
<tr>
<td>F&amp;R Lunch (X3)</td>
<td>1.00</td>
<td>-.06</td>
<td></td>
<td>.60</td>
<td></td>
<td>.490</td>
</tr>
<tr>
<td>Pretest score (Y)</td>
<td>1.00</td>
<td></td>
<td></td>
<td>181.03</td>
<td></td>
<td>10.265</td>
</tr>
</tbody>
</table>

Table 11: Summary data: regression of NGPT (mathematics) pretest score on selected variables (N=637)

The total variance explained by the regression model (Table 12) for the pretest was less than 1% (.006). None of the independent variables were found to explain a significant proportion of the variance in the dependent variable mathematics pretest score.

<table>
<thead>
<tr>
<th>Variables</th>
<th>R^2</th>
<th>R^2 Change</th>
<th>b</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>.003</td>
<td>.003</td>
<td>1.062</td>
<td>1.305</td>
<td>.192</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>.003</td>
<td>.000</td>
<td>.343</td>
<td>.402</td>
<td>.668</td>
</tr>
<tr>
<td>F&amp;R Lunch</td>
<td>.006</td>
<td>.003</td>
<td>-1.214</td>
<td>-1.449</td>
<td>.148</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td>181.029</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 12: Regression of NGPT (mathematics) pretest scores on gender, ethnicity, and free and reduced lunch. (N= 637)
Objective 4: To determine the proportion of variance in the treatment group (Summer Bridge Program) students’ posttest scores on the NGPT (mathematics) that could be explained by gender, ethnicity, free and reduced lunch status, and mathematics pretest score.

Multiple regression was used to determine the proportion of variance in the NGPT mathematics posttest score (dependent variable) that could be explained by a linear combination of independent variables: gender, ethnicity, free and reduced lunch, and the mathematics pretest score. For multiple regression, the level of significance criteria was set at alpha = .05. The simultaneous method of entering variables into the regression was selected since this was an exploratory study. The dummy coding technique used for the pretest analysis was also used for the posttest analysis.

Table 13 presents the intercorrelations for gender, ethnicity, free and reduced lunch, and pretest score. All of the correlation coefficients reported a negligible to low association with other independent variables (X1, X2, X3, X4) and with the posttest dependent variable (Y), with the exception of the pretest variable (X4). The correlation coefficient between the pretest independent variable (X4) and the posttest dependent variable (Y) was reported as a substantial (.51) association. Of the independent variables studied, only the pretest independent variable was found to be useful in explaining the variance in the dependent variable mathematics posttest score.
### Table 13: Summary data: regression of NGPT (mathematics) posttest scores on selected variables (N=185)

<table>
<thead>
<tr>
<th>Variables</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
<th>Y</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender (X1)</td>
<td>1.00</td>
<td>.11</td>
<td>.13</td>
<td>.04</td>
<td>-.03</td>
<td>.48</td>
<td>.501</td>
</tr>
<tr>
<td>Ethnicity (X2)</td>
<td>1.00</td>
<td></td>
<td>.11</td>
<td>-.04</td>
<td>.08</td>
<td>.72</td>
<td>.451</td>
</tr>
<tr>
<td>F&amp;R Lunch (X3)</td>
<td></td>
<td>1.00</td>
<td>.03</td>
<td>.01</td>
<td>.57</td>
<td></td>
<td>.497</td>
</tr>
<tr>
<td>Pretest score (X4)</td>
<td></td>
<td></td>
<td>.51</td>
<td>179.94</td>
<td></td>
<td>10.427</td>
<td></td>
</tr>
<tr>
<td>Posttest score (Y)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1.00</td>
<td>187.32</td>
<td>12.116</td>
</tr>
</tbody>
</table>

Table 14 presents the regression analysis score of the mathematics posttest on gender, ethnicity, free and reduced lunch and pretest score. The independent variable that accounted for the most variance (26%) in the NGPT posttest score was the pretest score. All the other variables’ explanations of the dependent variable were extremely low. The ethnicity variable explained approximately 1% of the variance in the posttest score with the remaining variables explaining less than 1% of the variability. The total variance explained by the regression model for the posttest was approximately 27%.
Table 14: Regression of NGPT (mathematics) posttest scores on gender, ethnicity, free and reduced lunch, and pretest scores (N= 185)

Multicollinearity was examined by reviewing the values for each independent variable in the intercorrelations tables. A review of Tables 11 and 13, revealed that none of the independent variables should be a concern for multicollinearity since their intercorrelations were below .80. Because multicollinearity can involve more than two variables at a time, the tolerance statistic was also investigated. A tolerance that falls below .40 may be a concern (Allison, 1999). None of the independent variables for either analysis had a tolerance value below .97.

Examination was conducted to check for independency, homoscedasticity, and normality. The plots of the residuals against the dependent and independent variables are presented in the appendix A, figures A1 through A7. Based on the review of those graphs, it was determined that the assumptions for regression were met.
Summary

The study was designed to assess the impact of the Summer Bridge Program on student achievement in mathematics. This chapter described the statistical results for the four objectives of the study. Descriptive data, ANOVA and Multiple Regression analysis results were presented in relation to these objectives.
CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

The purpose of this study was to determine if the Summer Bridge Program was effective in increasing student achievement in mathematics for those who attended, as compared to the students who were not enrolled in the Summer Bridge Program. This chapter includes a summary of the study and its findings, conclusions and recommendations.

Summary

With the changes in federal legislation, the explosion of computer/information technology, and the changes in workforce needs in the 1980s, vocational schools began to infuse more applied academic skills into the vocational education curriculum. New initiatives such as the development of identifiable pathways for students to follow, correlation of academic skills with career-technical programs, tech prep, career academies, and High Schools That Work have been tried by many school districts in
order to provide a more focused support system. For some school districts, the refocusing and redesigning of their traditional vocational education delivery system into a comprehensive career-technical system that included a focus on academic skills and performance measurement has been relatively easy. In most situations, this transition has been guided and supported by each state’s education department. In Ohio, the ODE provided leadership and an increased expectation that students in career-technical education would perform as well as non career-technical students on standardized tests such as the NGPT.

The NGPT is one example of standardized testing as a method for validating educational gain. Some educators feel that too many of the standardized tests measure lower cognitive skill development instead of focusing on higher level development. Hoachlander (1998, p.15) stated that, “this type of assessment is well suited for assessing students’ recall of factual knowledge and their ability to solve problems that have an unambiguous right answer.” But constructivist educators stress that students need higher level cognitive development with “deeper learning” of mathematics and improved critical thinking skills. Teachers are often expected to cover the mathematical procedures at an accelerated pace, even though students may need more time to develop these thinking skills. The Third International Mathematics and Science Study (TIMSS) data indicated that Japanese students significantly outperform United States students in mathematics and spend much more time delving deeply into mathematical ideas (Battista, 1999). Realizing that they need to increase a child’s time on task, school administrators have often turned to summer school instructional programs as way to
bring students up to the predetermined academic level. For Columbus Public Schools, this was one avenue that was chosen.

With only 25% of the CPS middle school (8th grade) students passing the mathematics NGPT on their first try, it was apparent that a majority of the students would not be ready for Algebra 1 in 9th grade. For the freshmen (9th grade) students entering the career academy, it was necessary to develop special intervention programs that would provide additional time and support. The Freshmen Success Academy support structure included extra tutoring help after school, an advisor/advisee monitoring system, and a Summer Bridge Program. The Summer Bridge Program was selected as the focus of this study because evidence was not available to determine its success in improving mathematics skills and therefore increasing the likelihood of a student passing the NGPT. The academic focus of the program was to increase student learning in mathematics by increasing time on task for students who have been identified as deficient, as measured by the NGPT. The NGPT was considered a suitable instrument for the study since the academic focus of the Summer Bridge Program was to better prepare incoming ninth grade students to pass the NGPT and to enter Algebra 1. The NGPT is considered by ODE as a valid and reliable assessment instrument.

External factors have been known to affect a student’s performance on the NGPT. CPS and the State of Ohio test scores in mathematics consistently showed that African-Americans (blacks), Hispanics, and Native Americans score below the 75% state standard benchmark. Goldberg (2000) contended that on eighth-grade mathematics scores, social class was twice as predictive of variation as race, and about 45% of the variation can be predicted on the national assessment scores without knowing anything
about race if the household income level and education level of the parents are known. Research cited in chapter two also indicated that ethnicity and SES were strong predictors of student performance. As an example, the difference between white and black students as measured on the Ohio NGPT for the 2000-2001 school year was 41% in mathematics, and 39% in science (Center on Education Policy, 2002, August). Most studies that cited SES as a strong predictor have shown a considerable difference in income between the groups being examined. In this study, the measurement variable for SES (free and reduced lunch) was not expected to indicate a significant difference because all the students live in the same general neighborhood with a small difference in income between a student that received free and reduced lunch and a student who did not.

In this Ex Post Facto study, the researcher was not able to control many of the process factors. The students self-selected the Summer Bridge Program. Therefore, the researcher could not manipulate the variables and thus used a nonequivalent quasi-experimental comparison design. The available population for the study included all students who enrolled in a CPS Career Academy High School, and had taken the March and the July or October administration of the mathematics NGPT. The pretest data was collected from the administration of the March 2002 NGPT, and the posttest data was collected from the administration of both the July and October 2002 NGPT. Participants in the treatment group consisted of 185 students and the comparison group included 452 students. The instructional time in mathematics for the Summer Bridge Program was 1.5 hours per day for 19 days, resulting in a total of 28.5 hours.

The data were analyzed using SPSS version 11.0. Descriptive data, ANOVA and Multiple Regression analysis results were presented in relation to the four objectives.
An ANOVA analysis was used to determine if there was a statistical significance at an .05 alpha level between the comparison and treatment group for both the pretest and the posttest. The analysis of the data indicated that there was not a significant difference between the treatment group and comparison group on the NGPT mathematics pretest (objective one). Therefore, the comparison group and the treatment group were considered to be equal when the Summer Bridge Program started. An analysis of data using ANOVA also indicated that there was not a significant difference between the treatment group and comparison group on the NGPT mathematics posttest (objective two). The analysis showed that both groups of students were equal in October, and thus were assumed to be equal when the study was completed.

Multiple regression was used to determine the proportion of variance in the NGPT mathematics pretest score (dependent variable) objective three, that could be explained by a linear combination of independent variables: gender, ethnicity, and free and reduced lunch. These variables were chosen because they were common non-instructional factors. The free and reduced lunch status was used as a general measurement of SES since other indicators such as family income and parent’s education level were not available. All of the independent variables showed a negligible association to each other, and a low association to the dependent variable pretest. Multiple regression was also used to determine the proportion of variance in the NGPT mathematics posttest score (dependent variable) objective four, that could be explained by a linear combination of independent variables: gender, ethnicity, free and reduced lunch, and the mathematics pretest score. The gender, ethnicity, and free and reduced lunch independent variables showed a negligible association to each other, and a low association to the dependent variable.
posttest. The independent variable pretest score showed a substantial association (.51) with the dependent variable NGPT mathematics posttest score, and explained 26% of the variability in the posttest score.

Conclusions

After careful examination of the data and findings, the following conclusions were developed in relationship to the objectives of this study.

1. The value of the Summer Bridge Program to make a significant improvement in student mathematics knowledge as measured by the NGPT was not a valid assumption with only 28.5 hours of instruction.

2. The multiple regression analysis of the variables gender, ethnicity, or free and reduced lunch did not explain any of the variance in the NGPT mathematics pretest or posttest. The researcher therefore would conclude that student demographic characteristics had little effect on the performance of students in the treatment or comparison groups on the pretest or posttest. This study’s findings on race and SES are not supportive of the finding cited in chapter two, which indicated that minorities and lower SES students scored lower on standardized tests. This study’s findings on gender however, are supportive of Schreiber’s
findings on middle school students, and Clark’s (1997) findings in Akron Public Schools that there was little difference between students of different gender on standardized tests.

Recommendations

The need for educators to infuse increased academic skill training into career technical programs was paramount to the success of both CPS and the Ohio Department of Career-Technical and Adult Education’s efforts to modernize their programs. Without empirical evidence, it is more difficult for educators to know if they are making decisions in the best interest of their career-technical programs and the students that they are trying to assist. The CPS Department of High School/Career Education Curriculum Development & Instructional Support created the Summer Bridge Program with the hope of increasing academic and career success for students who were entering the Career Academies. This study provided information for educators to use in making a more informed decision regarding the effectiveness of the Summer Bridge Program. The study, however, was limited. Therefore, the researcher would make several recommendations for further study:
1. CPS data shows that black males in the district for many years have not been performing as well as other groups of students. The regression analysis did not indicate that ethnicity or gender were major factors related to performance in the Summer Bridge Program. The researcher recommends that a review of data from another summer be undertaken in order to validate the regression analysis conclusion.

2. The study indicated that the value of the Summer Bridge Program in improving students’ mathematics skills as measured by the NGPT is questionable. The NGPT, however, is now being phased out and will be replaced by the Ohio Graduation Test (OGT). Although the OGT is similar to the NGPT, it is recommended that a future study be undertaken using the new OGT.

3. The study’s focus was on the results achieved by the students as measured on the NGPT. The study did not attempt to evaluate the design of the Summer Bridge Program in order to determine if it utilized the time and resources available in the most efficient and effective manner. It is recommended that a more comprehensive review of the Summer Bridge Program be conducted taking into consideration how the Summer Bridge Program was implemented.

4. The study did not examine a teacher’s knowledge and experience or its relationship to student performance on the NGPT. It is recommended that a
future study incorporate an analysis of certification and instructional experience in the Summer Bridge Program.

5. Instructional methodology was not part of this study. The Summer Bridge Program teachers were all given curriculum guides, but they were allowed to teach the material in a variety of ways including class lecture, small group learning, traditional paper and pencil, and computerized instruction using PLATO software. There were no detailed recordings of which methods may were used by each teacher. It is recommended that a future study examine the various methods used in the Summer Bridge Program in order to identify which are most effective.

6. The study’s focus was on the effectiveness of the mathematics instruction for the Summer Bridge Program. This, however, was only one component of the program. It is recommended that future research investigate the other components: English instruction, career awareness, and job shadowing.

7. The compilation of data for analysis was made more difficult because the NGPT data was provided in Microsoft Access tables by one of the CPS departments and the data for the attendance of students in the Summer Bridge Program was provided in a Microsoft Excel spreadsheet by another CPS department. Many of the names in the Excel spreadsheet did not have student identification numbers, and it took several hours to verify names prior to
converting the Excel data into Access. Once this was accomplished, a data match was possible. It is recommended that names and student identification numbers for the Summer Bridge Program be entered into an Access database so they could be more easily matched with the NGPT database.
LIST OF REFERENCES


Columbus Public Schools (2002a). *Smaller learning communities grant*. Columbus, OH: Author

Columbus Public Schools (2002b). *Moving forward*. Columbus, OH: Author

Columbus Public Schools (2003). *Internship report*. Columbus, OH: Author


Ohio Department of Education. (1990). *High school proficiency testing: Fact sheets.* Columbus, OH: Author


Watts, E. (2000). *Students will rise to the challenge.* ENC Focus, 7, 2, 42. Columbus, OH: Eisenhower National Clearinghouse for Mathematics and Science Education.
APPENDIX A

Plots of Regression Analysis Residuals
Figure 9: Gender residual regression analysis of pretest (objective 3)
Figure 10: Ethnicity residual regression analysis of pretest (objective 3)
Figure 11: Lunch code residual regression analysis of pretest (objective 3)
Figure 12: Gender residual regression analysis of posttest (objective 4)
Figure 13: Ethnicity residual regression analysis of posttest (objective 4)
Figure 14: Lunch code residual regression analysis of posttest (objective 4)
Figure 15: March mathematics score residual regression analysis of posttest (objective 4)
APPENDIX  B

Selected excerpts from the

CPS Freshmen Success Academy Manual
## “HIGH SCHOOLS THAT WORK” KEY PRACTICES*

<table>
<thead>
<tr>
<th>High Expectations</th>
<th>Setting higher expectations and getting more students to meet them.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocational studies</td>
<td>Increasing access to intellectually challenging vocational and technical studies, with a major emphasis on using high-level mathematics, science, language arts and problem-solving skills in the modern workplace and in preparation for continued learning.</td>
</tr>
<tr>
<td>Academic studies</td>
<td>Increasing access to academic studies that teach the essential concepts from the college preparatory curriculum by encouraging students to use academic content and skills to address real-world projects and problems.</td>
</tr>
<tr>
<td>Program of study</td>
<td>Having students complete a challenging program of study with an upgraded academic core and a major.</td>
</tr>
<tr>
<td>Work-based learning</td>
<td>Giving students and parents a choice of a system that integrates school-based and work-based learning. The system should span high school and post secondary studies and should be planned by educators, employers and employees.</td>
</tr>
<tr>
<td>Teachers working together</td>
<td>Having an organization, structure and schedule giving academic and vocational teachers the time to plan and deliver integrated instruction aimed at teaching high-level academic and technical content.</td>
</tr>
<tr>
<td>Students actively engaged</td>
<td>Getting every student involved in rigorous and challenging learning.</td>
</tr>
<tr>
<td>Guidance</td>
<td>Involving each student and his/her parents in a guidance and advising system that ensures the completion of an accelerated program of study with an in-depth academic or technical major.</td>
</tr>
<tr>
<td>Extra help</td>
<td>Providing a structured system of extra help to enable students who may lack adequate preparation to complete an accelerated program of study that includes high-level academic and technical content.</td>
</tr>
<tr>
<td>Keeping score</td>
<td>Using student assessment and program evaluation data to improve continuously the school climate, organization, management, curricula and instruction to advance student learning and to recognize students who meet both curriculum and performance goals.</td>
</tr>
<tr>
<td>Assessment</td>
<td>Using student assessment and program evaluation data to continuously upgrade and improve instruction and school climate to promote student success.</td>
</tr>
</tbody>
</table>

*Developed by the Southern Regional Education Board (1987)
FRESHMEN SUCCESS ACADEMY
A self-contained school-within-a-school organized around interdisciplinary teams designed to provide incoming freshmen with a smooth transition into high school.

Rationale
- Improve attendance and academic success
- Reduce drop out rate
- Career focused instruction

Components
- College preparatory curriculum with extra help available
- Algebra 1 blocked for the entire year
- Career Based Intervention classes (mathematics assistance)
- Small learning communities
- Common planning time for teachers
- Teacher: student ratio- 1:25
- Integrated lessons and projects
- Career Connections class with career development activities
- Teacher advisement program
- Computer literacy class
- Academy location in a designated wing or floor

FRESHMEN SUCCESS ACADEMY TEAMS
Teams of core academic teachers working together with a group of 125-150 freshmen students

Rationale
- To promote small learning communities.
- To promote teacher collaboration across disciplines.
- To provide integrated learning opportunities for students.

Components
- Common planning time for core academic teachers.
- Regular weekly meeting times for teacher collaboration.
- Teachers have the same group of students throughout the year.
- Teachers advise a group of students assigned to their team (if scheduling permits).
- Each team should consist of a math, science, English, and social studies teacher.
- Career Connections & 9th grade CBI teachers should be assigned to teams.
FRESHMEN ACADEMY ADMINISTRATOR
RESPONSIBILITIES

- Support lead teachers in their roles as team leaders.
- Coordinate with lead teachers the collection & analysis of team data.
- Coordinate scheduling of academy courses.
- Coordinate teachers' schedules to ensure daily common planning time.
- Support team staff development activities.
- Provide administrative support for academy career development activities.
- Support/assist with marketing academy to students, parents, community.
- Establish communication with feeder middle schools.
- Attend all school-wide and district-wide meetings dealing with freshmen issues.
- Assist teachers with obtaining the necessary support services.
- Serve as a resource for staff, visitors, community members.
- Focus teams on achieving their benchmarks.

FRESHMEN ACADEMY LEAD TEACHER
RESPONSIBILITIES

- Attend all scheduled district-wide lead teacher/administrator meetings for freshmen academies.
- Attend all scheduled CPSI site leadership meetings.
- Serve as a resource to team members, parents, team administrator.
- Clarify team goals and priorities.
- Facilitate collection of data and team analysis of data, including the prior week’s extra help attendance.
- Plan agendas, coordinate team meetings & documentation of activities. (Lead teachers plan & conduct meetings during common planning time.)
- Coordinate all team activities.
- Coordinate staff development for team members.
- Serve on teacher advisement committee.
- Submit team data in designated format to testing coordinator within one week of the end of each grading period.
FRESHMEN ACADEMY TEACHER RESPONSIBILITIES

In the classroom:

- Support the principle that all students can learn with effort.
- Assess student assignments and course syllabi for high expectations for students.
- Use a variety of instructional strategies to teach from bell to bell.
- Assist students to meet competencies as directed by the course curriculum guide.
- Direct and encourage students to attend extra help as needed to achieve academic expectations.
- Relate course work to the real world (career focus) and to other subject areas.

As a team member:

- Collaborate with other teachers to integrate instruction across disciplines and apply instruction to the “real world”.
- Meet with team members during common planning time.
- Collaborate with other team members on parent/student communication, curriculum and instruction delivery, motivation/recognition events, student evaluation and staff development.

As an advisor:

- Be an advocate for a group of 15 students.
- Insure that students are "on track" for graduation.
- Review and deliver planned teacher advisement activities.
- Assist students in planning coursework according to their individualized career plan.
FRESHMEN SUCCESS ACADEMY
Sample Student Schedule

Summer Bridge Program
For students needing academic assistant before entering 9th grade

9th Grade

<table>
<thead>
<tr>
<th>Block</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exploration in Literature and Composition</td>
<td>Social Studies</td>
</tr>
<tr>
<td>2</td>
<td>Algebra 1 with CBI or Geometry</td>
<td>Algebra 1 with CBI or Elective (for students enrolled in Geometry)</td>
</tr>
<tr>
<td>3</td>
<td>Physical Science</td>
<td>Career Connections/Computer Literacy</td>
</tr>
<tr>
<td>4</td>
<td>Foreign Language or P.E./Health</td>
<td>Fine or Practical Art Elective</td>
</tr>
</tbody>
</table>

Optional 4th block

<table>
<thead>
<tr>
<th>4th block</th>
<th>Foreign language 45 minutes year long</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Elective (ROTC, band, vocal music)</td>
</tr>
</tbody>
</table>
### FRESHMEN SUCCESS ACADEMY

**Sample Teacher Schedule**

#### Semester 1

<table>
<thead>
<tr>
<th>Team A Teachers</th>
<th>Math (Keebler)</th>
<th>CBI (Wo)</th>
<th>English (Archway)</th>
<th>Social Studies (Sunshine)</th>
<th>Sciences (Nabisco)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>Section 5</td>
<td>Sections 6</td>
<td>Section 1</td>
<td>Section 2</td>
<td>Section 3</td>
</tr>
<tr>
<td></td>
<td>Section 6</td>
<td>Section 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td>Section 2</td>
<td>Section 1</td>
<td>Section 3</td>
<td>Section 4</td>
<td>Section 5</td>
</tr>
<tr>
<td></td>
<td>Section 1</td>
<td>Section 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 3</td>
<td>Section 3</td>
<td>Section 4</td>
<td>Section 5</td>
<td>Section 6</td>
<td>Section 1</td>
</tr>
<tr>
<td></td>
<td>Section 4</td>
<td>Section 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 4</td>
<td>Common</td>
<td>Planning</td>
<td>Time and Duties</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Semester 2

<table>
<thead>
<tr>
<th>Team A Teachers</th>
<th>Math (Keebler)</th>
<th>CBI (Wo)</th>
<th>English (Archway)</th>
<th>Social Studies (Sunshine)</th>
<th>Sciences (Nabisco)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block 1</td>
<td>Section 5</td>
<td>Sections 6</td>
<td>Section 2*</td>
<td>Section 1</td>
<td>Section 4</td>
</tr>
<tr>
<td></td>
<td>Section 6</td>
<td>Section 5</td>
<td>(Green)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 2</td>
<td>Section 2</td>
<td>Section 1</td>
<td>Section 4</td>
<td>Section 3</td>
<td>Section 6</td>
</tr>
<tr>
<td></td>
<td>Section 1</td>
<td>Section 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 3</td>
<td>Section 3</td>
<td>Section 4</td>
<td>Section 6</td>
<td>Section 5</td>
<td>Section 2</td>
</tr>
<tr>
<td></td>
<td>Section 4</td>
<td>Section 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Block 4</td>
<td>Common</td>
<td>Planning</td>
<td>Time and Duties</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Each section consists of 25-30 students.
- Shaded areas represent non-teaching blocks.
- Math and CBI share 2 sections of students each block. Each works with half the students for the first half of the block; then teachers switch which section of students they work with the second half of the block.
## FRESHMEN SUCCESS ACADEMY - Sample Schedule

<table>
<thead>
<tr>
<th>Block</th>
<th>Course</th>
<th>Teacher</th>
<th>Section</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>English</td>
<td>Archway</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Algebra/CBI</td>
<td>Keebler/</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td>Phys.Science</td>
<td>Nabisco</td>
<td>1</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>19th Century</td>
<td>Sunshine</td>
<td>2</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Algebra/CBI</td>
<td>Keebler/</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Phys.Science</td>
<td>Nabisco</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>2</td>
<td>English</td>
<td>Archway</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Algebra/CBI</td>
<td>Keebler/</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>19th Century</td>
<td>Sunshine</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>2</td>
<td>Algebra/CBI</td>
<td>Keebler/</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Groups 5 & 6 are not shown
- Students are assigned to an English teacher from another academy in order to meet CEA contractual agreement for English teachers.
- All classes are scheduled in the lower level of the building.
<table>
<thead>
<tr>
<th>Actions</th>
<th>Responsible Party</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Review last week’s action plan</td>
<td></td>
</tr>
<tr>
<td>II. Individual student achievement</td>
<td></td>
</tr>
<tr>
<td>Identify low achieving students (attendance, grades, behavior)</td>
<td>Actions to address needs of low achieving students</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
<tr>
<td>III. Curriculum &amp; Instruction</td>
<td></td>
</tr>
<tr>
<td>Assess student work for high expectations.</td>
<td></td>
</tr>
<tr>
<td>Plan an interdisciplinary project.</td>
<td></td>
</tr>
<tr>
<td>IV. Academy motivation/ recognition activities</td>
<td></td>
</tr>
<tr>
<td>Plan motivation/ recognition activities</td>
<td></td>
</tr>
<tr>
<td>Organize career development activities</td>
<td></td>
</tr>
<tr>
<td>Showcase student work</td>
<td></td>
</tr>
<tr>
<td>V. Collect &amp; analyze data. Adjust action plan accordingly.</td>
<td></td>
</tr>
</tbody>
</table>
TEACHER WEEKLY DATA COLLECTION
(To be discussed during common planning time)

Meeting date: _________________ Freshmen team: ______________
Teacher: _____________________ Subject: ____________________

Daily average of absences this week . . . . ______
No. students on roster . . . . . . ______
Total no. phone calls made . . . . ______
Total no. student conferences . . . . ______
Total no. parent conferences . . . . ______
Total no. resource people used . . . . ______
Total no. referred to extra help tutoring . . ______
% of students with grade of “A” or “B” . ______
% of students with grade of “F” . . . . ______

Concerns:
FRESHMEN ACADEMY - Conference Record

Student: ____________________________  Team: ______________________

Conference date(s): _______________________________________________

Adults present/relationship: ________________________________________

Conference initiated by:____________________________________________

Staff Present:
___  English    ___  Science    ___  Counselor
___  Mathematics  ___  Social Studies  ___  Administrator
___  Other ______________________________________________________

Purpose:
___  Academic    ___  Discipline    ___  Social
___  Attendance    ___  Parent Request
___  Other ______________________________________________________

Data Presented:
___  Attendance    ___  Health concerns
___  Behavior    ___  Homework
___  Classroom performance  ___  Notebook
___  Grades    ___  Referral: ______________________

Other Topics Discussed:
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Action Plan/ Comments:
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

________________ Parent/guardian signature  Date ___________________

________________ Administrator/ teacher signature Date ________________

APPENDIX C

Staff development for the

Columbus Pathways to Success Initiative (CPSI)
The CPSI required all staff members in the initiative take part in professional development activities. Professional development activities included familiarization with the components of the CPSI, (Freshmen Success Academy, Career Academy, Safety Net Programs, and Summer Bridge Program) attendance at conferences, site visits to successful schools, presentations by guest speakers and consultants, and structured teacher planning time. Implementation of lessons learned by participating in this professional development is expected to lead to an improved quality of instruction. Release time and a reassignment of staff duties allowed principals to be freed from many management tasks and provided time to be true instructional leaders in the classrooms. Each administrator serves as the chairperson for one of the academies and each has a lead teacher. Teachers were involved on leadership teams and steering committees, and were engaged in curriculum development for the integration of higher academic standards at all grade levels. Teacher externships over the summer months provide staff with the opportunity to learn new ways to relate their curriculum to the world of work. An example of the following professional development activities were developed for the West High School staff for the 2001-02 school year, and have been aligned to the goals of the smaller learning community initiative.
<table>
<thead>
<tr>
<th>PROJECT GOAL</th>
<th>STAFF DEVELOPMENT ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>To provide a continuous network of intervention and support services to students.</td>
<td>“How to be a Teacher Advisor,” presented by Southern Regional Education Board consultant through the CSRD Grant.</td>
</tr>
<tr>
<td>To improve the quality of instruction through professional development.</td>
<td>“Instructional Strategies for Teaching Bell to Bell, “ by John Fahey, James Madison University, Va.</td>
</tr>
<tr>
<td>To improve the quality of instruction through professional development.</td>
<td>“Making it Happen Through Leadership,” by Southern Regional Education Board consultant through the CSRD Grant.</td>
</tr>
<tr>
<td>To provide a continuous network of intervention and support services to students.</td>
<td>“Grading Practices &amp; Alternative Schedules That Increase the Odds for Student Success,” Lynn Canady.</td>
</tr>
<tr>
<td>To improve the quality of instruction through professional development.</td>
<td>Six coaching sessions provided by Southern Regional Education Board (SREB) consultant through the CSRD grant.</td>
</tr>
<tr>
<td>All goals</td>
<td>“How to Administer the 2002 HSTW Assessment,” Heather Boggs, SREB.</td>
</tr>
<tr>
<td>To raise the mathematics, science, communication, problem-solving, and technical achievement of students.</td>
<td>“Reading and Writing Across the Curriculum,” district professional development presentation.</td>
</tr>
<tr>
<td>To improve the quality of instruction through professional development.</td>
<td>“Technology Training in Grade Quick and Plato,” PLATO consultant.</td>
</tr>
<tr>
<td>To improve the quality of instruction through professional development.</td>
<td>HSTW Local Leaders Retreat—“Leadership for Curriculum and Instructional Improvement”.</td>
</tr>
<tr>
<td>To provide a seamless education path.</td>
<td>“High Expectations for Urban Youth,” by Dawn O’Parah, arranged through SREB.</td>
</tr>
<tr>
<td>To raise the mathematics, science, communication, problem-solving, and technical achievement of students.</td>
<td>“Writing Effectively,” district professional development presentation.</td>
</tr>
</tbody>
</table>
To provide a seamless education path. | “HSTW Meeting the Challenge of Transitions—Middle Grades to High School and Postsecondary,” SREB.
---|---
To provide a continuous network of intervention and support services to students. | “Instructional Strategies for Teaching Bell to Bell,” John Fahey, James Madison Univ.
To raise the mathematics, science, communication, problem-solving, and technical achievement of students. | “Communicating High Expectations to Students and Parents,” by Heather Boggs, SREB consultant
To improve the quality of instruction through professional development. | Annual “HSTW National Conference”
To provide a seamless education path. | Academy Team Meetings
To raise mathematics, science, communication, problem-solving, and technical achievement of student. | Business Steering Committee Meetings
APPENDIX D

Study consent documentation
Dear Investigator,

You recently submitted an application for exemption. Your application has been determined to be exempt from review by the Institutional Review Board. The form that is enclosed with this letter is the notice of approval. Please keep this notice with your research materials.

The approval letter is being sent to you because you are listed as the Principal Investigator. Please copy the letter for any co-investigators who wish to have a copy.

Please note that exempt research is intended to be short term in nature - less than one year. It is anticipated that you will conduct the research as written and that you will not make changes to the research design, the selection of subjects, the informed consent process, or the instrumentation during the course of the study. Exempt research cannot be amended or extended.

Investigators are responsible for protecting the rights and welfare of human subjects participating in research.

Please contact me if you have questions about the review process.

Sincerely,

Jane Kelsey
Administrative Associate
Phone: 292-6950 Fax: 688-0366
E-mail: kelsey.18@osu.edu
October 28, 2002

The Ohio State University
Office of Research Risks Protection 310 Research
Foundation Building 1960 Kenny Road
Columbus, OH 43210-1063

To: Institutional Review Board

I am writing this letter of support for the proposed research study titled, "An Evaluation of the Summer Bridge Program's Delivery of Mathematics Instruction to Career Academy Students." As the administrator in charge of Evaluation Services, I feel that the results of this study will provide useful information regarding the impact the program may have on our students.

Upon your approval and the approval of Columbus Public Schools Department of Pupil Services, I will provide the researcher access to the data collected by our department related to this study. All data released to the researcher will be in conformance with the parameters set by the Institutional Review Board and the Columbus Public Schools.

Sincerely,

Saundra G. Brennan, Ed.D.
Acting Director
January 6, 2003

Mr. Maurice D. Blake, Director
Columbus Public Schools
Department of Pupil Services
61 South Sixth Street
Columbus, OH 43215

Dear Research Proposal Review Committee:

The focus of my proposal, titled “An Evaluation of the Summer Bridge Program” will explore the effects of the Columbus Public Schools Summer Bridge Program on student mathematics achievement during the summer of 2002.

The study supports the districts goals of “Increase Academic Achievement” and “Operate Efficiently & Effectively” by providing information that could assist administrators in evaluating the impact of the Summer Bridge Program on various student demographic groups. The results of the study will be provided to the Department of Pupil Services, Department of High School/Career Education Curriculum, and the Department of Evaluation Services.

My hope is to receive Columbus Public Schools approval for the study in January since the remainder of the student data will be available in early February (October NGPT scores). I have already arranged for the support of both departments where the data is being collected.

I have attached to this memo a briefly explanation of the purpose, value and data collection procedures for this study. Your support is greatly appreciated.

Sincerely,

William Blain Waldron
OSU Graduate Student &
CPS Adult Education Supervisor