American Mathematical Association of Two Year Colleges Reform Policies in Practice: Implementing Standards in Classroom Instruction for Basic Skills Mathematics at One Four-Year College in New Jersey

Patricia J. Garruto
Montclair State University

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AMERICAN MATHEMATICAL ASSOCIATION OF TWO YEAR COLLEGES

REFORM POLICIES IN PRACTICE: IMPLEMENTING STANDARDS IN
CLASSROOM INSTRUCTION FOR BASIC SKILLS MATHEMATICS AT ONE
FOUR-YEAR COLLEGE IN NEW JERSEY

A DISSERTATION

Submitted to the Faculty of
Montclair State University in partial fulfillment
of the requirements
for the degree of Ed.D. in Mathematics Education

by

PATRICIA J. GARRUTO

Montclair State University

Upper Montclair, NJ

2012

Dissertation Chair: Dr. Kenneth C. Wolff
MONTCLAIR STATE UNIVERSITY
THE GRADUATE SCHOOL
DISSERTATION APPROVAL

We hereby approve the Dissertation

AMERICAN MATHEMATICAL ASSOCIATION OF TWO YEAR COLLEGES
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of
Patricia J. Garruto
Candidate for the Degree:
Doctor of Mathematics Education

Department of Mathematical Sciences
Certified by:

Dr. Joán C. Ficke,
Dean of The Graduate School

Date 4/23/12

Dissertation Committee:

Dr. Kenneth C. Wolff, Dissertation Chair

Dr. Cynthia S. Onore

Dr. Helen M. Roberts

Dr. Mark L. Weinstein
High school graduates continue to enter post-secondary education lacking in basic mathematical skills and thus not academically prepared to enroll in college-level mathematics courses (ACT, 2010). Although it can be argued that those mathematical concepts should have been mastered in grades K-12, educating those students in basic skills mathematics has become the responsibility of universities and colleges. Two publications of the American Mathematical Association of Two Year Colleges (AMATYC), *Crossroads* (1995) and *Beyond Crossroads* (2006) set forth standards for mathematics programs and courses offered to students during their first two years of post-secondary education, which includes basic skills programs. Those standards can be used as guidelines for departments that are maintaining and supporting a basic skills mathematics program.

Case study methodology was used to describe how the AMATYC standards impacted the implementation, evaluation and modification of a basic skills program at one four-year institution. Data sources included an initial survey, interviews and observations as well as program documents such as mission statements, course syllabi, texts and supporting technology. The study’s findings indicated that the institution had
used AMATYC standards to guide many aspects of their program. Overall, the findings indicated that the institution’s basic skills mathematics program was fairly well aligned with the AMATYC standards. This study confirmed research findings suggesting that it is difficult for programs to completely align with standards put forward by professional associations or councils.
ACKNOWLEDGEMENTS

The present study would not have been possible had it not been for the valuable input of many individuals. I offer special thanks to Dr. Kenneth Wolff for his valuable insight, kindness and sheer endurance during this process. His continued support, intelligence and guidance were instrumental throughout the design, analysis and completion of this study. I am also very grateful to Dr. Cynthia Onore for her constructive advice on case studies and for her ongoing support during all stages of this research study. I also thank committee members Dr. Helen Roberts and Dr. Mark Weinstein for their constructive comments and encouragement during the data collection and analysis stage.

I would like to also thank the participants of this study who have allowed me to visit their institution, examine their materials, observe their math lab sessions and interview their instructors. These individuals were instrumental in this study by allowing me to continually visit and discuss issues regarding their basic skills program. Their support and enthusiasm were greatly appreciated. I am also grateful to Dr. Joan Burke, Mathematics Chairperson at Caldwell College, for her encouragement and support throughout this process.

I am most grateful to my husband, Nick and my children Christine, Lauren and Robert for their love and continual encouragement which buoyed me throughout this nine-year process. Without their support, I would never have undertaken and completed the requirements for this Ed.D. in Mathematics Education. Each of you inspires me with all of your accomplishments as well.
Dedicated, first and foremost,

To my husband for his love, strength and endless courage,

My children, Christine, Lauren and Robert for their love and support,

To my parents, George and Joanne, and all members of “The Fort” for their continual encouragement throughout this process.
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LIST OF SYMBOLS AND ABBREVIATIONS

AFT – American Federation of Teachers
AMATYC – American Mathematical Association of Two-Year Colleges
AMS – American Mathematical Society
COMAP – Consortium for Mathematics and Its Applications
I – 1 Standards for Intellectual Development One: Problem-Solving
I – 2 Standards for Intellectual Development Two: Modeling
I – 3 Standards for Intellectual Development Three: Reasoning
I – 4 Standards for Intellectual Development Four: Connecting With Other Disciplines
I – 5 Standards for Intellectual Development Five: Communicating
I – 6 Standards for Intellectual Development Six: Using Technology
I – 7 Standards for Intellectual Development: Develop Mathematical Power
IM – 1 Implementation Standards One: Student Learning and the Environment
IM – 2 Implementation Standards Two: Assessment of Student Learning
IM – 3 Implementation Standards Three: Curriculum/Program Development
IM – 4 Implementation Standards Four: Instruction
IM – 5 Implementation Standards Five: Professionalism
LAMP – Low Attainers Mathematics Project
MAA – Mathematical Association of America
NADE – National Association for Developmental Education
NCLCA – National College Learning Center Association
NCTM – National Council of Teachers of Mathematics
NJAMTE – New Jersey Association of Mathematics Teacher Educators
NRC – National Research Council

P – 1 Standards for Pedagogy One: Teaching With Technology

P – 2 Standards for Pedagogy Two: Interactive and Collaborative Learning

P – 3 Standards for Pedagogy Three: Connecting With Other Experiences

P – 4 Standards for Pedagogy Four: Multiple Approaches

P – 5 Standards for Pedagogy Five: Experiencing Mathematics
Chapter 1. Context of the Study

Standards for Mathematics Programs Offered in the First Two Years of College

In 1995 and 2006 the American Mathematics Association of Two-Year Colleges (AMATYC) published two noteworthy documents that established principles and standards with recommendations for the design, delivery and support of college-level mathematics courses. Both documents are concerned with courses designed for students in their first two years of post-secondary study. These documents, *Crossroads in Mathematics: Standards for Introductory College Mathematics* (AMATYC, 1995) and *Beyond Crossroads: Implementing Mathematics Standards in the First Two Years of College* (AMATYC, 2006), provide guidelines for course content, descriptions of underlying pedagogical principles, and methods for successfully implementing the standards and practices described in the first publication. Also addressed are descriptions of instructional modes and suggestions for program assessments. Both publications are intended for any institution of higher education, not just two-year colleges.

The Mathematical Association of America (MAA), the National Association for Developmental Education (NADE), the American Mathematical Society Committee on Education (AMS), and the National Council of Teachers of Mathematics (NCTM) along with other national, state and regional mathematical organizations, endorse these documents. MAA and AMS, AMATYC and NCTM are the primary U.S. professional organizations for college/university faculty members, two-year college/university mathematics faculty members and K-12 schoolteachers respectively. The National
Science Foundation, the Exxon Education Foundation and Texas Instruments Incorporated provided funding for parts of these projects and related studies.

Thus it is not surprising that the AMATYC documents have provided a new vision for the first two years of college mathematics, which includes basic skills mathematics courses. As noted, the vision is designed to improve mathematics education by implementing standards that focus on the learning environment, program instruction, and professionalism. Recognizing that faculty are usually responsible for designing the educational framework for courses, which includes content, classroom environment, course pedagogy and assessment while chairpersons, directors and administrators can affect policy, hire and retain personnel, provide departmental resources and offer funding for professional development opportunities, the standards are designed to stimulate those individuals to work collaboratively to improve student success in mathematics courses. That is, to implement the standards as intended by AMATYC, these key personnel must commit to continuous evaluations that examine policy, improvements to instruction and learning, and to professional development opportunities for faculty. When properly implemented, these practices are intended to enable more students to successfully study mathematics and allow them to maximize their potential in every college mathematics class. It portrays each student as achieving mathematical competence and each faculty member as a lifelong learner, who is engaged in quality professional growth (AMATYC, 2006).

Standards for K-12 Mathematics Education
NCTM (1989, 1991, 1995, 2000b) developed standards for course content, instructional practices, assessment and professionalism for K-12 teachers and administrators that are well aligned with those developed by AMATYC for college faculty and administrators. Many states later developed standards modeled after those put forward by NCTM. Never-the-less, large numbers of high school graduates continued to arrive at the doorsteps of colleges with diploma in hand but lacking in basic mathematical skills (ACT, 2010; Sherman, Bohlander & Snell, 1996; Stigler, Givvin & Thompson, 2010). Because so many entering college students lacked the computational and algebraic skills required for success in credit bearing college mathematics courses most, if not all, two and four-year colleges and universities in the United States are providing basic skills mathematics instruction.

**Failing to Meet the Needs of Students**

One of the goals set forth by AMATYC (1995, 2006), NADE (2002, 2003) and NCTM (2000a, 2000b) is to instill mathematical competence in all students. Those individuals who understand and use mathematical concepts fluently will have more options and opportunities available to them in the future (AMATYC, 1995, 2006; NCTM, 2000b, 2003). Classroom instruction should be integrating skills with conceptual knowledge so students can learn mathematics thoughtfully and with understanding (Hiebert & Carpenter, 1992; Koehler & Grouws, 1992; NCTM, 2000b, 2003; National Research Council, 2000, 2001a, 2001b, 2005). To achieve and maintain this specific goal, K-14 classroom teachers and college instructors should be participating in high quality professional development that assists them in implementing a standards-based
curriculum (Lieberman, Saxl & Miles, 2000; Little, 2000; NCTM, 2000a, 2000b; Wheatley, 2000).

However, like any large-scale undertaking, this vision of nationwide mathematical competence has not been achieved by all students. A recent federal report, Foundations for Success: The Final Report of the National Mathematics Advisory Panel (National Mathematics Advisory Panel, 2008) addressed the need for reform in mathematics teaching for elementary and middle school students (Lewin, 2008; Toppo, 2008). This report was the culminating work of respected scholars and researchers who sought to uncover the reasons the mathematics skills of U.S. students continue to wane in comparison to other industrialized nations. The report noted that weak mathematics skills plague some students into their high school years and post-secondary educational path. Based on their work, panel members recommended a number of reforms for K-8 education, many of which were in substantial agreement with the actions recommended for the first two years of post-secondary education by AMATYC. The reforms described in this federal report focused on curricular content, learning processes, instructional practices and materials, teachers, assessments and future research priorities. In addition, one of the research priorities called for cyclic evaluations of the current K-12 mathematics programs. If these recommended reforms are successfully implemented, institutions of higher education might see an improvement in the mathematical skills of incoming freshmen. Regrettably, even though some students received passing grades and high school diplomas, many are identified as in need of basic skills math education when they reach college. These students did not process and/or retain the knowledge of basic
mathematics concepts from previous classroom experiences. Clearly for some students, there has been a persistent disconnect between what is being taught in the mathematics classroom and the information these students are acquiring or, more accurately, not acquiring. Thus the need to address the gap in students’ mathematical knowledge, caused by what some view as shortcomings of high school programs, has fallen on institutions of higher learning.

Addressing this lingering issue of incomplete comprehension of math content, the Common Core State Standards Initiative published the College and Career Readiness Standards for [K-12] Mathematics (2009) and the Common Core State Standards for [K-12] Mathematics (2010) both of which address the need for greater attention to thoughtful lessons and coherence of mathematical concepts. They call for a deeper focus on fewer topics to help students connect the relationship between key ideas, mathematical skills and comprehension. It is a balancing act between mathematical procedures and conceptual understanding. Without that understanding, students are reduced to relying on procedures that are easily forgotten and this creates a pattern of subsequent failures and the necessity to repeat classes. On the other hand, conceptual understanding without strong procedural knowledge may make it difficult to see connections between some topics and procedures or lessen a student’s ability to investigate applications or solve routine problems. Although these new standards have been adopted by most states, they are being phased in over the next few years. Thus it is too soon to observe the impact they may have on preparing students for college level mathematics courses.
This need for repetitive mathematics courses can severely disrupt students’ progress in college since it bars them from taking college level mathematics courses until they pass the basic skills mathematics classes. For certain majors, the need to complete additional mathematics courses lengthens the necessary time frame for students to earn a degree in that particular major. Therefore, many of those students are unable to graduate college in a timely fashion or are forced to alter their first choice of major due to this complication. This causes disparities in opportunities, course selection, college achievement and targeted careers (AMATYC, 1995, 2006; Oakes, 1990; NCTM, 2000b; Secada, 1992; Weissglass, 2000).

It may be reasonable to argue that the primary reason there is a need for college level developmental mathematics courses is a result of students’ K-12 mathematics education or weaknesses in that education. However, whether or not to enroll students in college, when they have been identified as not academically prepared for college level work, continues to be debated as both a political and academic issue. As a result, the K-12 schools and college communities currently share responsibility for developmental mathematics instruction. Thus it is important that college level, mathematics basic skills programs are well designed and effective at their primary task, which is preparing their students for success in credit bearing, college level courses in mathematics or other subjects that require mathematical reasoning and procedural skills.

Although it is not the focus of this study, it is appropriate to note that basic skills programs are not new to the United States’ education system. Since colonial times, higher education has been concerned about inadequate preparation of students for college
course work. The use of basic skills courses to enable students to successfully complete college was commonplace during that era and still plays an important role today. The terms describing these courses have evolved over time and are commonly listed as basic skills, developmental or remedial instruction. For a more detailed discussion of these terms see Appendix A and for a brief history of college level basic skills course work at U.S. institutions of higher education see Appendix B.

**Implementation Recommendations of National Workshops, Conferences and Panels**

In spring of 2009 I attended a national basic skills workshop offered by the Mathematics Association of America (MAA) in Washington DC that examined existing, effective basic skills practices at several U.S. colleges and universities and applied the AMATYC research principles and standards to those programs. Workshop topics included the use of supportive classroom environments, meaningful instructional strategies and routine program evaluations “by collecting comprehensive information about the mathematics program” (AMATYC, 1995, Ch. 4, p.7). In the spring of 2010, I also attended a NADE conference in Columbus, OH that focused on similar areas for students in need of basic skills reinforcement. This national conference stressed the importance of knowledgeable and nurturing teachers along with the incorporation of technology to reinforce newly learned material.

**The Need to Evaluate and Modify the Implementation Standards**

Both the MAA workshop and the NADE conference stressed the need for continual assessment of student progress and program effectiveness. These are just two examples of many workshops and conferences that focused on the need to improve the
implementation of standards at all levels for mathematics education. Together, they serve as constant reminders that even though standards exist, implementation is often slow, and in some cases ignored in classrooms. When such inaction occurs, very little changes in the students’ educational experiences in those classrooms. It is noteworthy that NCTM (2000b), AMATYC (1995, 2006), MAA (2009), and NADE (2002) all agree on the need for continuous evaluation of the implementation of standards along with research based recommendations for changes in the implementation process. That is, four major professional groups for K-16 educators as well as the National Research Council (2000) and the report of the National Mathematics Advisory Panel (2008) all state that it is necessary to study if, and how well standards are being implemented, and if the implementation occurs, are the related goals being achieved. Furthermore, if the goals or standards are not being achieved, what steps need to be taken to support or appropriately modify their implementation?

Statement of Problem

How are the AMATYC Standards Being Interpreted and Implemented?

The results of college placement exams continue to show that a significant number of high school graduates have not mastered the mathematical procedural and conceptual knowledge required by that those institutions. As a result, most higher education institutions have established basic skills mathematics programs to meet the prerequisite needs of those students. AMATYC calls for engagement in educational research to document the implementation of the instructional strategies used in basic skills mathematics courses. Defining course and program goals, designing pertinent
materials, and developing student assessments, as well as a process for individual course and overall assessments are all necessary components for affecting change and improvements in basic skills programs. Its two Mathematics Standards documents, *Crossroads* (1995) and *Beyond Crossroads* (2006), offer guidelines for course content, instructional strategies and professional development for basic skills mathematics programs. However, the goals and objectives found in these standards can only be realized when the guidelines are continuously evaluated and refined.

Thus, related to the need for institutions of higher education to provide courses that help students acquire necessary mathematical knowledge, there are at least four important reasons to know whether or not these policies and practices are being successfully implemented. First, success in these courses is critical to the future educational and related occupational plans of the affected students. Second, institutions want these programs to be effective and resource efficient. Third, the valuable time and effort of many professionals, as well as the resources of professional organizations have been spent to articulate them, and it is important for those resources to be used wisely. Fourth, if research based standards and practices are either not being implemented or only partially implemented in some programs, then the educational practices associated with those programs are, in all likelihood, not research based. Yet there is minimal research examining the current practices and policies of college basic skills courses and whether these practices are guided by the AMATYC principles set forth in *Crossroads* and *Beyond Crossroads*. The AMATYC standards, together with the recommendations of the
2009 MAA workshop and the annual 2010 NADE conference form the conceptual framework for this study.

This study documented how twelve of these standards were being interpreted and implemented in the basic skills program at one selected college with key faculty who were familiar with the AMATYC standards and had attended workshops and conferences advocating the principles found in the *Crossroads* and *Beyond Crossroads* documents. Research that informs us about the standards’ implementation process, including program assessment and refinement that guide college basic skills course practices, and the success of the related practices, is of critical importance to both educators and students. Sharing knowledge about programs that are having implementation difficulties, or are working well, can have significant impact on institutional and individual resources.

AMATYC standards address the learning environment, assessment of student learning, curriculum, instruction and professionalism. They are grouped by the categories of Intellectual Development (Appendix C), Content (Appendix D), Pedagogy (Appendix E) and Implementation (Appendix F). Each of these is broken down into goals and recommended actions for faculty, the mathematics department and the institution. All of the above categories are important for student learning, however, for the purposes of this research, I will be examining twelve standards that are summarized by the following five statements.

- A1. Students will learn mathematics through modeling real-world situations and will use a variety of problem-solving strategies.
• A2. Students will develop an understanding that mathematics is a growing discipline interrelated with many cultures and understand its connections to other disciplines.

• A3. Students will use appropriate technology to enhance their mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of their results.

• A4. Developmental mathematics faculty will be knowledgeable, caring, effective and provided with resources that support professional development.

• A5. The mathematics department will routinely assess the basic skills program to improve the curricula, materials and teaching methods and to help students attain a higher level of quantitative literacy.

The practices described in statement A1 are reflected in Standards for Intellectual Development I-1, I-2 and I-6 (Appendix C), Standards for Implementation IM-4 (Appendix F), along with Standards for Pedagogy P-4 (Appendix E). These particular standards emphasize the need for students to problem-solve and model mathematics. To achieve this goal, faculty members need to model lessons using multiple approaches to assist students in learning various problem-solving techniques.

The knowledge goals listed in statement A-2 are found in Standards for Intellectual Development I-4 (Appendix C) and Standards for Pedagogy P-3 (Appendix E). The importance of these standards is to ensure that students in basic skills classes see the mathematical connections between classroom knowledge and other disciplines and life experiences. Faculty members have the responsibility to offer meaningful
mathematical examples in the classroom that build on student experiences and connect math to other subjects.

The skills and practices described in statements A-3 are found in Standards for Intellectual Development I-6 (Appendix C) and Standards for Pedagogy P-1 and P-4 (Appendix E). These standards reflect the need for incorporating appropriate technology in the basic skills program to complement the math lab learning environment and to assist in students’ mathematical thinking. This can be accomplished through use of faculty designed lessons that make use of computer labs or classroom technology to enhance the student learning experience.

The characteristics and support listed in statements A-4 are found in Standards for Implementation IM-1 and IM-5 (Appendix F). The importance of this concept reflects the need for basic skills programs to have effective instructors who have the ability to create an environment that supports the learning of mathematics for each student. These instructors also need to engage in quality professional development that enhances their pedagogical knowledge and classroom techniques for basic skills programs at their institutions.

The practices described in statement A-5 are found in Standards for Implementation IM-2 and IM-3 (Appendix F). This emphasizes the need for routine evaluations of the basic skills program. This ongoing assessment will allow the department to make necessary changes to improve the curricula and teaching program. In turn, it is presumed that these modifications will improve student learning in basic skills
mathematics programs. Table 1.1 summarizes the relations between the five statements A1 – A5 and the 12 AMATYC standards addressed by the study.

Table 1.1

Summary of Standards aligned with Associated Teaching/Learning Statements

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All of the standards are meant to serve as a strong yet flexible framework for structuring successful basic mathematics courses for college students. However, the selected standards for this study can be observed in instructional practices and program assessment and do not rely solely on self-reported data. For instance, it might be difficult to document data regarding teacher self-reflection on classroom lessons or activities. Therefore, not all of the AMATYC standards were included in the scope of this study.

This study documented the practices and instructional policies used at one private institution in New Jersey for assisting students in developmental mathematics classes and determined how well they aligned with the AMATYC standards by addressing the following research questions.
Research Questions

1. What are the current practices and related policies used to bridge the mathematical gap for basic skills students in developmental mathematics classrooms, mathematics labs and/or computer labs at one post-secondary institution in New Jersey?

2. How are the current practices for this institution aligned with the principles and standards found in the AMATYC publications, *Crossroads* and *Beyond Crossroads*?

3. What are the barriers and supports to implementing the AMATYC standards?

4. How effective do those responsible for the basic skills program think their program is and what evidence do they have that supports their claims?

It was in response to AMATYC’s call for educational research that documents the implementation of its standards and the pressing need to understand and disseminate information about issues related to the implementation of standards-based basic skills policies and practices that I undertook this research.

To answer the four research questions, I gathered data from a single survey, visited and observed the math lab sessions, reviewed available departmental documents, and completed interviews with the mathematics chairperson, the basic skills director and one adjunct basic skills instructor at one small coeducational liberal arts college.

Selection of Study Site

The study site was a coeducational liberal arts college, with deeply rooted religious affiliations. The college is populated with students from diverse religious and
ethnic backgrounds. In 2011, the undergraduate enrollment was 1800 students. In 2009 the study site institution had a freshmen population that consisted of 12% African American students and 18.4% Hispanic students (American Federation of Teachers, 2010). (Tuition and fees for a full-time student for 2010-2011 was approximately $13,175.00/semester for students taking 12 to 18 credits.) The college has two campuses and the study site was conducted on the campus that housed the mathematics department. The selection of this institution was based on several criteria. The institution has a strong moral commitment to its students and strives to educate the students in a learner-centered environment. The mission of the college is to maintain a personalized and nurturing community for learners along with supportive academic experiences (Study Site website, 2010). These broad goals were well aligned with AMATYC standards.

In addition, the chairperson of the mathematics department and the director of the mathematics lab appeared to be committed to implementing the AMATYC standards in their basic skills program. Both of these faculty members were active participants or presenters at workshops and conferences that addressed issues related to basic skills programs.
Chapter 2. Review of the Literature

This study examined how twelve AMATYC standards had been implemented in the basic skills program at one four-year institution. The twelve standards that framed this study addressed:

- The use of authentic and meaningful lessons,
- The use of technology,
- The impact of a culturally responsive classroom environment,
- The qualifications for faculty and the level of support for professional development, and
- The need for ongoing program assessment.

The review of the literature begins with an overview of current research on teaching and learning. This is followed by a discussion about the need for implementing and evaluating standards. The remainder of the literature review focuses on research relevant to those pedagogical practices and institutional commitment.

Teaching and Learning

The goal of education, including basic skills mathematics education, is to assist students in developing learning strategies and intellectual tools that enables them to comprehend important subjects and topics (NRC, 2000). Effective instructional practices and methods for facilitating learning can positively influence the quality of formal education. Research has shown that one of the characteristics for effective education is learning with understanding (AMATYC, 1995, 2006; Hiebert & Carpenter, 1992; NRC, 2000, 2001a; NCTM, 2000b). In the past, many curricula stressed rote knowledge rather
than understanding. Students were primarily passive learners, expected to memorize facts and then pass tests that assessed the students' ability to recall those same facts. In *How People Learn*, the National Research Council (2000) clearly acknowledges the importance of facts and data. These pieces of information play a vital role in problem solving and critical thinking. However, a large body of knowledge of disconnected facts is not sufficient for a quality education. Facts, data and procedures must be "connected and organized around important concepts" (p. 9) for students to understand the related concept. This comprehension transforms factual information into usable knowledge. It enables students not only to remember the information, but also to transfer it to other contexts and subject areas.

Research has shown that active learning can play a positive role in the education of students (AMATYC, 1995, 2006; Hiebert & Carpenter, 1992; NRC, 2000, 2001a; NCTM, 2000b, Schoenfeld, 1992). An active learning environment allows individuals to take control of their own learning by recognizing what information they understand and when they need assistance in order to advance their understanding of what they are investigating. Proponents of active learning claim that teaching practices need to include activities and assignments that focus upon sense making and self-assessment (NRC, 2000, 2001; Schoenfeld, 1992). To optimize learning, especially with older students, classroom practices must be centered on the student (Cross, 1981). Pedagogical practices such as cooperative groups, think-pair-share, discovery, inquiry-based and interdisciplinary lessons are purposely designed to require the active participation of learners. In these active learning environments instructors "recognize the importance of
building upon the conceptual and cultural knowledge that students bring with them to the classroom” (NRC, 2000, p. 134). Furthermore, in learner-centered classrooms, assignments are challenging enough to ensure student engagement but not discouragingly difficult. Vygotsky (1986) discussed the zone of proximal development that describes a student's ability or readiness to learn new tasks with the support of more knowledgeable peers or adult guidance. The choice of assignments, for each student, should recognize this zone of proximal development in order to foster their intellectual growth. Designing problems and projects that are within a student's cognitive development are critically important for effective instruction. The tasks a student can perform today with assistance are the tasks a student can perform independently tomorrow (NRC, 2000). It is the instructor's role to recognize what each student knows and is capable of knowing with assistance. Literature related to differentiated instruction offers instructors ways to modify lessons for students with different readiness levels (Tomlinson, 1999, 2001). It suggests a variety of instructional approaches that appear to help students acquire knowledge and process curricular material. But, in order to create effective lessons, instructors need to know the differences and similarities of their students’ skill levels (1999, 2001).

Instructors, including college level basic skills mathematics instructors, need to be cognizant of the knowledge, skills, and interests that that their adult, or almost adult, students bring to the classroom. That is, effective learning environments are designed to focus on the students, what is taught, how it is taught, and how it is assessed (AMATYC, 1995, 2006; NRC, 2000, 2001a). Collaborative and cooperative learning are techniques
that encourage active student learning and increase an understanding of the course content (AMATYC, 1995, 2006; Good, Mulryan, & McCaslin, 1992; NRC, 2000, 2001a). Other strategies that increase student interest, curiosity and active learning include interactive lecturing and question posing (Marzano, Pickering, & Pollock, 2001). Teaching for learning with understanding is more difficult than teaching for rote learning. Often, pacing guides for curricula demand that instructors present too much material in too short a timeframe, causing students to merely memorize rather than understand (NRC, 2000, 2001a). Proponents of constructivist teaching and learning environments suggest that college level, basic skills math instructors need to embrace a change from teacher centered classrooms to student centered learning environments. Thus they also need to become informed about the related research and recommended practices for learning and teaching mathematics in an active learning environment (AMATYC, 2005).

The assessment of students must examine their understanding of concepts rather than their ability to merely repeat facts or demonstrate their mastery of skills. Assessment needs to be aligned with learning goals and should provide opportunities for feedback and even revision (Marzano et al., 2001; Stipek, 2002). Effective instructors offer feedback on a continual basis throughout the semester. During this process, they monitor student work individually and strive to link the material to other parts of the curriculum. This feedback can be through tests, worksheets, reports, and homework. However, feedback is most valuable when students have the opportunity to use it to revise their thinking (NRC, 2000, 2001a). For example, some software packages provide students with immediate feedback to their responses to prompts or questions. Instant
feedback confirms a correct response or allows students to discover and correct their errors immediately after they enter their responses. Some software packages that support this capability are the Hawkes Learning System (Hawkes Learning Systems, 2012), and MyMathLab (MyMathLab, 2011).

The age-old question of whether to teach the basics or focus on problem-solving skills continues to haunt many higher education institutions and school districts. Recognizing that no one method of teaching works universally for all students, in How People Learn (2000), the National Research Council stresses the need for both avenues:

Students’ abilities to acquire organized sets of facts and skills are actually enhanced when they are connected to meaningful problem-solving activities, and when students are helped to understand why, when and how those facts and skills are relevant. And attempts to teach thinking skills without a strong base of factual knowledge do not promote problem-solving ability or support transfer to new situations.

(p. 23)

Understanding how students learn, and based on that understanding, designing a classroom environment that maximizes their opportunities to learn, requires a collaborative effort and constant involvement of faculty members and administrators (AMATYC, 1995, 2006).

Need for Implementing, Evaluating and Maintaining Standards and Policy Guidelines
In this data-driven world, individuals need to be quantitatively literate in order to participate fully in a democratic society (Orrill, 1997; Wardrop & Wardrop, 1982). Mathematical literacy is an empowering resource for citizens who have constant access to quantitative information. Conversely, for those individuals who struggle and lack quantitative skills, the consequences can disable and marginalize them from becoming active members of society. Recognizing that 94% of all institutions of higher education offer basic skills courses, the need to address the mathematical deficiencies in many students is evident (Merisotis & Phipps, 2000). Establishing and maintaining effective standards and policies for basic skills mathematics is necessary since many of the students placed in those courses either “do not successfully complete the sequence of required courses or avoid taking math altogether and therefore never graduate” (Bryk & Treisman, 2010, p. B19). Thus, there is a need to continually revisit the goals, policies and standards for basic skills mathematics programs and courses to ensure that they are gateways, and not gatekeepers for student success in higher education.

In response to modern changes in society, technology, and education, the meaning of successful mathematics learning has undergone modifications. For example, the National Research Council adopted a comprehensive vision of successful mathematics learning, or evidence of mathematical proficiency, that is based upon research in math education and the experiences of mathematics teachers and learners (2001a). This vision identified five characteristics that should be evident in a mathematically proficient individual:
1. Conceptual understanding- which reflects a student’s ability to comprehend mathematical concepts, operations, and relations,
2. Procedural fluency- which reflects a student’s ability to carry out procedures accurately and efficiently,
3. Strategic competence- which reflects a student’s ability to formulate, represent and solve mathematical problems,
4. Adaptive reasoning- which reflects a student’s ability to logically think, reflect, explain, and justify steps taken within a problem, and
5. Productive disposition- which reflects a student’s ability to see mathematics as sensible, useful, and worthwhile, combined with a belief in diligence and one’s own efficacy.

These five characteristics of mathematical proficiency “are interwoven and interdependent in the development of proficiency of mathematics” (NRC, 2001a, p. 116). For successful mathematics comprehension, these characteristics should be addressed and well developed by the end of grade eight. Unfortunately, these characteristics also represent some of the mathematical gaps present in the mathematical knowledge of older students who progressed through middle school and high school and then to college.

In *Crossroads in Mathematics* (1995) and *Beyond Crossroads* (2006) AMATYC links NRC’s five characteristics of a mathematically proficient individual to standards for mathematics instruction during the first two years of college. Similar to the vision statement of the National Research Council (2001a), the AMATYC standards focus on developing quantitative literacy through not only students’ mathematics program but also
through other aspects of their academic experiences. The intent of these standards is to empower students with the ability to understand and engage meaningfully in mathematics and its role in other academic fields as well as in the world outside the classroom (AMATYC, 1995, 2006). To enable under prepared students for these courses requires thoughtful planning, skillful execution and continual evaluation of instruction within these basic skills programs. In particular, it is critical to have knowledgeable college mathematics instructors who understand how older students learn and can implement classroom practices that support their learning of basic skills mathematics (AMATYC, 1995, 2006; National Research Council, 2000, 2001a, 2001b, 2005).

The basic principles listed in *Crossroads in Mathematics* are that:

1. All students should grow in their knowledge of mathematics while attending college.
2. The mathematics that students study should be meaningful and relevant.
3. Mathematics must be taught as a laboratory discipline.
4. The use of technology is an essential part of an up-to-date curriculum.
5. Students will acquire mathematics through a carefully balanced educational program that emphasizes the content and instructional strategies recommended in the standards along with the viable components of traditional instruction.
6. Introductory college mathematics should significantly increase students’ options in educational and career choices.
7. Increased participation by all students in mathematics and in careers using mathematics is a critical goal in our heterogeneous society (AMATYC, 1995, p. 2-3).

To achieve the National Research Council’s goals for mathematically proficient individuals and the implementation of AMATYC’s standards, both the NRC and AMATYC recommend the cyclic evaluation of basic skills mathematics programs and their effectiveness. They call for continued improvement in course content, classroom pedagogy and professionalism that is monitored and evaluated on a regular basis. Students at all ages need to understand mathematics and implement it successfully to become productive citizens in our society and to make sense of their world. To reach this end, the AMATYC standards have been recognized as guides for developing and implementing programs for mathematics basic skills courses by focusing upon content, instruction and pedagogical principles (MAA, 2009; NADE, 2003; NCTM, 2000b).

Research has shown that K-16 reform efforts towards new standards often fall short and become largely unfocused before reaching the classroom (Chatterji, 2002; Cohen & Ball, 1990; Gess-Newsome, Southerland, Johnston, & Woodbury, 2003; Knapp, 1997). "Clear and useful policy guidelines for practitioners were lacking in the areas of instruction and funding. Teacher education was seen as lagging behind" (2002, p. 378). Often, it is the teachers' beliefs about teaching and learning that dictate the classroom structure and pedagogy. As a result, change can be difficult, if not impossible, to implement without changing teachers’ beliefs. At the university level, the following
observations were made by the Boyer Commission on Educating Undergraduates in Research Universities (1998):

For the most part, fundamental change has been shunned; universities have opted for cosmetic surgery, taking a nip here and a tuck there, when radical reconstruction is called for. Serious responses to complaints about undergraduate teaching have generated original and creative pedagogical and curricular experiments. But too often, bold and promising efforts have vanished after external grant support disappeared, have withered on the fringes of the curriculum, or have become so compromised that their originality has been lost. (Kenny, p. 6)

Shaw (1997) conducted a study at three urban community colleges that examined the different ways that state educational policies for remedial education were being implemented. She compiled case studies that described three very different pedagogical approaches to basic skills courses and the corresponding attitudes toward remedial students. She aptly named the three community colleges: Bootstrapper Community College, Nurturer Community College and Service Provider Community College. The ethnic/racial mix at all three colleges was predominantly composed of minority group students. The colleges were located in three different regions of the country: one in the Western United States, one in Northwestern United States and one in the Southwest. Shaw’s study examined how differences in educational philosophy at the three community colleges led to different interpretations and implementations of the varying
state educational policies. She called for more research to examine how closely institutions follow policy decisions made at the governmental level. Shaw also warns the reader of the “emerging state and system-level policy” (1997, p. 295) that is trending toward exclusionary remediation policies. Although the results of Shaw’s research are informative and add to knowledge base for remedial education at the college level, her study only examined three urban community colleges from three different states.

Researchers have tried to examine what characteristics are important for successful policy implementation (Chatterji, 2002; Confrey, 2006; Desimone, 2002; Hamilton, McCaffrey, Stecher, Klein, Robyn, & Bugliari, 2003; Knapp, 1997; Swanson & Stevenson, 2002). In the past, reform efforts focused mainly on changing institutional policies or organizations and failed to affect change within classrooms. Indeed, researchers find it difficult to measure the success or failure of reform attempts since policies are often implemented differently from site to site. Thus, reform models are subject to interpretation by local educators and often adapted or modified within individual school systems and classrooms to fit specific needs (Hamilton, et al.). Transforming the curriculum and the delivery of instruction are often the most difficult and resistant areas to change. Although these researchers were addressing school-based reform, their observations and recommendations appear to also apply to colleges and universities that traditionally have programs and faculty that are much more independent.

Desimone examined comprehensive school reform implementation and found that five characteristics play a key role in successful implementation. Her findings suggest that “the more specific, consistent, authoritative, powerful and stable a policy is, the
stronger its implementation will be” (2002, page 433). She uses the term specificity to describe the level of detail given to a particular policy. For example, are detailed guidelines or curricular frameworks given with a newly posited curriculum? Are there additional materials and possible pacing suggestions supplementing the supplied curriculum? Consistency within a curriculum represents similarities among various policies within a school. For instance, the curriculum can, and should, be reflecting the mission statement or vision of the institution. Specific policies attain authority through legislation or support from leaders and experts. Rewards or monetary incentives determine the level of power attributed to particular policies and stability corresponds to the degree to which key individuals, circumstances and policies persist over time. However, these structures alone are often not enough to sustain a systemic transformation within an institution (Desimone, 2002).

Using Authentic and Meaningful Lessons in the Mathematics Classroom

In one of its Implementation Standards, AMATYC (2006) discusses the need for mathematics faculty to “create an environment that optimizes the learning of mathematics for all students” (p. 17). Actions to support this standard include planning for and modeling classroom experiences with meaningful content and using multiple problem-solving approaches. AMATYC also stresses the need for colleges to have patience and offer support that builds confidence for struggling students. Developmental mathematics instructors can also benefit from having “knowledge of mathematics anxiety and associated coping strategies, motivation techniques and student learning styles” (AMATYC, 2006, p. 64). It would be incorrect to think that any full-time, part-time or
adjunct mathematics instructor can effectively teach the basic skills mathematics classes. Indeed, it is easier and more enjoyable for many mathematics professors to teach higher level, abstract courses to well-prepared students than to teach basic mathematics or elementary algebra to weak ones. The former students possess stronger learning skills and in general a better aptitude in mathematics, while students in the latter group have many gaps in their mathematical knowledge. To address those gaps requires the application of additional teaching methods by their instructor (Patterson & Sallee, 1986).

In 1987, a curriculum development study was performed to determine the needs of low achievers in mathematics in England. The Low Attainers Mathematics Project (LAMP) sought to develop and uncover best practices for struggling students (Backhouse, 1989). The findings of this study are consistent with other international studies performed in Malaysia and the United Kingdom (Yusof & Tall, 1999). In all three international studies, students often were able to learn skills-based lessons of basic skills but invariably forgot those skills once the next teaching unit began. However, by changing the classroom teaching methods and attitudes of the teachers, students were able to remember and achieve at higher levels. That is, as teachers revised their ideas about the teaching and learning of mathematics and implemented changes in the classroom, struggling students were more successful in their work. The use of authentic modeling and problem-solving techniques helped students improve their confidence and persistence in math classes. Problem-solving activities encouraged students to think for themselves, arrive at decisions and realize that even incorrect decisions can be stepping-stones on the path towards the solution. The students “found that they could explain
things to their friends, rather than simply satisfying the course requirements or pleasing
the instructor” (1999, p. 71).

The research by Backhouse and Yusof & Tall showed the importance of using
authentic, real-world pedagogy as well as nurturing pedagogy for successful instruction
with at-risk students. Their findings were limited to grade school students but use of
those teaching modes has been recommended for higher academic levels. In fact NRC
(2000) recommends the use of modeling at every grade level. Using Backhouse and
Yusof & Tall’s techniques of interviews and observations, a study at higher educational
levels such as high school or college might support the transferability of the findings.
Indeed, at the university level, Vasquez (2003) describes the need for building confidence
among basic skills mathematics students. Anxious students need to experience success in
the classroom to improve their confidence level. An interactive learning environment
that supports students in a nurturing environment with authentic, age-appropriate
problems has been shown to improve students’ confidence and their level of success.

Attitudes towards basic skills mathematics courses pose a barrier for many
students in meeting career aspirations because of stress and anxiety. For those who
struggle in mathematics, these courses act as gatekeepers that can effectively eliminate
possible occupational choices that use higher level mathematics (Stage & Kloosterman,
1995). Because students recognize the importance of passing these classes, they often
experience high levels of stress in basic skills classrooms. Research has shown that a
student’s attitude towards mathematics can affect their achievement in that subject
(Bessant, 1995; Clute, 1984; Ferguson, 1986; Ma & Kishor 1997; McLeod, 1994). The
findings in these studies suggest the need for nurturing teaching strategies that promote a sense of belongingness among students who would otherwise not see themselves as integral parts of the mathematics classroom, and as future participants in mathematical careers and the mathematics community (1994, p. 643).

These techniques could also be adapted to college basic skills courses in order to reduce the anxiety and stress experienced by those students. Students’ anxieties can also be caused by mathematical problems that are very abstract in nature. As noted, using concrete examples, modeling activities and sociocultural contexts within the curriculum were helpful for students learning new mathematical topics. These research findings stress the need for using lessons that recognize the variety of students’ backgrounds that exist in the college campus community and the wide range of students’ emotions regarding mathematics. Also, having an instructor who reassured students may reduce the anxiety found in basic skills mathematics students. Student beliefs about mathematics and themselves can be a factor in explaining success or failure in basic skills classrooms (Stage & Kloosterman, 1995). Further research involving teacher characteristics, characteristics of the students and with larger student populations was encouraged to complement this study.

Duranczyk (2007, 2008a, 2008b) conducted a study regarding successful developmental mathematics programs at a large Midwest public university. Its purpose was to assimilate students’ perspectives concerning the positive aspects of developmental math programs. Her findings suggest that nurturing pedagogy was an important contributing factor for student success in basic skills programs. It was the second most
dominant theme that emerged from the participant data. Caring faculty was mentioned a total of 37 times in 12 of the 20 interviews. “Over 66% of the 18 participants felt it was important to document the role of caring faculty in their mathematical achievements” (2008a, p. 25). She defines the characteristics of caring faculty as those who are willing to help students outside of class, willing to spend time with students in the tutorial center, encouraging students, giving students individual attention and respecting students regardless of their math ability. She calls for future research to study college-level basic skills mathematics programs, to examine the various programs being used and to uncover other techniques or classroom actions that foster student success.

**Using Technology within Mathematics Classrooms**

NRC (2000), NCTM (2000b), AMATYC (1995, 2006), and NADE (2002, 2003) discuss the importance of using technology within the mathematics classrooms to complement lessons and improve students’ computer/calculator skills. In *How People Learn*, the NRC discusses the importance of identifying and incorporating technology programs into the curriculum that are aligned with the principles of learning for understanding. These principles match those policies and standards found in *Crossroads* (1995) and *Beyond Crossroads* (2006). These three publications call for investigations exploring how technology “can be used as a tool to support knowledge building…and how it can further enhance the development of understanding key concepts” (NRC, 2000, p.256).

In examining the *Standards for Intellectual Development*, AMATYC (2006) outlines guidelines to ensure that students use appropriate technology to “enhance their
mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of their results” (Ch. 1, p. 5). Using technology within the classroom should be central and connected to the teaching and learning of mathematics. Using calculators, software packages and/or computer centers that support supplemental instruction are proven ways of incorporating technology into the classroom. For basic skills students, technology needs to be carefully incorporated within the curriculum. Many basic skills programs do not allow the use of calculators for many units of instruction, but recognize that some selected topics lend themselves nicely to the use of technology. Incorporation of technology whenever possible is paramount since all students need to become aware and knowledgeable about the power of technological tools. This can often be accomplished through activities, demonstrations and lab work (Vasquez, 2003).

Research has shown that students who struggle with mathematics benefit from technology within the curriculum (Ellington, 2003; Heid, 1997; Ruthven & Hennessy, 2002; Saracho, 1982). Ruthven & Hennessy studied the use of computer-based tools to assist high school students in learning mathematics. This study analyzed teachers’ accounts of successful use of graphing calculators and computer resources to improve the teaching and learning of mathematics. Seven secondary schools were studied and the findings showed that students who used calculators were more readily able to correct simple mathematical errors and were more likely to attempt alternative solution methods for posed problems than students who did not use calculators. The students with calculators were faster and more confident with mundane tasks that allowed for more
student participation and improved confidence in mathematics than those that did not use
calculators. Also, students who used calculators remained interested and persisted for a
longer time with the classroom activities. For students who needed additional
reinforcement with certain basic skills, teachers used interactive software packages, such
as SMILE or Omnigraph, that prompted students to practice particular concepts. From
the perspective of the teachers, the students seemed to enjoy this self-study technique,
since it allowed them to work at their own pace and to select particular topics they needed
to review. Ruthven & Hennessy’s research calls for additional studies to examine the
effects of information technology and graphing calculators in assisting student learning
and achieving goals for all levels of students in mathematics.

To better understand the role of calculators in mathematics education, Ellington
(2003) analyzed previous studies of calculator use in mathematics classrooms. She found
that most students using calculators held more positive attitudes towards mathematics
than students without access to this technology. Most of these studies were conducted in
classrooms in which teachers used traditional curriculums and therefore, the curriculum
materials were not specifically designed for calculator applications. Similar to
suggestions from NCTM (2000b) and AMATYC (2006), Ellington found a need for
further research that identified curriculum that would benefit from the use of calculators
and also enhance student learning.

As the technology revolution continues within the area of mathematics and
curriculum choices, the need for examining policy and standards at all educational levels
expands. One of the most important catalysts for efforts to reform mathematics education
is the continuing growth of computing technology (Heid, 1997). As new technologies continue to impact the teaching and learning of mathematics, there is an increased need to carefully examine, or reexamine, how they impact our curriculum, pedagogy and policies. New technologies allow mathematics classroom to transcend paper and pencil limitations and enable students to investigate and explore mathematical activities more deeply. However, it is not possible to continue adding to an already over-crowded curriculum. Heid calls upon researchers to reexamine policies and curricula in order to identify topics that, with the aid of technology, could be more easily and more efficiently learned as well as topics that should be removed from, and new topics that should be added to, the curriculum. Related to this technology-driven increase in the examination of policies and curricula is the adequacy of the preparation of K-12 teachers, and by extension, the preparation of those teaching in the first two years of college.

Using Culturally Relevant Pedagogy within Mathematics Classrooms

Effective instruction for mathematics requires the use of proper instructional materials, current technology and instructors that both recognize and honor their students’ diverse backgrounds. In describing the standards for effective instruction, AMATYC (2006) suggests using lessons that engage students in understanding “major public policy issues” (p. 40) as well as lesson that address the contributions to mathematics by different cultures. The responsibility for developing these types of curriculum materials should be shared by the entire college community, including those responsible for basic skills mathematics.
Through all grade levels, research has shown that students from ethnically diverse backgrounds experience school failure due to a mismatch between home culture and school culture (Delpit, 2004; Ladson-Billings 1995, 1997; Perry, Steele, & Hilliard III, 2003). To address this disparity, innovative educators have focused on the need for connections between school lessons and the community culture (Edwards, 2001; Ladson-Billings, 1994, 1995, 1997, 1998, 2001). Because teachers play an integral role in the achievement levels of their students, making this link can be one of the keys to educational success for students whose culture is different from that of mainstream America.

Although community culture varies greatly from community to community, and often within a single community, connecting mathematics to cultures, other than the dominant western European culture, enriches the broader knowledge of all students. In some neighborhood schools, students may be representative of only a few cultures while in others, especially in urban areas with large numbers of new immigrants, they may be representative of dozens of cultures. Similarly, a broad range of student/family/community cultures is often observed at the collegiate level.

Focusing on the school community and incorporating community activities into meaningful lessons is a distinctive trait of culturally responsive teachers. Haberman & Post (1998) contend that one of the essential ingredients found in culturally responsive teaching is “community knowledge” (p. 98). Those teachers possess a basic knowledge of the heritage of the students and their traditions that helps them develop multicultural lessons stemming from the life experiences of their students. Students of all ages need to
feel connected to their education in order for it to be meaningful to them. Implementing lessons that bridge community, heritage, and school has proven to be an effective teaching tool that engages students in those lessons (Edwards, 2001).

Ladson-Billings (1994) conducted a qualitative research study examining the classroom practices of eight highly skilled grade school teachers who implemented culturally relevant teaching during the school year. Using a poll, the parents, principals and colleagues selected the eight teachers because of their academic, social, and emotional successes with students. The study used classroom observations, videotaping and interviews to identify the teaching characteristics that were common to these eight teachers.

There were four common characteristics in these teachers’ pedagogical practices. First, the teachers used concrete experiences instead of theoretical ideas in their lessons. Second, the teachers used dialogue as a method of discovery and discussed topics with students. These teachers spoke with the students not to the students, which opened the door to their students’ interests and areas of expertise. Third, the teachers exhibited nurturing and caring relationships with their students. The teachers took great care to identify with the students and knew about their family, culture and home situations. During the interviews, the teachers often stated how much they cared about the future of their students. Findings from classroom observations confirmed that this “ethic of caring” (Ladson-Billings, 1994, p. 156) was evident in their daily activities. The final characteristic exhibited by each teacher was her sense of personal accountability for her
students and herself. Success for these students was not an option: “These children are the future…they have the brain power but they need the opportunity” (p. 90).

Just as post-secondary educational institutions have responded differently to the need for providing remedial education to their entering students (Shaw, 1997), research has shown that marked differences exist among student’s reaction to the same educational environment (Castle, 1993; Tate, 1995; Traub, 1994). Student retention in post-secondary education is directly related and influenced by these perceptual differences. Both Castle and Traub claim that effective college retention efforts must include recognition of race and ethnic diversity on campus and in the classrooms. Campus linguistic and cultural diversity needs to be incorporated into classroom experiences in order for minority students to gain a sense of belonging within the academic community. With respect to mathematics classes, Tate concludes that the educational system is failing African American students by neglecting to provide them with a curriculum that is centered on their experiences, culture and traditions. This poses a major obstacle towards achieving equity in the mathematics classroom. Because there is a high percentage of African American and Hispanics enrolled in basic skills courses, the use of culturally responsive pedagogy is of great importance in these classes (Arendale, 2000; Castle, 1993).

The nature of college level, culturally responsive pedagogy has been described in a variety of ways. This may be due to the diverse group of practitioners, researchers and educational scholars who have examined this topic from political, personal, pedagogical and philosophical vantage points (Gay, 2000, 2002, 2003). Definitions range from those
that focused on the cultural characteristics of diverse groups to those that examined social problems facing society, for instance, the allocation of economic resources or the financial response of nations to the 2010 earthquake in Haiti. Indeed, culture counts and “is at the heart of all we do in the name of education, whether that is curriculum, instruction, administration, or performance assessment” (Gay, 2000, p. 8).

Culturally responsive pedagogy can be viewed as an approach to teaching and learning that is anchored in democratic values. It is designed to achieve educational equality by using a curriculum that fosters understanding about ethnic groups and social justice. As Gay (2000) states,

The specific content, structures, and practices employed in achieving multicultural education will differ depending on the setting. Therefore, it is useful for educators to develop their own definitions of multicultural education…to fit their specific needs, rather than imposing a universal structure to implement multicultural education.

(p. 4)

Teachers need to be aware of both the personal and cultural knowledge of students for curriculum development for contemporary classrooms (Banks, 1993, 1995; Bennett 2001). When designing curriculum, “teachers can use student cultural knowledge as a vehicle to motivate students and as a foundation for teaching school knowledge” (Banks, 1993, p. 8). At the college level, multicultural education can help students become more proficient in their reading, writing, and basic skills mathematics. Culturally responsive pedagogy improves the students’ critical thinking and problem
solving skills by providing content and techniques that are more meaningful to them. This type of instruction is often a source of emotional strength that can motivate students to improve academically, socially, civically and personally (Amos, 2003; Hackett, 2003). Students who possess a positive self-image about their cultural and ethnic identities tend to perform better academically than students who are lacking this characteristic. Because these positive ethnic identities are not automatic for students, teachers need to incorporate teaching methods, such as culturally responsive pedagogy, to instill and foster this trait.

In Gay’s (1994) article, *A Synthesis of Scholarship in Multicultural Education*, she acknowledges the lack of substantial research involving culturally responsive pedagogy. She attributes this to the fact that this field is still in its early stages of development. Also, multicultural education “is a very heavily affective endeavor … and does not lend itself easily to traditional empirical research methods and paradigms” (p. 25). Many of the success stories of culturally responsive pedagogy are autobiographical in nature, told by leaders in the field, but not found as readily in conference presentations or scholarly presentations. Gay (1994, 2000, 2002) and Bennett (2001) discuss the need for additional research in multicultural education by examining current school practice at all grade levels and the effects these practices have on the student learning. Both authors also encouraged additional research that explored the selection, design and analysis of curriculum content and, if possible, how this content affects the achievement of students. Educators and researchers are called to examine cultural styles of teaching and learning along with curriculum reform via personal action-research projects.
Nationally, approximately one-third of college freshmen enroll in basic skills courses due to remediation needs. Underrepresented minority students, namely, African American, Hispanics and American Indians are nearly twice as likely to be enrolled in basic skills courses as Asian American and White students (ACT, 2010). The incorporation of culturally responsive and authentic mathematics helps students make connections between mathematical topics and their lives. “Students who understand the role that mathematics has played in their cultures and the contributions of their cultures to mathematics are more likely to persevere in their study of the discipline” (AMATYC, 1995, Ch.2, p. 9).

The Importance of Professional Development in Mathematics Programs

Research has shown that one of the critical components needed for successful educational reform is significant professional development (Chatterji, 2002; Desimone, 2002; Desimone, Porter, Garet, Yoon & Birman, 2002; Knapp, 1997; Porter, Blank, Smithson & Osthoff, 2005). Professional development can involve technical assistance and training, opportunities to learn about new content and alternative pedagogies, and access to appropriate materials specific to a particular educational context. Desimone (2002) calls for additional studies that examine the effects of professional development on classroom practice. She describes the need for research to determine how much professional development is adequate but not stifling. She also states the need for further research to observe classrooms in which policy changes are being enacted. “Documenting what happens in the classroom in a comprehensive and systematic way would go a long way towards helping us understand how specific changes in content and
teaching strategies affect student learning” (p. 469). She also suggests gathering data using multiple methods such as interviews, surveys, observations and questionnaires. Even though her research involved K-12 programs, the components of her analysis: policy implementation, instructional strategy, support from administration, and professional growth, are factors that also affect post-secondary education. Because of these connections, her findings may be transferrable and helpful to the higher education community.

At the college level, Gess-Newsome et al. (2003) examined the practices of three college science professors who were designing a new grant-supported course. This particular science department, like many other college departments, had issued many documents and guidelines intended to instill reform efforts in their classrooms. The guidelines for this particular course called for “an integrated, inquiry-based science course” (p. 731). It called for the development of deep conceptual, scientific knowledge for students using teaching strategies that required a fundamental change in current classroom practice and teacher thinking. These changes were intended to instill more student discovery and less direct instruction by the professors.

The findings of this study revealed the different approaches that educators employ when faced with similar pedagogical assignments. Each of the instructors brought their personal educational biases to the classroom and attempted to instill reform efforts with varying degrees of success. Furthermore, the findings of the study claimed that the intended changes did not occur within the classroom. Finally, the authors stated that the instructors’ personal beliefs about teaching appeared to be the most powerful influence
on instructional practices. Although grant funding aided in the development of a new science course, funding was not the key factor that instigated the desire for systemic change that is inherently difficult to implement. Because reform proposals rarely alter important aspects of teachers' knowledge and classroom beliefs, enactment of proposed pedagogical reforms is slow. According to the findings of this study, unless instructors are dissatisfied with the current curriculum, they often have little motivation to engage in reform efforts and classrooms remain remarkably traditional.

The Gess-Newsome et al. (2003) study calls for additional research to determine what makes instructors change their current methods of teaching to meet newly established policies. How important is grant support and revised curricular material to professors when they are instituting new policies? How important is allowing instructors to have time to review of new materials? How important is instructor dissatisfaction in originating policy reform and what characteristics make individuals ready for change in the classroom? How important is providing assistance in supporting individual professors or groups of professors who are ready to implement reform strategies?

*Principles and Standards for School Mathematics* (NCTM, 2000b), *Crossroads in Mathematics* (AMATYC, 1995) and *Beyond Crossroads* (AMATYC, 2006) discuss the need for students to learn key mathematical concepts and mathematical processes with understanding. The goal is to create mathematically knowledgeable students who can communicate mathematical concepts and use problem solving and reasoning skills effectively. However, achieving this goal presents many challenges to current
mathematics teachers and instructors, who often have not had the opportunity to learn mathematics using meaningful or thoughtful lessons. As stated by Smith (2001):

Although there is considerable consensus that meeting these challenges will require that teachers have deep insights about mathematics, about students as learners of mathematics, and about pedagogy that will support students’ learning, there has been little consensus on how teachers should acquire this knowledge. (p.1)

The National Council of Teachers of Mathematics (2000b), Mathematical Association of America (2009), and AMATYC (1995, 2006) acknowledge and support the need for teachers and instructors at all levels to receive sustained, constructive, professional education to ensure quality mathematics instruction in the classroom and implementation of new policies and standards. Both novice and seasoned mathematics teachers must continue to extend their knowledge by learning new mathematics and its applications, by implementing new technology, and by being mindful of how students learn mathematics.

Embedding mathematics into authentic and real-world assignments is a challenge for many instructors since they learned mathematics using a more traditional, algorithmic approach (Donovan, 2008). Adjusting teaching methods to reflect the results of recent research about how students learn mathematics, and extending one’s pedagogical knowledge to incorporate new technology, curriculum and teaching practices can be a very slow and uncomfortable process (Fuson, Kalchman & Bransford, 2005; NCTM, 2000b; Smith, 2001).
It would be unfair to expect teachers and instructors to undertake this transformation without the support of quality professional development. At all educational levels, and as stated in most, if not all, policy and standard guidelines, professional development programs directed at maintaining and improving classroom instructional expertise are essential for all educators (AMATYC, 1995, 2006; Darling-Hammond, 1996; MAA, 2009; NCTM, 2000b). Each mathematics department has the responsibility to support professional development for all its members to ensure they are all informed about the latest advances in mathematics education. Ideally, this professional development should be an ongoing process that addresses both pedagogical and content knowledge that clearly connects to the classroom (AMATYC, 1995, 2006; Lieberman, Saxl & Miles, 2000; Little, 2000; MAA, 2009; NCTM, 2000a, 2000b; Wheatley, 2000).

On most campuses, the mathematics department employs part-time and adjunct faculty members to teach developmental courses. Indeed, MAA (2009) cautions that “many mathematical sciences programs today tend to have too large a percentage of part-time faculty and, over time, should convert part-time positions into full-time positions” (p.7). However, part-time instructors play a necessary role and some make unique contributions to mathematics departments. To ensure quality instruction in all courses, part-time faculty need access to pedagogical resources that are comparable to those available to full-time faculty, along with appropriate professional development opportunities (Astin, 1998; MAA, 2009). This includes participation in “seminars,
graduate level mathematical sciences courses, appropriate courses in other disciplines, conferences, symposia, short courses, and professional meetings” (2009, p. 5).

The principles and guidelines stated in *Crossroads* (AMATYC, 1995) and *Beyond Crossroads* (AMATYC, 2006) stress the need for qualified faculty members, who are engaged in professional development and demonstrate a willingness to foster change in the teaching and learning environment. It is not enough for instructors to have mathematical expertise; they must also have the ability to design curricular pathways for students to acquire mathematical competencies. Through supportive professional development, faculty members can cultivate pedagogical strategies and deepen their own mathematical content knowledge (AMATYC, 1995, 2006; MAA, 2009). Constructive professional development can be a driving force that can increase the student success rates in mathematics programs.

The standard for quality professional development recognizes the need for a long-term commitment to educator growth and development that continues throughout the course of an instructor/teacher’s career (AMATYC, 1995, 2006; NCTM 2000b, Ryan & Cooper, 1998; Smith, 2001). Faculty members’ continuation with professional development, collaboration with knowledgeable peers and thoughtful reflection on classroom practices are necessary for implementing changes to a mathematics program.

**Summary**

The United States is facing an educational crisis at the college-level in regards to students who are not prepared for post-secondary work (Castle, 1993; Patterson & Sallee, 1986; Stigler, Givvin & Thompson, 2010). Data show that approximately 57% of
community college attendees (AMATYC, 2006) and approximately 22% of four-year college freshmen (U.S. Department of Education, 2001) were being placed into developmental mathematics classes. Too often, the freshman year of college “has been reduced to remediation or repetition of high school course material, rather than an introduction to a new and broader arena for learning” (Kenny, 1998, p. 1). Compounding this issue, due to the sequential nature of these classes, basic skills students placed in the lower-level math tier, often face two semesters of remedial coursework before they are able to enroll in a college-level course (Bryk & Treisman, 2010). Developmental mathematics programs have become the gatekeeper for completing a college degree for many students. As a result, the successful completion of basic skills courses may have substantial consequences for a student’s future academic experiences, employment and earnings potential.

The AMATYC standards and related publications are intended to “stimulate faculty, departments and institutions to examine, assess, and improve every component of mathematics education in the first two years of college” (2006, p.1). They can serve as a guide for

- identifying research-based methodologies that promote student success,
- creating standards-based mathematics courses, and
- promoting professional growth for instructors.

As seen in this literature review, many mathematical organizations recognize the need to routinely evaluate the effectiveness and currency of a program’s policies in connection with the program’s regular review cycle (AMATYC, 1995, 2006; MAA,
The National Mathematics Advisory Panel (2008) offers as one of its principal messages for improved mathematics education that “the nation must continue to build capacity for more rigorous research in education so that it can inform policy and practice more effectively” (p. xiv). However, it is evident that simply stating policies and standards for basic skills mathematics does not ensure that institutions will incorporate those standards within their programs. To obtain a measure of the success of a program’s policies, there have been calls for more research to examine the implementation of standards and policies for post-secondary mathematics courses, which include basic skills mathematics courses (AMATYC, 1995, 2006; MAA, 2009; NADE, 2002, 2003). To add to the existing body of knowledge about post-secondary basic skills mathematics education, this study examined twelve AMATYC standards at one four-year institution in order to determine the extent to which those standards were being successfully implemented.
Chapter 3. Methodology

My teaching experiences at a small private college included basic skills mathematics courses. Thus I experienced first-hand the challenges, and to a lesser extent, the rewards of teaching those courses. But more importantly, I saw how daunting the mathematics basic skills curriculum was for most students. Later, I became aware of the AMATYC standards and the recommendations of other organizations for college mathematics courses, including basic skills courses, and that the basic skills curriculum was delivered in a variety of ways at other institutions. And yet there did not seem to be any institution claiming to have a successful approach that might be transferrable to other locations.

As noted in the review of the literature, there have been calls for additional research into many aspects of basic skills mathematical programs by individuals and organizations (AMATYC, 1995, 2006; Bennett, 2001, Duranczyk, 2008b; Gay, 1994, 2000, 2002; Gess-Newsome et al., 2003; MAA, 2009; NRC, 2005; Smith, 2001; Stage & Kloosterman, 1995). It was because of this need for information about basic skills programs that were experiencing some success that I undertook this study. I wanted to gain a deep understanding of how AMATYC standards were being interpreted and acted upon by program administrators and faculty.

To prepare for this study, in addition to conducting a literature review, I researched the AMATYC standards and selected those applicable to a basic skills program. See Appendices C, D, E and F for a list of those standards. Another aspect of my preparation for this study was my participation in a MAA workshop and a NADE
conference that presented implementation suggestions in alignment with those standards.

After discussions with my committee I developed the following eight, more focused, guiding questions. Those eight questions are listed next.

**Guiding Questions**

1. Within the basic skills classrooms/labs, what pedagogical strategies are being used and are these strategies reflective of the AMATYC policies, standards and guidelines?

2. Within the basics skills classrooms/labs, how do instructors connect mathematics to other cultures and disciplines and are these strategies reflective of the AMATYC policies, standards and guidelines?

3. Within the basic skills classrooms/labs, in what ways is technology being used to enhance students' mathematical thinking and understanding and are these strategies reflective of the AMATYC policies, standards and guidelines?

4. As reflected in AMATYC policies, standards and guidelines, how are instructors of basic skills using nurturing pedagogy and in what ways have they been affected by professional development?

5. Are the chairperson/instructors' visions of a basic skills mathematics program representative of this program and are these visions reflective of the AMATYC policies, standards and guidelines?

6. What specific actions has the chairperson taken to incorporate the AMATYC policies, standards and guidelines into the basic skills program?
7. How are the chairperson/instructors’ beliefs about teaching and learning incorporated into the basic skills program?

8. How do the chairperson/instructors’ beliefs about teaching and learning compare to the beliefs reflected in the AMATYC policies, standards, and guidelines?

**Research Design**

A qualitative design was appropriate for this research because “qualitative methods can contribute to useful evaluation, practical problem solving, real-world decision making…and policy analysis” (Patton, 2002, p.145). A case study can involve “… a single individual, group, event, institution or culture” (Wiersma, 2000, p. 455). That is a case study “… is an inquiry that studies a phenomenon within its real-life context,” (Hubbard & Power, 1993, p. 153). I used a case study methodology to collect, analyze and present descriptive information about the basic skills program at one institution using several data collection methods that enabled me to triangulate my data.

Prior to starting any data collection, I prepared, submitted and had my study procedures approved by the Institutional Review Boards (IRB) at Montclair State University and the study site institution for all aspects of this research. Data collection activities involving human participants began shortly after I received approval from those IRBs.

**Procedures**

**Data collection.** I employed several data-gathering methods for this research, namely, one survey, interviews with audio recording, field-based observations supported by detailed field notes, and the review of available departmental documents.
incorporated the use of a research journal to organize and oversee the entire project. Following the recommendations of Creswell (1998) the data was coded, sorted, and categorized. This process helped me develop an analytic framework for the qualitative data.

Through multiple visits to the study site, as well as through correspondence by email and phone, I collected data that reflected institutional policies and practices, concerns of key basic skills personnel, and plans for the future direction of their basic skills mathematics program. During interviews, thoughtful responses from program staff helped me gather information about the evolution of the program and its instructional and evaluation practices. Observations of the mathematics/computer lab sessions allowed me to see those practices in action and to observe the dynamics within the math lab setting.

Data collection instruments and methodologies.

Survey. After some initial contact by phone and email, an introductory letter (see Appendix G) with a survey (see Appendix H) was presented to the mathematics chairperson at the study site. Before collecting data from any participant, the mathematics chairperson and other participants reviewed and signed consent forms that had been reviewed and approved by both the Montclair State and study site’s Institutional Review Boards (see Appendices I and J for copies of the chairperson and instructor consent forms respectively). The survey asked for general information such as the percentage of students taking basic skills courses and the type of basic skills courses offered. After delivering the survey, I made arrangements to visit the college for the
initial interviews and to arrange my observations of the mathematics/computer lab sessions.

**Interviews.** I used a combined approach for interviewing the mathematics department chair and basic skills faculty. This involved a mix of the standardized open-ended format and the conversational strategy. As stated by Patton (2002):

This combined strategy offers the interviewer flexibility in probing and in determining when it is appropriate to explore certain subjects in greater depth, or even to pose questions about new areas of inquiry that were not originally anticipated in the interview instrument’s development. (p 347)

The mathematics department chairperson and basic skills teachers knew I was interested in exploring their experiences with basic skills mathematics courses and if they were aligned with the AMATYC standards. The interviews gave these educators an opportunity to share their thoughts and opinions about the program and to discuss present and past experiences with basic skills courses at their institution. For sample interview questions for chairperson and instructors, see Appendices K and L respectively.

**Audio.** I was able to audiotape each interview since all participants were comfortable with being recorded. Although I took notes during each session, the audio recorder allowed me to collect any conversational data that I inadvertently missed. Creswell (1998) notes the importance of using audio-recording devices since the interviewer’s hastily inscribed notes will be incomplete because of the complexity in asking questions and writing responses concurrently. By backing up the interviews with audiotapes, I was able to ensure the accuracy of the dialogue. I transcribed the contents
of these tapes onto my computer and the transcriptions complemented my interview notes.

**Field based observations.** During each math/computer lab observation, I wrote field notes to capture the math lab experience through the lens of the student and teacher. These notes were detailed and filled with “thick, deep and rich description” (Patton, 2002, p. 331). I incorporated the math lab setting, student/teacher dialogue and student/teacher action during the observations. I incorporated a reflective component within these notes by including my thoughts and feelings about the field observation. I did not collect data specific to any student in the math/computer lab. At the start of each observation, I supplied each student with a handout stating that information (see Appendix I).

**Research journal.** I gathered large amounts of data that needed to be organized and documented in an orderly fashion. My research journal acted as a tool for recording dates and college visits and my reflections regarding each visit. When scheduling changes occurred, this journal was a means of tracking and justifying changes that occurred throughout the course of this study.

**Additional data collection.** The math chairperson and the lab director agreed to participate in follow-up interviews, emails and phone conversations to answer additional questions and clarify any questionable information. Subsequent emails and interviews were conducted over the 2011 summer months. These emails included attached course syllabi, lesson plans, the completed survey and copies of the institution’s mission statements. I also had obtained copies of the basic skills texts to examine and the math
lab director taught me how to use the software they used to support the mastering of procedural skills with their basic skills students.

As the fall semester approached, I asked the department chairperson to recommend one to three basic skills teachers I could interview in order to get their perspective on the program. Acting on her recommendation, I interviewed Victor who was scheduled to teach two sections of a basic skills course. Following the interview I transcribed the audiotape and my written notes into a computer file.

During the fall math/computer lab observations, I found an unobtrusive location from which I could observe the interactions between the individuals in the lab. I distributed an information handout to any student in the lab stating that I was observing the math lab assistants and not any students (see Appendix W). I took pictures and notes about the lab environment, the lab assistant’s teaching/tutoring style, and the interactions between the individuals. After each college visit, I transcribed my field notes into a computer data file. All of my computerized data for this study is stored on my personal laptop that is protected by a password that is known only by me. I recorded my overall impressions regarding the basic skills program and the dynamics of the math lab in my research journal. These notes were more reflective in nature, while the field notes were more descriptive. All notes and journals are kept in a locked file in my office and I am the only person who has the key.

Data Analytic Methods

This study generated a sizeable amount of data for analysis. Therefore, I needed to maintain orderly data from the very first day. Creswell (1998) describes the need for
organization in qualitative research and recommends the use of stages for proper data analysis and representation. He outlines these stages using six steps: data managing, reading and recording, describing, classifying, interpreting and lastly, representing and visualizing.

Once the very first piece of data was collected, I began to organize computer files, back-up copies and hard copy files for this research. As I obtained additional information I stored it on a computer file or in the locked file I maintained for hard copies of data.

After I gathered all of the information from the basic skills survey, departmental documents, chairperson/instructor interviews and math lab observations, I began the process of reading through the interviews, and field notes. During this process, I made annotations and began the initial coding of these readings. For the observations, I described the setting and the classroom experiences of the participants by using key words in the margins of my notes. Interview and observation data added depth, detail and meaning to the other data. Thus, by analyzing and triangulating the interview and observational data with that from catalogs and course syllabi I was able to initially organize the data using the eight guiding questions.

Once I completed the initial coding for the interviews, departmental documents, and observations, I classified the data by searching for “themes and patterned regularities” (Creswell, 1998, p.149) such as varied instructional techniques, nurturing environment, interest in improvement of program or personal teaching techniques. To accomplish this, I looked for general categories by reading and re-reading the data in a spiraling fashion to capture the essence of the data. Because my data involved different
instructors and observations, I first, looked for and recorded developing themes or teaching philosophies that emerged for each instructor. Once this step was completed for each participating instructor, I examined the data from all the instructors to determine any common patterns for instruction and policy within the department.

To properly interpret the data, I needed to use the themes from the descriptive coded data to extract meaningful deductions. As stated by Patton (2002):

This descriptive phase of analysis builds a foundation for the interpretive phase when meanings are extracted from the data, comparisons are made, creative frameworks for interpretation are constructed, conclusions are drawn, significance is determined, and, in some cases, theory is generated. (p. 465)

At this stage, I looked for solid and consistent evidence that supported my findings for the research. This involved triangulation of the data, i.e., seeing similar findings from multiple research methods. By using interviews, observations and data from the survey, I hoped to solidify any interpretations that I made from this research data.

Validity / Trustworthiness

One of the main concerns in performing a qualitative study is ensuring that the findings are valid and trustworthy. As a qualitative researcher I needed to show that I took steps to verify the accuracy of the findings. To aid in this process, Guba & Lincoln (1989) identify four criteria – credibility, transferability, dependability and confirmability – to assist qualitative researchers in evaluating the trustworthiness of a study.
Credibility, as defined by Guba & Lincoln, establishes “a match between the constructed realities of respondents and those realities as represented by the evaluator” (1989, p. 237). Credibility in a qualitative research project is essential; otherwise the readers should not judge the findings of the study worthy of belief. To enhance the credibility in my study, I used several strategies.

The first strategy that I employed in my study was the use of triangulation of my data sources. This enabled me to compare and cross check the consistency of the data obtained at different times and by different modes. The second strategy I used was to engage in self-reflection and record in my research journal as the study progressed. By doing this in a direct and honest manner from the start of my study, a data audit would reveal any biases in my perspectives of the study site or the data. However, I believe that I have accurately represented the data and that by using multiple data sources, data triangulation supports this claim. In addition, when necessary I used the process of “member checking” to clarify and confirm data that I received from participants for which there was any ambiguity the readers are aware of my perspectives, which add to the credibility of my study (Guba & Lincoln, 1985, p. 314).

Transferability of a study “checks the degree of similarity between sending and receiving contexts” (Guba & Lincoln, 1989, p. 241). It asks the question: Are the findings from one study similar enough to be transferable or applicable to another context? Although qualitative researchers do not seek to generalize results of case studies, the results can be transferable. This transferability can be found in suggested questions or areas for further investigation, possible hypotheses and future implications.
Qualitative studies do not seek to produce findings that are reproducible, as is the case in physical or biological research conducted in a laboratory. Reproducing social phenomena is not feasible because “it is nearly impossible to replicate the original conditions under which data were collected or to control all the variables that might possibly affect findings” (p. 266). However, this concept of transferability can be applicable to qualitative studies. I used “thick, rich description” (Creswell, 2003, p. 196) to report the data which gives the readers the ability to judge the findings and possibly transfer these findings to their situations.

A third criterion specified by Guba & Lincoln (1989) that enhances trustworthiness of qualitative research is dependability. This construct is “concerned with the stability of the data over time” (p. 242). Although changes in methodology may occur in some qualitative studies, I have been vigilant in tracking and documenting these shifts for the study to be considered dependable. By using a technique called a dependability audit, any outside reviewer is able to trace or track the “logic of process and method decisions” (p. 242). The audit provides a reader with the steps and the decisions I made, along with any changes that I needed to implement during the study. I documented this process in my research journal to offer the reader a path or method for tracing my steps in this study.

The final criterion for ensuring the trustworthiness of qualitative research is confirmability. Guba & Lincoln (1989) define confirmability as being “concerned with assuring that data, interpretations and outcomes of inquiries are rooted in contexts and persons apart from the evaluator and are not simply figments of the evaluator’s
imagination” (p. 242). To accomplish this, I have ensured that all facts, figures, and constructions of data are traceable to sources and the logic used to draw interpretations from the data is explicitly stated in the study.

**Ethical Considerations**

Qualitative researchers face many ethical issues when conducting studies involving human participants. These concerns “surface during data collection in the field and in analysis and dissemination of qualitative reports” (Creswell, 2003, p.132). In my initial contact letter, I clearly stated that participation in this study was voluntary and withdrawal from the study was permitted at any time. When this institution agreed to participate in the study, I had IRB approved consent forms for the interviewees to sign before the interview began. I also informed the participants that during the interview, they could refuse to answer any question that made them uneasy or uncomfortable. I explained how my research data would be seen only by me and their real names and real school name would not be used in the write-up. I allowed each participant to select a pseudonym that I used in place of his or her real name and college name. I also assured the participants that all of my notes and audio recordings would be safely locked in a file cabinet or stored in computer files safeguarded by a password known only by me.

**Limitations and Significance**

Because I explored the various practices used for basic skills mathematics at only one New Jersey college, the findings of this study are not intended to be generalizable to all institutions. This study does not claim that any one pedagogical method is clearly better than another because what works well in one particular school might not work well
in another setting. However, I am providing readers with detailed descriptions of the policies, pedagogical views, and instructional practices used to support the teaching of basic mathematics skills at the study site. Using this information, readers can determine if this study’s findings might be transferable to their particular setting.

In performing this research, I used interview and observational data from three faculty members who teach basic skills mathematics courses at the study site. These three individuals were the math chairperson, the math lab director and one adjunct faculty member. Because there are additional basic skills faculty members at this institution, this study cannot claim that it reflects the views of all basic skills instructors. However, the three selected instructors represent faculty members who have varying levels of responsibility in the basic skills mathematics program. This range can provide readers with the different perspectives of these three individuals regarding the basic skills program at the study site.
Chapter 4. Data Analysis and Findings

This chapter presents the qualitative analysis and findings for the study’s eight guiding questions. Using program characteristics that reflect AMATYC policies and standards as guidelines, the analysis explores documented and observed policies, instructional methods and materials, software, and the academic preparation and professional development opportunities for instructional staff associated with the study site’s basic skills mathematics program. Qualitative data from a survey, departmental syllabi, interviews, lesson plans, course texts, math lab observations, and professional development data, as well as implementation recommendations from a 2009 MAA workshop and 2010 NADE conference were used for this analysis.

Before addressing the eight questions, some basic information about courses, faculty, and technology at the study site is provided. This information provides a rich description of the mathematics basic skills teaching and learning environment that aids in understanding the responses to the guiding questions. The section begins with an overview of the history of the basic skills program.

Program History

Prior to 2004, the basic skills mathematics curriculum was primarily based on material selected from a required textbook without supplemental software. In 2004 the mathematics department opened their math lab. In the 2007 the Hawkes, mastery-based educational software was installed on the lab’s computers. The software is also installed on computers in all of the other college computer labs. It is possible for students to install the software on their own computer but for a variety of reasons some do not take
advantage of this option. The lab is open to all students who can “drop-in” 40 hours per week, Monday – Friday, 9 - 5. Generally, the lab is not open in the evenings or on weekends. It is available to all students for mathematics tutoring assistance, not just developmental students. Full and part-time faculty, as well as peer tutors, staff it.

Students enrolled in basic skills mathematics courses are expected to make use of the Hawkes software as a supplementary resource for improving their math skills. As of Fall 2009, a significant portion, up to 25% of their course grade was based on their use of the software for out-of-class assignments.

In September 2011 there were eight computers in the math lab on which the Hawkes program was installed. Students have the option to work independently or with a tutor who can assist them with their use of the software or with mathematics. Often, students begin to work independently but subsequently request help with the software, particular problems, procedures or concepts. In the fall of 2011, in response to faculty suggestions, the department piloted the use of the web-based, adaptive software MyMathLab in one section of the Pre-Algebra course.

**Basic Skills Course Syllabi**

The course syllabi for the study institution’s two basic skills mathematics courses, MATH 001: Pre-Algebra and MATH 002: Algebra, contain excerpts from institutional mission statements, expectations and responsibilities for students and instructors and detailed information about the content for each course. The first page of each syllabus contains information about the educational goals and tenets of the college, division
(Division of Arts and Science) and department from each unit’s Mission Statement. The college’s Mission Statement stresses the need

… to provide a full complement of learning experiences, reinforced with strong academic and student development programs designed to bring students to their highest potential and prepare them to meet the challenges of the new century with informed minds and understanding hearts. (Syllabi, Appendices M and N)

Similar statements were found in both the division and department mission statements that also refer to the goals of maintaining high quality instruction and developing lifelong learners. Specifically, the Division of Arts and Sciences’ Mission Statement contains the following statement that addresses the need for continual program and student evaluation as a means for achieving those goals:

The division achieves the stated mission by using processes of continual improvement, based upon assessment of student learning at all levels, as well as the assessment of the administrative processes and mechanisms. (Syllabi, Appendices M and N)

These mission statements indicate that the educational philosophy of the institution is in agreement with the AMATYC standards for using a variety of instructional strategies with qualified instructors and performing ongoing program assessment.

After these initial declarations the two syllabi present the Course Objectives, Course Description and Course Content along with the grading structure and policies and expectations for students enrolled in the courses. A list of the various teaching/learning
strategies that students can expect to encounter is listed for them to review. Schedules for each week’s assignment are contained in the syllabi for MATH 001 (see Appendix M). The inclusion of teaching/learning strategies (class lectures, demonstrations, small group work, computer lab work) that students can expect to experience in the course syllabi is an indication of the department’s effort to implement AMATYC standards for using a variety of instructional strategies, implementing technology and developing an optimal learning environment.

**The Role of Hawkes Learning Systems’ Software**

The Hawkes mastery-based print material, together with its software based homework and testing system has been used since 2007. Originally it was available as an optional support feature for basic skills math students. However, once the department recognized the benefits of this feature, in 2009, its use by students was required and since then has accounted for up to 25% of their course grade.

Instructors are required to use the system for homework assignments since the reinforcement it provides is considered necessary for the success of basic skills students. Instructors have the option of using the software to maintain attendance records, create tests and quizzes and organize grades for the semester. They can customize homework in several ways. For example, Hawkes offers pre-set homework assignments arranged by chapter and sections. However, if instructors want to customize homework assignments, they can select certain problems and eliminate others from the pool of homework problems. This is an important feature because not all topics in the Hawkes Learning System are covered in a particular course and not all problems are appropriate for all
basic skills curricula. Items such as homework due dates, and penalties for late submissions, are flexible features that can be individually adjusted by each faculty member.

**Issues associated with the use of the Hawkes Learning Systems’ software.**

There have been four issues associated with the use of the Hawkes Learning Systems at the study site. One issue involved the equity of access to the required software through the use of computers in the math lab. The current position is that this concern has been addressed by having the lab available 40 hours per week and having the software available in other computer labs. But, as noted earlier, those 40 hours have not included weekends or evenings and there would not be mathematics tutors in the other labs.

The possibility that a student could have more knowledgeable peers complete their computer-based their homework assignments was another issue addressed by the department. The faculty position on this issue was that any students who engaged in this practice would be cheating themselves by not gaining the expertise and knowledge that should accompany their successful completion of online assignments by themselves. It is posited that a large discrepancy between a student’s traditional test-grades and online homework grades would detect this unethical practice. It was also mentioned that the academic penalties for such practices, that might include dismissal from the student body, would limit this type of student activity.

A third issue the department faced was that occasionally, a faculty member did not use the Hawkes System in connection with a course section they were teaching. As a result, students in that section did not receive the same level of homework review and test
preparation that students in other sections of the same course received. This issue was addressed by clearly communicating with all program faculty members that the use of the Hawkes learning systems was a mandatory component for all sections of both basic skills courses.

Finally, students did not always comply with this required computer-based component of the basic skills courses. Although instructors made Hawkes Systems’ assignments and explained that the homework accounted for up to 25% of the students’ final grade, this did not ensure that all students completed those assignments. Technically, even though it had a significant impact on their final grade, a student could still pass the course without completing any of the online mathematics assignments, but only with a grade of C or less. It was hoped that as the benefits of using the Hawkes Systems’ tutoring features became part of the campus culture, this would no longer be an area of concern.

Upon reflection, basic skills mathematics faculty had positive comments about the use of the Hawkes Learning Systems’ software. Through the use of this system the department was able to unobtrusively monitor the topics covered by all instructors in their basic skills program and thus have more certainty that all students were being properly prepared to successfully complete the courses. They also found the online homework feature was an excellent tool for helping students strengthen their procedural skills. Overall they regarded the Hawkes Learning Systems’ software as a worthy addition to their current use of more traditional classroom presentations and group work.
In summary, the math lab has become an integral part of the department’s instructional program, particularly for the basic skills mathematics program. However, even though use of the Hawkes Learning System was a key instructional component for all sections of the basic skills courses, the department did explore other software that might better serve the program. Faculty view the personal and computer-based support provided by the lab as valuable resources that assist students in mastering basic math concepts. The establishment of the math lab, the required use of a mastery-based software package, together with the department’s openness to alternative software are all actions that indicate an alignment of the department’s actions with the AMATYC recommendations and standards for implementing technology within the program, using a variety of instructional strategies and offering an optimal learning environment.

**Basic Skills Mathematics Faculty**

Table 4.1 shows the fall 2011 instructional load, basic skills expertise, experience using basic skills software, and other data for the three basic skills instructors that agreed to be interviewed. In addition to the department chairperson (Loretta) and the director of the Math Lab (Jaycee) one adjunct (Victor) agreed to be interviewed.
Table 4.1

*Fall 2011 Basic Skills Faculty Data*

<table>
<thead>
<tr>
<th>Name</th>
<th>Pre-Algebra sections taught</th>
<th>Algebra sections taught</th>
<th>Develop. Educ. Expertise</th>
<th>Hawkes Software Expertise</th>
<th>Other Dept. Admin. Duties</th>
<th>Other Courses taught</th>
<th>Highest Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loretta</td>
<td>2</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>Chair</td>
<td>Stat.</td>
<td>Ed.D.</td>
</tr>
<tr>
<td>Jaycee</td>
<td>2</td>
<td></td>
<td>yes</td>
<td>yes</td>
<td>Lab Dir.</td>
<td></td>
<td>M.S.</td>
</tr>
<tr>
<td>Victor</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>Adjunct</td>
<td></td>
<td>M.S.</td>
</tr>
</tbody>
</table>

Faculty preparation for teaching basic skills mathematics courses, their teaching practices and access to professional development are discussed later.

**Responses to the Guiding Questions**

The response to each question has three components. The first describes the importance of related program characteristics to basic skills math programs. The second describes how that characteristic presented itself through the data. The final component presents the analysis, through the lens of the AMATYC standards, of how the study site addressed the AMATYC standards for that characteristic.

Because no particular piece of information was able to completely answer any one guiding question, for each question (except question 6), a table shows the data sources used to examine each characteristic. The tables provide a convenient summary of the
relationships between the qualitative data sources and the relative program characteristics associated with the guiding question.

Response to Guiding Question 1. Guiding Question 1: Within the basic skills classrooms/labs, what pedagogical strategies are being used and are these strategies reflective of the AMATYC policies, standards and guidelines?

Data from the following sources was used to answer this question: the survey, course syllabi, lesson plans, field notes from math lab observations, and interviews. The connection of these data sources and the program characteristics identified by the AMATYC standards are summarized in Table 4.2.

Table 4.2

Data Sources and Program Characteristics for Guiding Question 1

<table>
<thead>
<tr>
<th>Data Sources</th>
<th>Optimal Learning Environment</th>
<th>Variety of Instructional Strategies</th>
<th>Qualified Mathematics Faculty</th>
<th>Ongoing Program Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Notes</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Lesson Plans</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Courses Syllabi</td>
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<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>Interviews</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Survey</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By investigating these four program characteristics, I was able to determine how the AMATYC standards for student learning, instruction, the learning environment and
professionalism aligned with the study site’s implemented practices and policies for basic skills mathematics.

Each of four characteristics and relevant AMATYC standards is discussed individually. Table 4.3 lists abbreviations for the relevant standards for each characteristic.

Table 4.3

<table>
<thead>
<tr>
<th>AMATYC Standards that Address Pedagogical Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimal Learning Environment</td>
</tr>
<tr>
<td>Variety of Instructional Strategies</td>
</tr>
<tr>
<td>Qualified Mathematical Faculty</td>
</tr>
<tr>
<td>Ongoing Assessment of Basic Skills Program</td>
</tr>
</tbody>
</table>

See the List of Symbols and Abbreviations on pages xvi and xvii

**Optimal learning environment.**

**Importance.** AMATYC (2006) recognizes the need for students to be in an appropriate learning environment in order to maximize their academic success. An optimal learning environment includes the design and proper use of policies, classrooms and labs by knowledgeable instructors who create well-developed content-based lessons. Departments need to thoughtfully reflect on all aspects of their programs, beginning with student placement. Accurate placement tests should be used to ensure that students are correctly placed in a course that is appropriate for their level of academic preparedness. MAA (2009) emphasizes the need for courses that provide suitable challenges to students. This is a critical factor for ensuring a student’s success in a mathematics
course. The placement policy should usually enroll a student in the most advanced course appropriate for their current level of knowledge.

High quality instruction that affords students the opportunity to interact with their professors is provided in classes with fewer than thirty students per section (MAA, 2009). In their extensive research on best practices for developmental mathematics, Golfin, Jordan, Hull & Ruffin determined that a key factor for student success was the number of students in their section of a basic skills course (2005). For those courses, low student to faculty ratios were seen as part of an optimal learning environment. Small group instruction was a promising and recurring salient theme related to student success (Golfin et al, 2005).

Instructors that are supportive of their students are another important component of an optimal learning environment for basic skills courses (Golfin et al., 2005). Basic skills instructors need to be patient and supportive of their students’ needs. This includes their awareness of and sensitivity to their students’ job or family responsibilities that may arise while they are enrolled in a course. Also, in all of their teaching locales, mathematics faculty must make concentrated efforts “to assuring that courses, programs, and the departmental climate are inviting and supportive to all students regardless of their gender, or cultural background” (MAA, 2009, p. 13).

**Evidence of an optimal learning environment at the study site.** Small classes were the norm for basic skills courses at the study site. This was seen in information from the survey, course syllabi, and confirmed by interviews with mathematics personnel. The enrollment limit for basic skills courses was 15 students. Although this
number had been much higher in the past, instructors claimed that smaller class sizes
enhanced the learning experiences for their students.

As witnessed during the math lab observations, the low ratio of student to
instructor or lab assistant was evident in this area as well. During observation sessions,
there were never more than six students per instructor/peer tutor. Although not all
students were requesting assistance, the lab director and student tutors were available if
and when any of the students needed help with the software or math.

Another important, intangible component observed in the math lab was the
hospitable atmosphere. Its basement location belied the warm and inviting environment
that greeted students. An amusing mathematical clock hung on the wall that displayed
mathematical calculations in lieu of numbers. On one table, students had access to
brewed coffee, tea, hot chocolate and freshly baked cookies. These welcoming edibles
were available to all students who came to the lab. Although the above items are not
specifically math-related, they added to the math lab’s embracing and nurturing
environment. Several data sources confirmed that such refreshments, most often supplied
by the lab director, were a regular occurrence. (See Appendix O for photos taken during
lab observations.)

According to survey and interview data, the department uses the Accuplacer
testing system to initially determine a course placement for students. However, during
the first week of class, students may take a challenge test if they think they have been
incorrectly placed. Course syllabi clearly state that students need to be placed in a course
that will challenge their critical thinking ability and the use of placement tests helps to ensure this occurs.

Interview data also provided evidence that faculty members used nurturing pedagogical practices in their basic skills classes by striving to learn about their students and, in one instance, by familiarizing herself with a student’s work schedule. Victor, an adjunct faculty member, distributes a form with questions designed to assist him in getting to know his students, their work schedules and their interests. In her May 5, 2011 interview, the department chair discussed the unfairness of barring students, who were waiting for notification of their financial aid from attending classes (see Appendix P for transcribed interview). She addressed this issue by instructing them to attend class, even though the registrar advised them otherwise.

*Analysis of the optimal learning environment data.* Data show that the study site strives to meet the standards associated with maintaining an optimal learning environment. For example, AMATYC Implementation Standard 1 (IM-1) states the need for mathematics faculty to create an environment that optimizes the learning for all students (see Appendix F for Implementation Standards). Beginning at the policy level, as evidenced by the college and division’s mission statements, as well as the course syllabi, this institution has demonstrated its attention to this standard. Also, at the implementation level, through the use of placement and challenge tests for the proper enrollment of basic skills students, the department is showing its desire to accurately enroll each student in an appropriate and challenging math course. Additionally, by limiting class size, the institution recognized the results of research that connect increased
rates of student success and basic skills courses with low enrollments (Golfin et al., 2005; MAA, 2009). Basic skills students also have access to individualized attention and assistance in the mathematics lab. Smaller rosters allow faculty to devote more time to each student and recognize their individual needs.

Finally, the faculty exhibited a degree of caring or nurturing pedagogy towards these students. In seeking to learn about their personal lives and hobbies, the instructors demonstrated that they were interested in their students beyond the confines of the classroom. By knowing a certain student’s work schedule, the math lab director showed that she cared about her students’ employment status as well as their academic status. The department chair showed her concern about students with financial aid issues by encouraging them to attend class before they were officially enrolled so they would not fall behind in their studies. Also, the hospitable structure of the math lab, with cookies and beverages adds an intangible but palpable feeling that shows that students are welcomed, wanted and nurtured.

One possible concern at this institution was access to the mastery-based Hawkes software. Although the software is installed on eight math lab computers, and also on machines in other campus computer labs, access to the math lab was only available Monday through Friday, from 9 to 5. Access to other labs vary. Students could install the software on their own computer but what if some did not own a computer or their family situation did not always give them access to a computer? Students who attended night classes were rarely able to gain access to the facility. Students who might use the math lab during the weekend faced the same difficulty. As a small private institution
with a limited endowment and tuition charges that reflect a modest level of student income, the college cannot afford to keep the math lab open continually. Therefore, certain students may have been affected by this financial constraint. With the piloting of MyMathLab software the institution may recognize that, in addition to its adaptive learning approach, another advantage of that software is its ability to be accessed from any computer with Internet access.

**Variety of instructional strategies.**

**Importance.** Academic programs can be responsive to the ever-changing needs of their students through the use of a variety of instructional strategies MAA (2009). An effective mathematics curriculum should provide students of every learning style opportunities to engage and connect with course material (AMATYC, 2006; Golfin, et al, 2005). Institutions also need to provide proper facilities for basic skills instruction in order to ensure students are working in supportive and productive learning environments. One way this can be accomplished is through the effective use of technology. In appropriate settings, the use of technology can increase basic skills students’ understanding of mathematical concepts (MAA, 2009). Its use can assist in the preparation of students for future courses and for technology use in future occupations. Technology use can be implemented in laboratory settings, through assignments that require the use of computer software or the Internet (MAA, 2009). After examining promising strategies for developmental mathematics programs, Golfin et al. (2005) specifically mentions the use of computer-assisted instruction, Internet-based
assignments and computer labs as options that lead to student success by integrating
classroom and laboratory learning experiences.

Another promising instructional strategy is the use of authentic lessons and
activities. This involves lessons that use mathematics to solve work-related or real-world
problems (MAA, 2009). When designing such lessons, instructors need to take their
students’ cultural background, as well as their personal interaction and communication
styles into consideration (AMATYC, 2006). This approach has been shown to improve
the level of student success by enhancing their academic performance in areas of
academic weakness (Ladson-Billings, 1994, 1995; NCTM, 2000). Faculty need to be
capable of implementing multiple instructional strategies such as multiple delivery
options, small group instruction and linkages to authentic examples if they want to
increase their students’ mathematical understanding and skills (Golfin et al. 2005).

Evidence of a variety of instructional strategies at the study site. As witnessed
by my math lab field notes, course syllabi, and interview data, the study site incorporates
technology within the curriculum for the basic skills program. By using the Hawkes
software and also piloting MyMathLab software, the department demonstrated its
commitment to the use of technology that supports its basic skills program. Their
students have benefited from classroom instruction supplemented by a math lab and the
use of technology. In fact, the passing rate of students in the basic skills program has
improved from 71% in 2004 to 83% in 2009.

Study data show evidence of the use of authentic lessons in some sections of the
basic skills courses. The department chair, Loretta, used four different lessons, some
modeled after those presented at the 2009 MAA workshop, that use real-world contexts in the Pre-Algebra course. She incorporated lessons for discovering pi (see Appendix S), approximating the height of inaccessible objects (see Appendix T), examining the division algorithm for fractions (see Appendix U), and estimating wildlife populations (see Appendix V). However, she believed her only fully successful attempt was the lesson that used proportions to approximate the heights of inaccessible objects. In an interview, Loretta noted that she was somewhat disappointed with the level of comprehension and engagement shown by the students for the majority of the lessons. In hindsight, she would have changed certain facets of these lessons to allow more time for the discovery of mathematical relationships by the students. In the future Loretta believes she can improve upon her piloted lessons by making minor changes in the grouping of students and by allowing more time for the activities.

Victor also attempted to incorporate authentic examples into his lessons. As a retired high school science teacher, he believes he can make his lessons more meaningful by connecting them to nature and the students’ majors. During his interview, he provided the example of using math to find the epicenter of an earthquake (see Appendix R for interview transcript). He claims that knowing his students’ majors helps him determine the examples he uses in his classroom.

Jaycee discussed the need to balance student exploratory activities with guided instruction. She discussed using groups and subtly steering their activities along the correct mathematical path. She also mentioned how balancing group work can be
challenging since some students want to take over and others would prefer not to work at all.

**Analysis.** Data show that the institution encourages the use of, and that members of the basic skills faculty have made sincere attempts to implement, a variety of instructional strategies. By varying the instructional strategies employed in basic skills classrooms the study site’s basic skill mathematics program has addressed AMATYC Standards for Intellectual Development I-1 and I-2 (see Appendix C), namely, engaging in problem solving and learning math through modeling real-world situations and the fourth Standard for Pedagogy, P-4, that addresses the need for faculty to use multiple approaches for problem-solving (see Appendix E). Implementation Standard IM-4 was partially addressed through the use of technology, authentic lessons and group work (See Appendix F).

**Qualified mathematical faculty.**

**Importance.** Hiring and maintaining a qualified mathematical staff is at the core of improving student success in mathematics (AMATYC, 2006). MAA guidelines describe qualified mathematical faculty members as those who have a minimum of a master’s degree in the mathematical sciences. The term, mathematical sciences, is a broad descriptor that encompasses pure and applied mathematics, mathematics education, operations research, statistics and computer science (MAA, 2009).

To enable faculty members to remain current with new advances in the field of mathematics, colleges and departments should encourage and support professional development (MAA, 2009). This includes attendance at seminars, conferences,
professional meetings, participation in appropriate courses and individual study. AMATYC (2006) endorses this position by encouraging lifelong learning for faculty members in the belief that professional development can be a key component to positive changes in the instructional programs they support. Along with attending appropriate professional development activities, faculty members are encouraged to contribute to the profession by presenting at conferences or writing articles for publication. Other ways that faculty members can be professionally active include their participation in timely discussions regarding teaching strategies or by building relationships with other departments and looking for connections with other disciplines.

**Evidence of qualified mathematics faculty at the study site.** The interview, field notes and course syllabi data show that instructors for the basic skills courses have earned masters or doctoral degree in mathematics or a closely related field. This requirement should ensure that knowledgeable and properly educated instructors lead all classes.

All full-time and adjunct faculty members are invited to attend in-house professional development programs. Full-time faculty members attend conferences and workshops throughout the country and state. The college offers funding support for some professional development programs to the full-time faculty. However, adjunct faculty members do not usually participate in any form of professional development.

Both Jaycee and Loretta have participated in many professional development activities. They are active in the developmental educational field and presented at the 2010 NADE national conference on the use of the Hawkes software at their college. They have been certified as developmental specialists through the National College
Learning Center Association (NCLCA, 2011). Loretta has taken on a leadership role at New Jersey Association of Mathematics Teacher Educators (NJAMTE) as the association’s Webmaster.

By email, adjunct faculty members are invited to attend professional development sessions on campus. Victor has never attended these sessions and claims that basic skills adjuncts have not been encouraged to participate in them.

*Analysis of the mathematical faculty data.* The fifth AMATYC Implementation Standard (IM-5), expresses the need for institutions to hire qualified mathematics instructors and that these instructors should routinely participate in in-service professional development. Through an analysis of the interview data, field notes, syllabi and professional development information, the evidence indicates that the department strives to meet the standards regarding well-qualified full-time basic skills faculty who participate in ongoing professional development. While there seems to be a sincere effort to meet the professional development standards with their adjuncts, they do not appear to have been successful.

Both interview and survey data provided evidence that it is an institutional policy that all new full-time or adjunct faculty member must have a master’s degree or higher in the mathematical sciences or closely related field. The department strictly follows this institutional requirement to ensure high quality instructors for their courses. However, at least one adjunct basic skills instructor has a degree that is not in mathematics and thus does not meet the expectations expressed by MAA and AMATYC. The interview data also demonstrated that hiring qualified adjunct faculty is not easily or always successfully
met. This is especially true when enrollment numbers fluctuate and suddenly dictate the addition of new classes shortly before the semester begins. In Loretta’s May interview (see Appendix P), she mentioned a particular situation that arose over the summer that necessitated her scrambling at the last minute to find a suitable candidate. She also described a situation in which an adjunct quit right at the start of a semester. Her search for a suitable replacement was difficult and led to hiring a minimally qualified replacement.

For adjunct faculty members, data from the survey and the interviews verify that financial resources are not readily available to support their professional development. This fact curtails the participation of these faculty members in professional development activities that might improve their knowledge of current pedagogical and curricular practices and the results of recent research about teaching and learning. Although the college offers on-site professional development sessions for everyone, most adjuncts are apparently not interested or able attending them. Victor stated that he did not believe it would improve his current teaching techniques.

As a small private college, finding funding for such activities is difficult, especially during the current economic downturn. In her May 2011 interview (see Appendix P), Loretta noted that the college cancelled her plans to attend and present at the spring 2011 NADE conference. However, budgetary concerns can become the overriding issue that trump best practices for professional development at the institution. Overall, the institution meets the standard for encouraging and supporting professional
development for full time faculty but needs to seek ways to involve and support adjunct faculty members in this area.

**Ongoing assessment of the basic skills program.**

**Importance.** Are students learning the intended course material in the study site’s basic skills mathematics courses? Are a variety of instructional practices being successfully used to present course material to students and are those practices supported by research on teaching and learning? How does a department answer these questions? MAA (2009), AMATYC (1995, 2006) and NCTM (2000b) all recognize the importance of program assessment, reevaluation and periodic planning. In addition to course content, instructional and assessment practices, the review process should also address the physical condition of classrooms and labs including the availability and quality of functioning presentation and educational software and print material for students and instructors. Mathematics departments need to assess and, if necessary, revise course content, instructional practices and available support to ensure that students have access to appropriate content through a supporting and engaging learning environment (AMATYC, 1995, 2006). The cyclic process should result in a strategic plan designed to enhance the strengths of the department but also equipped to remedy any deficiencies identified during a review (MAA, 2009).

**Evidence of ongoing assessment at the study site.** Data from interviews and course syllabi provided evidence that the program uses a combination of informal and formal program assessments. At the level of an individual course section all faculty must include the results their students’ use of the Hawkes’ homework system for as much as
25% of their course grade. The remaining 75% of a student’s grade is determined by their performance on instructor-selected assessments, although there is a departmental final exam.

Data from follow-up interview questions revealed that the college recently conducted an external review in preparation for its Middle States accreditation. Thus, at five-year intervals, all departments conduct an internal review and assessment of their curricula and other program aspects that will be reviewed by outside evaluators who in turn present a report that addresses that strengths and weaknesses of each program. In preparation for this external reviewer, Loretta emailed math department chairs at local colleges with similar institutional characteristics seeking an appropriate reviewer. Over the next five months, she sent him any pertinent materials he needed concerning the department. He visited the campus to learn more about the department and its programs and observe classes and the math lab. He submitted a final report to the college offering suggestions concerning the math department. In his report, he did not include any suggestions for the basic skills program since he did not consider the program to be important to math majors. At the end of this process, Loretta became the resident expert on outside reviews since no one else at the college had completed this type of review. Other departments sought her help in arranging outside reviewers and otherwise preparing for an external review.

In her September interview, Jaycee mentioned that during the summer of 2011 she researched some software packages as possible alternatives to what was being used to support the Pre-Algebra course (see Appendix Q for interview transcript). Her actions
were motivated by complaints from adjunct faculty members about the limited functionality of the Hawkes software. As a result of her investigations, Jaycee recommended, and Loretta agreed to the Fall 2011 piloting of Pearson’s MyMathLab software in one section of the course in place of the Hawkes software.

In the future, Jaycee and Loretta plan to compare the success rate of basic skills students who used the MyMathLab software with those who used the Hawkes software. They also plan to track the success rate of basic skills students in their first graduation credit bearing college mathematics course. Such data may help them make better informed decisions about which software to use and perhaps other aspects of the Pre-Algebra course.

Data from interviews and math lab observations revealed that the math lab director regularly, but informally, receives information about the effectiveness of the mathematics basic skills program as viewed through the eyes and ears of the other basic skills instructors. The lab is the before, between and after class social hub for members of the mathematics faculty. Jaycee often conversed with them about their experiences with the basic skills courses. As coordinator for the basic skills courses she is very interested in their opinions about their courses and how well the basic skills program is serving the needs of the students. Jaycee is the math lab director and only teaches basic skills mathematics courses. As a result, most of her time and energy is devoted to those two components of the department’s responsibility.

*Analysis of the ongoing assessment of the basic skills program.* AMATYC Implementation Standards 2 (IM-2) and 3 (IM-3) discuss the need to regularly assess
curricula, materials, and teaching methods (see Appendix F). They also recognize the need for mathematics faculty to create an environment that optimizes the learning of mathematics by students. This includes assessments that are linked to student outcomes and help students attain academic goals. By continually assessing and improving these programs, all students are better able to achieve their academic objectives and their future career goals (AMATYC, 2006; MAA 2009).

In 2008, the department participated in its first scheduled programmatic review as required by the institution’s external accreditation agency. Unfortunately, the visiting accreditation team did not include the basic skill mathematics program in its review. In addition, based on the research and recommendation of the lab director, the department piloted new software in one section of the Pre-Algebra course during the fall 2011 semester.

During their May 2011 interview, Jaycee and Loretta were asked if they maintained data regarding the success rates of the students once they left the basic skills program (see Appendix Q for interview transcription). They stated that they had intended to prepare such reports, and that the data was probably somewhere. However those reports have never been completed. Loretta also spoke of an adjunct who used a more abstract teaching approach with basic skills students. The method of instruction was not successful with the students and she intended to prepare an accompanying report. Due to more pressing responsibilities and various deadlines for other departmental issues, the reports were never completed. Therefore, these findings were never properly documented for the math department and college. Since the item was not a required
departmental assignment, it did not receive the attention or sense of urgency afforded to Loretta’s other duties.

Overall the department is making progress with its assessment of the basic skills program. Their prompt attention to the programmatic review is a positive feature although the outside reviewer did not address the basic skills program. Perhaps in future reviews, the department could ask that the basic skills math program be included in the process and in the final report. Communicating with other basic skills instructors to determine their opinions of the basic skills components also represents a form of assessment. This communication instigated the researching and piloting a new software package. It also indicates that the department is assessing current teaching practices and making changes when indicated.

Responses to Guiding Questions 2, 3 and 4

Guiding Questions 2 - 4 are concerned with three specific AMATYC program characteristics related to pedagogical practices. Those characteristics are evidenced by practices that make connections between the mathematics being studied and real-life activities (Guiding Question 2), the use of technology to support student learning (Guiding Question 3), nurturing teaching practices (Guiding Question 4) and how those pedagogical practices are influenced by profession development (Guiding Question 4). The use of these three practices has been endorsed by professional organizations because of their potential to improve student learning (NCTM, 2000b; AMATYC, 1995, 2006; MAA, 2009). They can be especially helpful for basic skills students who often benefit from multiple approaches to the mathematical topics they are studying (AMATYC,
Evidence related to all of these characteristics was found at the study site. Some of that evidence was described in the response to Guiding Question 1. The responses to Guiding Questions 2, 3 and 4 expand upon that material. Data sources that contributed evidence to answer each question are summarized in Table 4.4.

Table 4.4

*Data Sources and Program Characteristics for Guiding Questions 2, 3 and 4*

<table>
<thead>
<tr>
<th>Pedagogical Practices (Characteristics)</th>
<th>(Question 2)</th>
<th>(Question 3)</th>
<th>(Question 4)</th>
<th>(Question 4)</th>
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<td>Effects of Professional Development</td>
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**Response to Guiding Question 2.** Within the basic skills classrooms/labs, how do instructors connect mathematics to other cultures and disciplines and are these strategies reflective of the AMATYC policies, standards and guidelines?

**Importance.** AMATYC (2006) stresses the need for instructors to make mathematical connections that link the material in basic skills math courses to every day phenomena and to their students’ everyday experiences and culture. Through such associations, instructors motivate students to acquire mathematical knowledge that can be
used in everyday situations. This helps them to become more enlightened individuals who can think logically and critically analyze numerical information (AMATYC, 1995, 2006; MAA, 2009; NCTM, 2000b).

The Consortium for Mathematics and Its Applications (COMAP, 2003) described the need for students to develop mathematical literacy in order to be successful in our data-driven society. One way to do this is by demonstrating the connection between mathematical concepts and how they are used in today’s world. AMATYC (2006) stressed the need for lessons that used this same approach in basic skills mathematics programs. That is, students need to view mathematics, as interrelated concepts and not as unrelated facts that are memorized for tests. Lessons that demonstrate connections between a mathematical concept and a real-life application, to which the students can relate, can strengthen their understanding of the mathematics (AMATYC, 1995, 2006; NCTM, 2000b). Recommendations from the 2009 MAA workshop also validate the importance of making meaningful connections between math and students’ lives in order to increase their comprehension of mathematics. The workshop, for which authentic activities were a mainstay, was focused on ways of redesigning basic skills courses that would get students more involved in their studies and as a result increase their success with mathematics.

While examining best instructional practices for basic skills mathematics programs, Golfin et al. (2005) found that the type of problems used with basic skills students was important. Specifically, problems that reflected authentic problem-solving situations found in the business environment seemed to engage students and assist them
in their understanding of mathematical concepts. Such contextual learning added meaning and relevance to the basic skills curriculum that helped to reinforce the underlying mathematical concept being studied.

**Evidence.** Data from the following sources was used to answer Research Question 2: course syllabi, lesson plans, and interviews. As noted earlier, the course syllabi for both the Pre-Algebra and Algebra courses include key components of the college, division, and department’s mission statements, all of which foster intellectual growth and a love of learning. To accomplish those goals, the syllabi refer to the use of a “full complement of learning experiences” and providing students with both the theory and actual practice to instill logical reasoning, proper data analysis and problem solving skills (see Appendices M and N). Additional evidence that the institution supports the exploration of alternative pedagogical approaches for the delivery of the basic skills curriculum is provided by its professional development support for Loretta and Jaycee. Jaycee attended a MAA Workshop related to basic skills programs in 2008 and based upon her positive experience convinced Loretta to join her at a similar 2009 workshop. This is clear evidence that this institution’s math department supports integrating teaching practices that include authentic lessons into the curriculum for basic skills mathematics.

As discussed in connection with the *Variety of Instructional Strategies* characteristic for Guiding Question 1, Loretta incorporated the use of several lessons that were modeled after those recommended by the 2009 MAA workshop. Her lessons attempted to connect real-world phenomena to basic skills math concepts. In particular,
she used two lessons that applied proportional reasoning to real-world situations. One lesson used proportions to estimate the heights of inaccessible objects (see Appendix T for the lesson plan). Another lesson used proportions to estimate the size of a wildlife population (see Appendix V for the lesson plan). These activities gave students the opportunity to experience the application of mathematics to a real life situation that they could understand. Loretta believed that the height estimation investigation was more successful than the other authentic lessons she had tried. In those less successful lessons, she did not believe that the students made the anticipated connections between the applications and the mathematics they were studying.

Victor also attempted to incorporate connections between mathematics and the lives of his students. In his September interview he said he was able to include topics such as weather phenomena and - when they were studying percentages, decimals and fractions - topics related to financial issues (see Appendix R). The interview data revealed that all three interviewees discussed their desire to make effective mathematical connections for the students.

Analysis. The use of mathematical connections is an important factor in assisting basic skills students in achieving mathematical competence and understanding. However, such connections can be difficult to effectively introduce to students who are not prepared to discover and explore independently. As noted by Loretta, she did not believe most of her authentic lessons fostered the meaningful understanding that she had sought. Although she had engaged in these lessons at the 2009 MAA workshop with other mathematics instructors, there is an enormous difference in using those same
lessons with basic skills students. After reflecting on those lessons, she decided that modifications needed to be made by extending the time for preparing the students for the lesson and then allowing them more time to discover the connections.

The other constraint mentioned by instructors was the need to complete the material as stated in the course syllabus. This can sometimes cause instructors to rush and feel pressured to completely “cover” course material more quickly than they prefer. This can hinder an instructor’s intent to incorporate additional authentic activities into the curriculum.

Overall the study site has made a number of sincere attempts to incorporate lessons that make meaningful connections between their students’ general knowledge and the mathematics they encounter in its basic skills program. By integrating mathematical concepts with useful applications, the institution has addressed AMATYC Standards for Intellectual Development I-1, I-2 and I-4 that discuss the need for students to engage in problem-solving, to learn mathematics through modeling real-world situations and to connect mathematics to other disciplines (see Appendix C). By incorporating lesson plans that model actual activities such as estimating the size of an unknown population and the height of an inaccessible object, students were engaged in authentic problem-solving activities. By learning how weather and geological phenomena, and topics from finance are related to basic skills mathematics, students examined and used authentic data that connected mathematics to other disciplines. Standards for Pedagogy P-3 and P-4, state the need to connect the mathematical concepts to authentic experiences and to use multiple pedagogical approaches during instruction (see Appendix E). All five of these
standards were addressed through the use of the meaningful lessons in the basic skills classrooms at the study site through a variety of instructional approaches that included whole class activities, group work, out of class “field” work, and direct instruction.

**Response to Guiding Question 3.** Guiding Question 3: Within the basic skills math lab, in what ways is technology being used to enhance students’ mathematical thinking and understanding and are these strategies reflective of the AMATYC policies, standards and guidelines?

**Importance.** Proper incorporation of technology within a basic skills program can deepen students’ understanding of mathematics and help to prepare them for employment opportunities (AMATYC, 2006; NCTM, 2000b). In their analysis of best instructional practices in post-secondary basic skills mathematics programs, Golfin et al. (2003) found that a greater use of technology, and the integration of technology into classroom instruction increased students’ interest and achievement in mathematics. Technology can extend the mathematics taught and offers students other methods for exploring and learning the course material.

In the basic skills classroom, technology allows students to find solutions using avenues other than pencil and paper. It has the ability to change what mathematics is taught and how it is taught in basic skills courses (AMATYC, 2006). Technological tools, for both computation and problem construction, can provide basic skills students’ access to mathematical contexts that might otherwise be too complex for their exploration. The incorporation of these powerful tools can offer students opportunities to examine more difficult problems and use higher order thinking skills. The curricula for
basic skills programs, like all math programs, should incorporate appropriate instructional technology into course procedures, lesson planning and assessment practices (NCTM, 2005).

Technology is driving changes to existing, and the creation of new, pedagogical tools that in turn creates a need to continually review curriculum and address the needs for appropriate instructional support (AMATYC 1995, 2006; MAA 2009; NCTM 2005). Because of this ongoing evolution, the use of technology in the basic skills classroom needs to be revisited and evaluated on a regular basis. Departments and faculty members need to be knowledgeable in selecting technology and software packages that are appropriate for, and accessible by, basic skills students. Of course, they must also be aware of institutional and departmental fiscal and physical plant constraints.

Evidence. The following data sources were used to answer this question: field notes, interviews, syllabi, survey and data related to workshops and conferences. Survey data and course syllabi addressed the required use of the Hawkes Learning System materials and emphasized that a student’s grade on the software component accounted for up to 25% of their final grade. In addition to the goal of providing students with a “full complement of learning experiences” (see Appendices M and N), the course syllabi address the goal of preparing the students to meet future challenges and to be well equipped to contribute to society and the workplace. One way the institution strives to meet these goals is through the use of educational software in connection with their basic skills courses. By exposing students to math labs and new math software, the college
strives to enhance their learning experiences, broaden their mathematical knowledge base, and prepare them for using technology in future academic and workplace settings.

During four of my visits to the study site I was able to observe basic skills students using the Hawkes software in the math lab. For the most part they worked independently, but occasionally with a tutor when they required assistance. Students were engrossed in their assignments and appeared to be fairly adept at using the technology.

During the interview sessions, all three basic skills instructors indicated that the Hawkes software reinforced their basic skills students’ understanding of concepts and procedural skills. The chairperson and lab director clearly expressed their opinion that the combination of tutorial assistance and supportive software available through the math lab was a major component of the support provided to basic skills mathematics students by the institution.

Through their participation in a number of workshops and conferences, including the 2008 and 2009 MAA workshop and 2010 NADE conference, Loretta and Jaycee have kept informed about software packages and other technological components designed to be used with basic skills mathematics programs. The 2009 MAA workshop dedicated an afternoon to the discussion of this topic during which presenters and participants openly debated the positive features and potential drawbacks to specific packages. Through their attendance at professional conferences, such as the 2010 NADE conference, Jaycee and Loretta were able to discuss software packages with representatives from a number of companies that develop these learning systems. These discussions often included hands-
on demonstrations and informational packages that participants can review and share with others at their institution. By participating in such venues, both Jaycee and Loretta have strived to remain informed about new software and other technology for their basic skills program. Additional evidence that supports this statement is Jaycee’s review of a number of software packages and her subsequent recommendation to field test the MyMathLab software in the Fall 2011 semester.

An interesting observation that was gleaned from the course syllabi was that calculators were used as needed in the two basic skills courses. Although they were not allowed on a few, or parts of some assessments, there appeared to be broad acceptance that their use supported student learning.

**Analysis.** Evidence from a variety of sources indicates that the institution and members of the mathematics faculty have made well-informed and successful attempts to incorporate the use of technology into their basic skills program. The study site has addressed AMATYC Standards for Pedagogy P-1 and P-4: teaching with technology and using multiple instructional approaches. By incorporating the use of educational software into their course materials they offered their students a medium for learning mathematics outside of the formal classroom. In addition, by using technology, the institution has addressed the AMATYC Standard for Intellectual Development, I-6 (see Appendix C).

The college has also addressed parts of AMATYC Implementation Standards IM-1, IM-2 and IM-3 (see Appendix F). IM-1 describes the need for institutions to create a learning environment that optimizes the learning experience for students. By searching and comparing various software packages for use with their basic skills curriculum, the
math department demonstrated its attention to this standard. IM-2 and IM-3 describe the importance of assessing student learning to improve curricula and pedagogical choices for the program. The department has addressed this standard through their dual use of the Hawkes software and MyMathLab and to track the progress and passing rates of the students using each package. Their plan to compare the achievement of students who used the MyMathLab software with those who used the Hawkes software is another indication of the study site intent to continually address this standard. By seeking to discover which software package yields better student achievement results the department has demonstrated its intention to base its choice of technological support on products for which there is evidence of increased student learning.

**Response to Guiding Question 4.** Nurturing pedagogy and professional development are examined through Guiding Question 4. Although related, each characteristic has a different type of effect on a basic skills program. Nurturing pedagogy impacts the learning environment while professional development more directly impacts the content knowledge and teaching practices of instructors. Nurturing pedagogy will be discussed first, followed by an examination of the effects of professional development on instruction.

Guiding Question 4: As reflected in AMATYC policies, standards and guidelines, how are instructors of basic skills using nurturing pedagogy and in what ways have they been affected by professional development?

**Importance of nurturing pedagogy.** Mathematical organizations have acknowledged that the attitudes and practices of classroom instructors can greatly
influence the educational effectiveness of a mathematics program (AMATYC, 1995, 2006; MAA 2009; NCTM, 2000b). Instructors who exhibit a caring and helpful attitude seem to positively affect the learning processes of basic skills students (AMATYC 1995, 2006). Golfin et al. (2005) described several important affective factors for basic skills classrooms, such as students’ self-esteem, students’ confidence and students’ anxiety levels. Golfin claimed that the use of nurturing pedagogies can be an effective tool for addressing those affective factors found in basic skills students, many of whom have an inferior self-image when it comes to engaging in mathematics.

Research has identified teaching practices that have been shown to improve basic skills mathematics students’ attitudes about their ability to understand and do mathematics (Duranczyk, 2007, 2008a, 2008b). Nurturing pedagogical practices that improve students’ attitudes and achievement include providing positive feedback, support for student learning - other than through classroom instruction and office hours, the use of small class sizes that allow for more individualized attention, and positive attitudes by the basic skills faculty toward the program, students and mathematics.

**Evidence from study site concerning nurturing pedagogy.** The college, Arts and Sciences division, and mathematics department’s mission statements contain statements that they strive to provide the highest quality of instruction for students and to encourage them to reach their full potential and to make positive contributions to the broader society. While those mission statements apply to the learning of basic mathematics, they transcend any specific college program by showing concern for all aspects of each individual student. This broader interest in all aspects of their students’ experiences and
their preparation for life is also representative of a nurturing pedagogy. Relative to the basic skills program, the capping of enrollments at 15 students in order enable instructors the time to provide more individualized attention to their students is also representative of a nurturing educational environment.

During each of my visits to the math lab some basic skills students received one-on-one help from the assigned tutors while others worked without assistance. At any time, students who were working independently were able to ask for help from either student lab assistants or the lab director. This supportive environment provided individualized attention for the students. Both the lab director and the tutors seemed to know the basic skills students very well. Interview data documented the use of nurturing pedagogies by the chairperson, lab director and at least one adjunct faculty member. During their May 2011 interview, both Loretta and Jaycee fretted over basic skills students missing classes at the beginning of the academic year while they waited for notification about their financial aid packages (see Appendix P). In opposition to messages from some administrators, they encouraged students to attend their math classes. Those actions by Loretta and Jaycee, even though they were counter to recommendations from other offices, reflect a caring attitude for the students’ learning experience. The September 2011 interview data revealed that Victor distributed a questionnaire to his basic skills math students requesting them to voluntarily share information about their interests, work obligations, intended major and career plans along what other courses they were currently taking (see Appendix R). After learning about this
practice by Victor, Loretta used the same questionnaire with her classes to learn more about her students outside interests and obligations.

Additional evidence that the study site engaged in nurturing pedagogical practices was presented in connection with the responses to Guiding Questions 1 and 2 as well as by Jaycee’s use of in-class group work for discovering mathematical relationships and concepts on several occasions each semester. She mentioned how difficult she found the preparation and use of this type of instruction to be because too often some students don’t contribute to the activity and instead let one or two of the group members perform all of the tasks. She also noted that it had been her experience that some students cannot “discover” mathematical concepts without the proper guidance from an instructor.

**Analysis of the evidence about the use of nurturing pedagogies.** Triangulation of the evidence from several study site data sources clearly indicates that, at all levels – college, division, department, math lab and individual classrooms - the institution has made sincere attempts to incorporate the use of nurturing pedagogical practices into the basic skills program. AMATYC Implementation Standard IM-1 best represents the nurturing pedagogy characteristic (see Appendix F). This particular standard calls upon institutions to create an environment that optimizes the learning of mathematics for all students. Evidence from mission statements reflects a concern for the total student, including the establishing of a supportive environment for the teaching and learning of basic skills mathematics. When Jaycee recognized that some students could not discover mathematical concepts without support, she is addressing Vygotsky’s zone of proximal development (Vygotsky, 1986). This allows her to offer additional guidance to some
students during some math lessons. A policy that limits the number of students in either basic skills course to a maximum of 15, the availability of a math lab and supportive software and the implementation of nurturing teaching practices and caring instructors were all well documented by more than one data source. Although this characteristic is difficult to measure, the presented data demonstrates that the study site strives to meet the standards regarding the implementation of nurturing pedagogy.

**The importance of professional development for basic skills instructors.**

Instructors who participate in appropriate professional development activities can positively affect their students’ learning of basic skills mathematics (AMATYC, 1996, 2005; MAA, 2009; NCTM, 2005b). By participating in well-designed professional development activities, instructors can increase their ability to communicate mathematical concepts in a variety of ways and through the use of authentic examples. Quality professional development geared towards the basic skills curriculum can lead to a stronger program that more readily meets the needs of basic skills students. Through his examination of best practices for post-secondary mathematics, Golfin et al. (2005) found that providing professional development opportunities for basic skills instructors was essential in order to ensure that they were exposed to the intended use of current technology as well as to research about pedagogical approaches for teaching basic skills mathematics.

According to Golfin et al. (2005), incorporating the use of tested and established software into a basic skills program can have positive effects on student learning. However, to do that, the individuals responsible for selecting the software need to be
knowledgeable about basic skills programs, students and the available software options. In addition, all basic skills instructors need to be educated on the proper use of the selected software. AMATYC (2006) also recognized the importance of providing opportunities for basic skills faculty members to continually expand their mathematics knowledge, including their pedagogical content knowledge, through suitable professional development. Learning new material and how to share it often empowers and invigorates an instructor’s teaching practices while at the same time improving their attitude toward their students and the subject they are teaching.

Evidence related to professional development for basic skills mathematics instructors. As seen from data gleaned from lesson plans, interviews, syllabi, survey and workshops/conferences, the study site has engaged in the use of professional development that supports the basic skills mathematics program. The authentic lessons organized and delivered by Loretta for the Pre-Algebra course were based upon professional development workshops that she arranged to attend having in mind the goal of enhancing her classroom instruction. By assessing and critiquing her own lessons, Loretta concluded that better outcomes might occur in future lessons if she provided students with additional time for individual and/or group discovery and for performing the actual activities.

At the 2009 MAA workshop Jaycee and Loretta participated in discussions about a number of software packages designed to support basic skills mathematics programs. In addition, Jaycee conducted her own research in this area while seeking software packages that might replace the system currently in place. Both women also regularly
participate in professional development at their own campus, but those campus-wide activities have a more general focus than the basic skills curriculum. Jaycee has also participated in several professional activities that reflected the broader mission of the college. The focus of those workshops and seminars were aligned with the nurturing pedagogical practices exhibited by a caring and supportive instructor.

Jaycee and Loretta’s interview data revealed the importance placed on professional development by the department. In their May and June interviews they discussed the numerous venues they had attended in order to enhance their knowledge of pedagogy and the appropriate use of technology with basic skills students. Venues ranged from national and regional conferences and workshops to seminars and meetings on other regional campuses as well as on their own campus. However, very little, if any, professional development opportunities related to basic skills mathematics has been available for adjunct faculty members. College funding for professional development did not include support for adjunct faculty members.

Data found in documents such as the course syllabi and the survey along with the interview data collaborate these findings regarding the availability of professional development opportunities for members of the mathematics department. The response to a particular question on the survey confirmed that the use of professional development funding was only for full-time personnel. However, information in the course syllabi describes the need for continually improving the curriculum within all college programs.

*Analysis of the use of professional development at the study site.* It is clear that the mathematics department is passionate about the importance of professional
development for all full-time faculty. That position is in strong agreement with AMATYC Implementation Standard IM-5, which seeks to ensure a high level of professionalism in the department. It addresses the need for faculty to engage in both professional development and service. Both Loretta and Jaycee have actively sought workshops, conferences and seminars that addressed topics appropriate for their area of study or curriculum expertise. They are lifelong learners who enjoy participating in a variety of professional development and service activities. It must be noted that, similar to most other institutions of higher education, it is only the full-time faculty who receive institutional support to engage in professional development activities. However, it is questionable if such continual improvement can be accomplished without providing some professional development opportunities for the entire basic skills faculty.

**Responses to Guiding Questions 5, 7 and 8**

These three guiding questions are concerned with how the chairperson and instructors’ visions for a basic skills mathematics program and their beliefs about teaching and learning were manifested in the program. They also addressed the alignment of those visions and beliefs with the AMATYC standards. Because of the natural interaction between visions for academic programs and beliefs about best instructional practices as well as how people learn, the responses to these three questions are addressed at the same time. Data sources that contributed evidence to answer each question are summarized in Table 4.5.
Table 4.5

**Data Sources and Program Characteristics for Guiding Questions 5, 7 and 8**

<table>
<thead>
<tr>
<th>Data Sources</th>
<th>(Question 5) Vision of Program</th>
<th>(Question 7) Beliefs of Teaching / Learning</th>
<th>(Question 8) Teaching / Learning in AMATYC Standards</th>
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Guiding Question 5: Are the chairperson and instructors’ visions for the basic skills mathematics program representative of this program and are those visions reflective of the AMATYC policies, standards, and guidelines?

Guiding Question 7: How are the chairperson and instructors’ beliefs about teaching and learning incorporated into the basic skills program?

Guiding Question 8: How do the chairperson and instructors’ beliefs about teaching and learning compare to the beliefs reflected in the AMATYC policies, standards, and guidelines?

Unfortunately, at some institutions, not all faculty members support the learning goals, assessment practices and other aspects of the programs sponsored by their department. However, for any program in which they have significant instructional
responsibilities, it is important for their students and the academic reputation of the program that they have and project a positive attitude about course content, their students and the program. Triangulation of evidence from the study site shows that the chairperson and faculty members are in agreement with the mathematics department vision for its basic skills program and that they are supportive of the AMATYC standards.

Any educator’s vision for a particular program is framed by ambitious but attainable goals balanced with the understanding of possible constraints. NCTM (2000b) describes their vision for a mathematics program as one in which:

All students have access to high-quality engaging, mathematics instruction. There are ambitious expectations for all, with accommodation for those who need it. Knowledgeable teachers have adequate resources to support their work and are continually growing as professionals. The curriculum is rich, offering students opportunities to learn important mathematical concepts and procedures with understanding. Technology is an important component of the environment. (p. 3)

This vision offers an idealized description of the teaching and learning environment for academic mathematics programs. Similarly, the publications, Crossroads and Beyond Crossroads (AMATYC, 1995, 2006) contain visions for mathematics programs, including those designed for basic skills college students. These visions are shaped by the desire to empower all students quantitatively by using a variety of instructional styles that show students the value and interconnectivity of mathematics
and how knowledge of mathematical concepts and procedures can help them become successful in their future academic and vocational lives. They also recommend that departments make use of appropriate technology in their curriculum, instructors seek information about instructional practices that improve student learning, and that instructors regularly reflect on their instructional practices and be engaged in professional development activities.

Both AMATYC and NCTM claim that well-designed standards play a large role in the continual improvement of any mathematics program. Standards can serve as guidelines for determining content, pedagogical strategies, goals for student learning, aspects of different learning environments and metrics for professionalism. Most formal documents, such as the visions for mathematics programs provided by NCTM and AMATYC, are meant to act as a starting point for discussions at each institution, not as a mandated prescription to be blindly followed (AMATYC, 2006). Because of individual characteristics that distinguish post-secondary institutions from one another, members of each program’s resident mathematics faculty need to determine their institution’s process for implementing and maintaining positive programmatic changes, balanced by any institutional constraints.

At the study site, the overarching vision for the basic skills mathematics program is represented by language in the mission statements of the college, division and department. This information is found on the opening pages of the syllabi for both basic skills courses (see Appendices M and N). Tenets in those mission statements reflect the vision of ideal practices for each program at the institution.
Several goals emerge from the three mission statements that are aligned with the AMATYC’s goals for basic skills program. The first is to offer a full array of learning experiences for students. All three of the mission statements stress the importance of this practice in order to assist students’ understanding of course content. They describe the vision of a quality program as one that offers students many different avenues for learning, i.e., a variety of instructional strategies. As seen in the response for Guiding Questions 1 and 2, the study site offered students a variety of learning experiences to help them acquire the conceptual and procedural knowledge associated with the basic mathematics skills courses.

A second goal that emerged from the mission statements was the desire to prepare all students, relative to their individual potential, with the intellectual and personal tools needed to successfully meet current and future academic, political, social and job related challenges. The college and division-level mission statements word this goal in a reflective tone. Those statements are respectively described as preparing students “to meet the challenges of the new century with informed minds and understanding hearts” and “to produce graduates well-equipped to contribute to society”. The mission statement for the Department of Mathematics more specifically states the need to “bring students to their highest potential by providing theory and practice related to problem solving, logical reasoning, and analytical skills.” (Appendices M and N).

The mission statement for the Mathematics Department stresses the need to incorporate a mix of applied and theoretical mathematics in its curriculum in order to properly prepare students to meet future challenges with sufficient mathematical skills.
To meet this goal the AMATYC standards recommend the use of authentic lessons, designed by nurturing instructors, that, when appropriate, incorporate the use of technology. As seen in the response to Guiding Questions 1, 2, 3 and 4, the study site has employed mathematical connections, authentic examples, nurturing pedagogy and appropriate technology within its basic skills curriculum.

Other goals that were common to the three mission statements, were for all programs to include current material that was relative to the course content, pedagogical practices, applications and examples, technology, and assessment in addition to regular program assessment in order to ensure that effective teaching and learning practices were in place. For programs to attain these goals requires them to have an ongoing, cyclic review of instructional practices, course content, student assessment practices, and for departments to continually explore changes to curriculum that lead to improved student learning. A number of recommended assessment practices were observed at the study site and documented in connection with the responses to other guiding questions. For example, the institution recently completed a review of all programs in connection with their continuing Middle States accreditation. In addition, informal program assessment data had prompted Jaycee to research and recommend a new software package that might replace the current package that supports students enrolled in basic skills courses. A more mundane, but never-the-less a very important, change that was based on faculty input and research results was reducing the maximum number of students enrolled in all sections of a basic skills courses from more than 30 to 15. The establishment of the math
lab in 2004 and the use of supporting educational software that began in 2007 are two major steps taken by the institution that are well aligned with the AMATYC standards.

Interviews with members of the mathematics faculty supported my understanding of the three mission statements and their relation to the department’s vision for the basic skills math courses. As noted earlier, vision statements are normally idealistic and state goals instead of identifying stages along a path aimed at those goals. While the mission statements described the institution’s vision for the basic skills math program, interview data offered concrete evidence about program successes and insights into some of the stumbling blocks that were encountered. In follow-up interviews, the mathematics department chair and lab director agreed that the vision for the basic skills mathematics program was in agreement with the college, division and department’s mission statements as well as with their own visions for the program. In a January 2012 email Loretta reflected on the human side of those goals by saying:

Yes, we certainly try to adhere to the vision in those mission statements, even when the semester is ending and we are tired and we need to push on to finish the course material. (Loretta, personal communication, January 13, 2012)

Her comments demonstrated how the weight of duties associated with being department chairperson, student issues, and campus responsibilities could interfere with an instructor’s efforts to meet the spirit of a program’s vision.

All three of the interviewed faculty agreed that their beliefs about teaching and learning mathematics were aligned with statements found in the department’s mission statement. In addition, Loretta and Jaycee stated that their visions for a basic skills
program were well aligned with the AMATYC standards. Furthermore, they had
designed the program’s current structure and curriculum with those standards in mind.
Although he did not explicitly state that his teaching practices were aligned with the
AMATYC standards, evidence discussed in the response to Guiding Questions 1 and 2
shows that Victor’s teaching practices were reflective of standards that addressed the use
of authentic lessons, nurturing pedagogy, and technology. In conclusion, evidence from
the study site shows that the chairperson, and at least two other instructors, shared
common beliefs about teaching and learning that were in agreement with the
department’s mission statement and reflected the goals and objectives of the AMATYC
standards.

   An institutional goal, that may be the primary goal for this institution, reflects its
strong religious affiliation. That goal is for the institution to promote a desire for God, a
respect for all creation and to offer service to others. This particular goal is more difficult
to measure or accurately examine within the mathematics program. However, after
spending time observing and talking with the faculty at this institution, I found that this
aspiration was visible within the basic skills program. All three of the faculty members
that were interviewed saw their purpose as more than mathematical instruction at this
religiously affiliated institution.

   Jaycee viewed her participation in retreats and pilgrimages as a form of
professional development. During one interview session it was clear that she was
touched by the support she received that enabled her to participate in a particular
pilgrimage (see Appendix Q). She discussed how the college meant so much more to her
than just a job, how her faith was rooted in the college’s mission and how she strives to incorporate an attitude of caring and kindness into her classes. A similar sense of care and concern was observed in Loretta who also mentioned that she, and the other members of the department strived to follow the mission of the college. These positive, perhaps faith motivated traits are aligned with the characteristics of nurturing instructional practices.

In conclusion, the chairperson and instructors’ visions, and their beliefs about teaching and learning relative to the study site’s basic skills mathematics program are in agreement and supportive of that program and reflect the policies, standards and other program guidelines recommended by AMATYC.

Response to Guiding Question 6

Guiding Question 6: What specific actions has the chairperson taken to incorporate the AMATYC policies, standards and guidelines into the basic skills program?

Supporting and descriptive documentation. AMATYC recognizes the important role that mathematics faculty, specifically the department chairpersons, have in moving the vision for mathematics programs as described in *Crossroads* (1995) and *Beyond Crossroads* (2006) towards reality. Chairpersons are key players in transforming the vision into practice by their leadership and support of data driven changes to department programs. MAA (2009) echoes these observations by stressing the importance that department administrators plan for the proper assessment of programs and allocate resources for this process, which begins with reflection on how the mission
and goals of the institution relate to each program and what professional programmatic standards are appropriate for each program. Following that reflection, the next step involves determining how well the curriculum, policies and practices of each program are aligned with those goals and standards.

Interpreting and implementing standards of any kind often involves “varying degrees of fidelity” (NCTM, 2000, p. 5). In some cases, shallow interpretations can lead to trivial changes that are ineffective in practice. To ensure effective improvement through standards, leaders in math education need to promote meaningful, not superficial changes, to curriculum, classroom practices, and the level of support for professional development. Understanding and sharing this vision by implementing practices that reflect the standards as completely and effectively as possible is one of the most important roles of chairpersons, administrators and program leaders.

The major mathematics education professional organizations (MAA, NCTM, and AMATYC) agree that for all academic programs, the most important components of the standards are those that address the need for a coherent and focused curriculum, effective teaching and learning strategies, the incorporation of technology, and ongoing assessment of all aspects of the program. Those organizations unanimously agree that it is the leaders in the field who are the driving force behind efforts to keep programs aligned with standards. Without their determination and direction, positive reform efforts are doomed to remain only as empty words found in standards manuals and not constructive action in mathematics classrooms and programs.
Evidence of chairperson’s actions to incorporate AMATYC policies, standards and guidelines into the basic skills program. Data from several sources revealed actions taken by the chairperson that incorporated AMATYC recommendations for the use of a variety of instructional practices and learning environments, the use of authentic examples and technology, nurturing pedagogy and appropriate program assessment. When Loretta first arrived at this campus she found there were more than 30 students in most sections of the basic skills courses. She, and the other instructors, found it very difficult to effectively instruct such a large number of under prepared students and to interact with their students on an individual basis. After recognizing the need to connect with their students in a more personal and meaningful way, Loretta successfully negotiated with the institution’s administration to cap the class size for all sections of basic skills mathematics courses at 15. Other changes to the basic skills program that occurred during Loretta’s tenure as chairperson include improvements in the Math Lab, the selection of the Hawkes learning system software, and the piloting of the MyMathLab software.

After the math department realized that the use of the Hawkes Learning System was having a positive effect on student comprehension and grades Loretta changed its use from an optional component to a required component for both courses. During her watch instructors were required to use student assessment data from the software for a significant portion (up to 25%) of their students’ semester grade. Through this action, Loretta instituted uniform use of the software and all basic skills students benefited by having a common exposure to the software.
Loretta has actively sought information about effective teaching strategies for basic skills students by attending professional development workshops and conferences. It is through collaboration with peers that she gains knowledge that enables her to make changes to her own teaching and to the basic skills program at her institution. As noted earlier, data show that Loretta used authentic lessons in her courses and has reflected on those lessons. Loretta has also supported requests from other full-time faculty to participate in a variety of professional development. However, interview and survey data show that financial resources for professional development are not available for the department’s adjunct faculty members. Survey data show that adjunct faculty members instruct 50% of the basic skills courses. This means that half of the basic skills instructors do not participate regularly, if ever, in any form of professional development.

**Analysis of actions by the chairperson to incorporate the AMATYC policies, standards and guidelines into the basic skills program.** Evidence from several sources shows that actions by the chairperson have led to the incorporation of AMATYC policies, standards and guidelines into the basic skills program. Her actions were aligned with the Implementation Standards (see Appendix F) that describe methods for translating knowledge into classroom practice and for making improvements to programs on a continual basis. For example, by reducing the maximum enrollment in basic skills classes to 15, Loretta addressed Standard IM-1 that addresses the need to improve student learning by designing teaching environments that optimize student learning. Smaller class size enabled instructors to become acquainted with their students more quickly and as a result, students received more individualized attention for their specific needs. It is the
opinion of Loretta and Jaycee that this has helped students reach a higher level of mathematical competency.

Actions by Loretta have also addressed Standards IM-2, IM-3 and IM-4 which are: Assessment of Student Learning, Curriculum and Program Development, and Instructional Variety respectively (see Appendix F). These three Implementation Standards are inter-related since each standard addresses issues concerned with assessing and improving the curricula, materials and teaching methods to better support the learning of mathematics by basic skills students.

Standard IM-2, Assessment of Student Learning, addresses the need for faculty members to use results from student assessment to improve program instructional methods. This standard pairs seamlessly with Standard IM-3, which discusses the importance of enacting program changes based on the results of student assessment data. Loretta’s actions regarding the role software played in the basic skills mathematics classes exhibited evidence of Standards IM-2 and IM-3. Loretta and Jaycee’s Hawkes software presentation at the 2010 NADE conference connects the use of the software with improvement in the passing rates for students in the basic skills courses. As noted, Loretta’s actions led to changing the use of the software from optional to mandatory and reflected her use of the results of student learning to revise policies and practices to improve student learning. That is, her actions were again aligned with Standards IM-2 and IM-3. Loretta also sought to continue this positive trend more permanently. To achieve that end, with her leadership, the department required all basic skills instructors to have assessment data related to the use of the software count for up to 25% of the
students’ final grade. These actions ensured the use of the system by all basic skills students, which in turn allowed all basic skills students to receive a variety of instructional techniques that included the computer component along with the classroom and individual mentoring components. This action reflects Standard IM-4 that states the need for the use of a variety of instructional strategies in basic skills courses. It also provided students equal access to knowledge and exposure to a variety of instructional strategies regardless of their instructor.

Standard IM-5 recognizes the need for the department to employ qualified mathematics faculty who engage in continual professional development and service. Interview data revealed that Loretta sought to hire instructors who have a strong background in the mathematical sciences. She believes she has been successful in this area, although there were a few times when she was rushed to hire adjunct faculty members that only minimally met the institutions requirements. As noted previously, both survey and interview data show that the department encouraged full-time faculty members to participate in various forms of professional development, but the more extensive and expensive forms of professional development was not extended to the adjunct faculty. Overall, the actions of the mathematics department chair are well aligned with the recommendations of AMATYC.

Chapter Summary

Data from a variety of sources was used to examine how well the policies and practices for the study site’s basic skills program aligned with twelve of the AMATYC program standards for the first two years of college mathematics. Analysis of the data
showed that, for at least seven years, the mathematics department has strived to align their program with the AMATYC standards. In fact, as noted in the response to Guiding Questions 5, 7 and 8, the program was designed with those standards in mind.

This study’s eight guiding questions (see Chapter 3) are more specific and focused than its four research questions. While the guiding questions focused on specific program characteristics, the research questions addressed more general information that, with the exception of Research Question 3, encompassed a number of program characteristics.

**Response to the four research questions.** Research Questions 1 and 2 queried the policies and practices that were being used in connection with the study site’s basic skills mathematics program and how well those practices were aligned with the AMATYC standards.

Research Question 1: What are the current practices and related policies used to bridge the mathematical gap for basic skills students in developmental mathematics classrooms, mathematics labs and/or computer labs at one post-secondary institution in New Jersey?

Research Question 2: How are the current practices for this institution aligned with the principles and standards found in the AMATYC publications, *Crossroads* and *Beyond Crossroads*?

The responses to Guiding Questions 1, 2, 3 and 4 revealed that the basic skills program employed a number of pedagogical practices that were well aligned with those supported by research and suggested by the AMATYC. Those practices included
establishing and maintaining supportive learning environments, employed qualified faculty who used a variety of instructional practices, used assessment to guide program changes, used technology, and exhibited the use of nurturing pedagogy. Evidence also documented that full-time faculty received institutional support for program related professional development but that similar support was not available to part-time faculty. Responses to Guiding Questions 5, 7 and 8 showed the existence of policy statements at the level of the College, the Division of Arts and Sciences, and the Mathematics Department that were in agreement with the standards. The responses to those three questions also documented that the chairperson and programs instructors’ beliefs about teaching and learning were also well aligned with the AMATYC standards.

Research Question 3 was aimed at identifying the barriers and supports that were encountered relative to the implementation of the AMATYC standards at the study site. As previously noted, the program was designed with those standards in mind. In addition, the department chairperson and the math lab director have actively pursued professional development that was specific to the basic skills program. These two faculty members, together with supportive mission statements and policies, are the primary supports for the program. The chairperson and lab director are clearly dedicated to the success of the program as evidenced by their statements and actions.

However, since adjunct faculty members teach 50% of the basic skills courses, three related barriers to fully implementing the AMATYC standards were uncovered. First, the standards for adjunct faculty at the study site allow for the appointment of individuals with academic preparation in a field that is closely related to mathematics.
The AMATYC standards state that the academic preparation of all instructors is to be in mathematics. Second, professional development support is not available for adjuncts. Together, these two barriers suggest that improvements to the program through regular ongoing assessment may not occur in some classrooms and thus limit the provision of a rich variety of learning and alternate assessment experiences to all students.

Research Question 4 asks, how effective do those responsible for the basic skills program think their program is and what evidence do they have to support their claim? All three of the faculty who were interviewed stated that the program was effective. Most basic skills students are successfully progressing through the basic skills program and enrolling in college level mathematics courses. Institutional data for 2009 that was presented at the 2010 NADE conference showed the success rate for students in the basic skills program was 83%. This high passing rate was attributed to the mix of classroom instruction together with individualized help in the math lab and the required use of technology.

Loretta and Jaycee realize that program assessment is necessary in order to maintain a successful program. As noted elsewhere, such assessment resulted in the piloting of MyMathLab software and a plan to compare student success with that software to the current Hawkes Learning System software. The department is planning to offer two new math classes to better serve their students’ needs. The first course will be piloted in the fall 2012 semester. It will incorporate topics from both the Pre-Algebra and Algebra curriculum for students who test into Pre-Algebra but whose placement score was near the cut-off score for those courses. This course should enable students to
complete all of their mathematics basic skills course requirements in one semester. Students enrolled in this pilot course will use the MyMathLab software. Offering this new course demonstrates that the department is striving to streamline the basic skills program for better prepared students and thus enable their enrollment in college-level math courses in half the usual time.

The other course under consideration will be a combination of the basic skills Algebra course and an applied business math course. This course is being designed for students who test into the basic skills Algebra course with a high placement score. Those students will be eligible to enroll in this five-credit hybrid-course that will allow them to complete their basic skills requirements and a core math class in one semester.

Both Loretta and Jaycee stated that they are always seeking ways to improve the program through their attendance at professional development activities and regular program assessment. These tools have helped them to shape the existing basic skills program. They believe that their review process has resulted in regular improvements to the program and has been relatively successful. They plan to continue this process while minimizing the impact of any existing constraints. The responses to Guiding Question 6 documented that Loretta’s actions as department chairperson were supportive and aligned with the AMATYC standards.
Chapter 5: Summary, Conclusions and Recommendations

This chapter is a synopsis of a research study that examined the basic skills program at a private, religiously oriented, northern New Jersey college. Approximately 1800 full-time undergraduates were enrolled at the study site. The primary data collection activities occurred during the Fall 2011 semester. For purposes of clarification, some additional data was collected during the first part of the Spring 2012 semester. The study’s findings indicated that the institution had used the AMATYC standards to guide many aspects of their program. Institutional policies and a number of department practices, as well as the instructional practices of individual professors were well aligned with the standards. The findings may be useful to other, similar colleges that offer a basic skills mathematics program. However, since the study only examined one institution, there are limitations to its transferability to any other institution, especially to larger universities or community colleges that have different institutional characteristics.

Summary

Research design. Case study research was used to describe how the AMATYC standards impacted the implementation, evaluation and modification of a basic skills program at one four-year institution. Data sources included an initial survey, interviews and observations as well as program documents such as mission statements, course syllabi, text and supporting technology. Data was recorded, coded and classified by categories related to the AMATYC standards that addressed topics that included authentic lessons, the use of technology, culturally responsive and nurturing pedagogies,
program assessment and the impact of professional development on the program as well as its availability for basic skills instructors. A research journal was used to keep the collection of the data organized by documenting the dates, locations and individuals or documents encountered during site visits and also for my reflections.

Findings. Triangulated data showed that the program maintained a mathematics lab where students could get individualized assistance with their mathematics assignments, required the use of technology to support student learning, and made use of assessment to evaluate, and when appropriate, modify aspects of the program. In addition, for courses in the program, data showed that the level of student success (indicated by a grade of at least C) was approximately 80%. Data also revealed that the institution supported the professional development of its full-time faculty. However, it appeared that there were only minimal professional development opportunities for the adjunct faculty. Overall, the findings indicated that the institution, through the effective leadership of two full-time faculty members, has a basic skills mathematics program that is well aligned with the AMATYC standards. Not surprisingly, budgetary issues have limited the implementation of some components to all sections of the courses.

Conclusions

This study examined the implementation of the AMATYC standards at one four-year institution. In this section, the findings of this particular study are examined in comparison to prior research. Although MAA (2009), NADE (2002), NCTM (2000b) and AMATYC (1995, 2006) define lofty goals for improving mathematics programs, implementation can be difficult to achieve at many institutions.
Authentic lessons have often been described as a vehicle for improving mathematical understanding (AMATYC, 1995, 2006; Backhouse, 1989; NADE 2002; NCTM, 2000b, NRC, 2000; Yusof & Tall, 1999). Meaningful content has been seen as a vehicle for assisting students in understanding difficult, abstract concepts. The findings from this study demonstrate that authentic lessons were being used in some classrooms with mixed results. Some real-world assignments seemed to be more successful than other activities. For future authentic lessons, the faculty suggested more time for discovery and understanding in order to ensure better understanding.

NRC (2000), NCTM (2000b) AMATYC (1995, 2006) and NADE (2002, 2003) stressed the need for using technology within mathematics programs. Research from Heid (1997) and Vasquez (2003) echoed this belief for students in all types of math classes. The findings from this study demonstrated that the study site followed these research recommendations by incorporating appropriate technology within the basic skills math program. This was accomplished through the use of the Hawkes Learning System and MyMathLab software. Data provided evidence of the positive effect the combined use of the math lab and this software had on the passing rate of students.

MAA (2009) stressed the need for class sizes to be fewer than thirty students in order to create a classroom environment that fosters effective instruction and a nurturing environment. Research from AMATYC (2006) and Golfin et al. (2005) also supported a low teacher to student ratio. The research by Duranczyk (2007, 2008a, 2008b) also found that small class sizes encouraged a nurturing and caring environment for basic skills classes. The findings from this study showed that the study site incorporated the use of
small classes and that there was evidence of nurturing pedagogy that was affiliated with smaller classes. Although using classroom culture was mentioned in the standards and research literature, this research found no evidence of its use at the study site.

The following organizations, MAA (2009), NADE (2002), NCTM (2000b) and AMATYC (1995, 2006) stress the need for strong professional development support for all faculty members. Chatterji (2002), Desimone (2002) and Knapp (1997) also acknowledged the importance of professional development with regards to instituting new standards and policies. The findings of this study showed that professional development is a key component for full-time faculty but the department is constrained by budgetary concerns in offering it to all basic skills instructors.

Gess-Newsome et al. (2003) researched the reasons that college professors make changes within their programs and instructional methods. They demonstrated that instructor dissatisfaction with the current curriculum is one of the main reasons for change within a program. The findings from this study reinforce Gess-Newsome’s research. The search for new software at the study site arose from the dissatisfaction of a basic skills instructor who thought the Hawkes system could be replaced with a more effective software package. It was this dissatisfaction that led to the piloting of the MyMathLab software.

In conclusion, the study site has met many of the standards set forth by AMATYC. By implementing authentic lessons and technology, the math department sought to improve the success rate of the basic skills students. By supporting professional development for full-time faculty members, the institution assisted those
instructors in enhancing their pedagogical skills. The study site also maintained a supportive learning environment that offered individualized attention to the students through classes and personal attention in the math lab. However, due to financial constraints, the study site is not supplying all faculty equal professional development opportunities. Similarly not all students are able to receive equal access to the math lab since its hours are curtailed during the evening and weekend timeframes.

This study added to the existing research by demonstrating that it is difficult to fully implement standards in a program. Many research studies cited in the literature review acknowledged this difficulty in changing policies or standards. The study also strengthened previous research findings by showing that technology seems to help students succeed in mathematics. It also reinforced other findings that instructor dissatisfaction seems to be a key factor in program change. It also seemed to demonstrate that basic skills mathematics programs need a dedicated person to take ownership of the program.

**Recommendations**

The findings of this study may have implications for any institution offering a basic skills mathematics program. But, it must be noted that the limitations of this study may limit its findings. However, whether or not the findings are transferable to institutions with similar financial structures and enrollment numbers is a decision that is made by those institutions. This study confirmed research findings suggesting that it is difficult for programs to completely align with standards put forward by professional associations or councils. This study demonstrated that there are constraints that affect
many institutions from fully attaining the standards, especially for small private colleges. Financial issues limit the use of the facilities such as a math lab and the availability of professional development for all instructors, especially adjunct instructors. Small colleges or mathematics departments could apply for relevant grants that might assist the departments with funding both of these needs. Departments could also offer workshops for adjuncts that cover material similar to that available in formal professional development venues. To assist in record keeping and data tracking, departments should seek additional funding from their college to hire a part-time employee who could also maintain data relative to the level of student success after they complete the basic skills program.

For future research, similar studies could be performed that examine other institutions with different characteristics. This research could be extended to community colleges and state universities that have very different financial characteristics and student populations. Other studies could be conducted over an extended period of time to determine if specific pedagogical changes have had a positive effect on a basic skills program. Following programs for longer periods of time might add to the trustworthiness of the data. Finally, as an assistant professor, I look forward to continuing my research in this area.
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Appendix A

Basic Skills Terminology

Within the research, the following terms are frequently used interchangeably: college remediation courses, basic skills courses and developmental courses. Each of these terms refers to the special courses offered to students who enter college and “lack some of the reading, writing and mathematics skills that are critical for college-level work” (Attewell, Lavin, Domina & Levey, 2006). Each of these courses refers to introductory subject courses that offer no college credit to the students. However, researchers and educators in the field see subtle distinctions between these terms and greatly prefer the use of developmental education or basic skills education over the term remedial education.

The term, remedial, defined as “correcting deficiencies” (Webster, 2002), leads one to believe that the remedial course will “fix the student or some weakness exhibited by the student” (Kozeracki, 2002). Because of this slightly negative connotation, a majority of educators in this field are moving away from using this particular term. Therefore, for the purposes of this study, the term, remedial will be used only within quotations from other sources.

The term, developmental education, is defined as assistance offered to students academically and emotionally based upon their current stage of progression (Kozeracki, 2002). It is viewed as a more comprehensive process and assumes that all learners have talents and can improve their learning skills. Topics such as time management or constructive study habits are often incorporated in these developmental courses.
However, as noted above, these developmental courses do not offer the student college credits towards graduation.

The term, *basic skills*, is defined as courses that offer further review of elementary concepts to students before they take additional courses in mathematics, business, science, or other fields (Lial, Hornsby & McGinnis, 2002). These courses give the students the foundation for progressing into higher-level content courses that would count towards college credits and graduation.
Appendix B

History of College Level Basic Skills Courses

Currently, most colleges and universities in the United States offer basic skills or developmental courses for students who lack certain mathematical skills (Attewell, Lavin, Domina & Levey, 2006; Cross & Fideler, 1989; Grubb, 1991). Developmental courses are quite commonplace at the majority of institutions of higher education with approximately 40% of traditional undergraduates requiring one such course (Attewell et al., 2006; Patterson & Sallee, 1986; Shaw 1997). These courses are not new to the American educational system because basic skills or developmental courses have been regularly included within the spectrum of the curriculum at Ivy League universities and other colleges since the Colonial period (2006). In 1849, the University of Wisconsin established the first official developmental education program, which focused upon accommodating and assisting ill-prepared students (Arendale, 2000). Known as the Department of Preparatory Studies, this program instructed students in basic skills by offering courses in reading, writing, and arithmetic. This began a movement by most institutions of higher learning to establish academic preparatory courses for students who needed additional assistance. These programs became vital for bridging the gap between college expectations and the academic abilities of high school students.

Academic preparatory departments became the norm at most institutions of higher education by the end of the nineteenth century. Approximately 80% of the nearly four hundred colleges and universities had developed basic skills programs for college preparatory programs by 1889 (Arendale, 2000). Like today, nearly 40% of all incoming
freshmen were enrolled in these basic skills classes. The open-door admissions policy in the 1960s at some colleges had also made basic skills classes more common (Shaw, 1997). By 1993, 90% of all four-year colleges and universities offered developmental instruction in some form.
Appendix C

Standards for Intellectual Development

Standard I-1: Problem Solving

Students will engage in substantial mathematical problem solving.

Standard I-2: Modeling

Students will learn mathematics through modeling real-world situations.

Standard I-3: Reasoning

Students will expand their mathematical reasoning skills as they develop convincing mathematical arguments.

Standards I-4: Connecting With Other Disciplines

Students will develop the view that mathematics is a growing discipline, interrelated with human culture and understand its connection to other disciplines.

Standard I-5: Communicating

Students will acquire the ability to read, write, listen to and speak mathematics.

Standard I-6: Using Technology

Students will use appropriate technology to enhance their mathematical thinking and understanding and to solve mathematical problems and judge the reasonableness of their results.

Standard I-7: Developing Mathematical Power

Students will engage in rich experiences that encourage independent, nontrivial exploration in mathematics, develop and reinforce tenacity and confidence in their abilities to use mathematics, and inspire them to pursue the study of mathematics and related disciplines.

Standards in bold are being investigated in this study.
Appendix D

Standards for Content

Standard C-1: Number Sense
Students will perform arithmetic operations, as well as reason and draw conclusions from numerical information.

Standard C-2: Symbolism and Algebra
Students will translate problem situations into their symbolic representations and use those representations to solve problems.

Standard C-3: Geometry
Student will develop a spatial and measurement sense.

Standard C-4: Function
Students will demonstrate understanding of the concept of function by several means (verbally, numerically, graphically and symbolically) and incorporate it as a central theme into their use of mathematics.

Standard C-5: Discrete Mathematics
Students will use discrete mathematical algorithms and develop combinatorial abilities in order to solve problems of finite character and enumerate set without direct counting.

Standard C-6: Probability and Statistics
Students will analyze data and use probability and statistical models to make inferences about real-world situations.

Standard C-7: Deductive Proof
Students will appreciate the deductive nature of mathematics as an identifying characteristic of the discipline, recognize the roles of definitions, axioms and theorems, and identify and construct valid deductive arguments.

Standards in bold are being investigated in this study.
Appendix E

Standards for Pedagogy

**Standard P-1: Teaching with Technology**

Mathematical faculty will model the use of appropriate technology in the teaching of mathematics so that students can benefit from the opportunities it presents as a medium of instruction.

**Standard P-2: Interactive and Collaborative Learning**

Mathematics faculty will foster interactive learning through student writing, reading, speaking, and collaborative activities so that students can learn to work effectively in groups and communicate about mathematics both orally and in writing.

**Standard P-3: Connecting with Other Experiences**

Mathematics faculty will actively involve students in meaningful mathematics problems that build upon their experiences, focus on broad mathematical themes, and build connections within branches of mathematics and other disciplines so that students will view mathematics as a connected whole relevant to their lives.

**Standard P-4: Multiple Approaches**

Mathematics faculty will model the use of multiple approaches-numerical, graphical, symbolic, and verbal-to help students learn a variety of techniques for solving problems.

**Standard P-5: Experiencing Mathematics**

Mathematics faculty will provide learning activities, including projects and apprenticeships that promote independent thinking and require sustained effort and time so that students will have the confidence to access and use needed mathematics and other technical information independently to form conjecture from an array of specific examples, and to draw conclusions from general principles.

Standards in bold are being investigated in this study.
Appendix F

Implementation Standards

**Implementation Standard IM-1: Student Learning and the Learning Environment**

Mathematics faculty and their institutions will create an environment that optimizes the learning of mathematics for all students.

**Implementation Standard IM-2: Assessment of Student Learning**

Mathematics faculty will use the results from the ongoing assessment of student learning of mathematics to improve curricula, materials, and teaching methods.

**Implementation Standard IM-3: Curriculum and Program Development**

Mathematics departments will develop, implement, evaluate, assess and revise courses, course sequences and programs to help students attain a higher level of quantitative literacy and achieve their academic and career goals.

**Implementation Standard IM-4: Instruction**

Mathematics faculty will use a variety of instructional strategies that reflect the results of research to enhance student learning.

**Implementation Standard IM-5: Professionalism**

Institutions will hire qualified mathematics faculty, and these faculty will engage in ongoing professional development and service.

Standards in bold are being investigated in this study.
Appendix G
Introductory Letter

Mathematics Department Chairperson,

My name is Patricia Garruto and I am an Assistant Professor of Mathematics at Caldwell College in Caldwell, New Jersey. I am also pursuing my doctoral degree in Mathematics Pedagogy at Montclair State University under the guidance of Dr. Ken Wolff. I have currently arrived at the dissertation stage in my doctoral program and I am reaching out to your particular institution of higher education for some assistance with my research.

My interest for research focuses upon the basic skills mathematics programs offered in higher education programs. So much has changed over the past few years in how colleges address the issue of students who are in need of additional support for basic skills mathematics. I am attempting to identify the range of instructional methods used in basic skills and try to discover successful practices and policies that are effective for these students. I am enclosing a survey and consent form containing general questions regarding your basic skills mathematics program. Most of this survey should not take more than 10 minutes to complete, however, some of the more specific data items (such as enrollment figures) may take additional time. For your convenience, I have enclosed a self-addressed stamped envelope for returning the consent form and survey to me.

To further enhance this information, I would like to visit your particular institution of higher education in order to obtain a more complete understanding of their basic skills
program. If you would be willing to have me visit your institution, please answer ‘yes’ to the last question on the survey. A description of the purpose of my visit is on the last page of the survey.

I sincerely hope that you will take time from your busy schedule to complete the enclosed survey. As noted earlier, I have provided you with a self-addressed stamped return envelope for your convenience. Thank you very much for your time and consideration of this research project.

Sincerely,

Patricia Garruto
Doctoral Student,
Montclair State University
Appendix H

Basic Skills Survey

Survey to Mathematics Chairperson

Name_________________________  Job Title ______________________________

Email Address __________________  Phone Number ________________________

School __________________________________________________________________

Does your institution offer basic skills (i.e., developmental, remedial) mathematics courses?

Yes ______ No ________  If yes, please continue with this survey.

If no, you may stop this survey at this point. However, please return this form by using the stamped self-addressed envelope.

How do you determine who is placed in basic skills mathematics classes?
(check all that apply)

______ placement test  (test name, if known: ____________________________)

______ SAT scores

______ high school grades

______ other: (please describe)__________________________________________
Do students receive college credit for basic skills mathematics classes?

_______ Yes ________ No

Approximately, what percentage and number of first year students are placed in a basic skills mathematics classes?
(For example, 42% = 840 basic skills students out of 2000 total students)

____________ %     ____________basic skills students    ___________ total students

Approximately, what percentage and number of first year students will need to take two or more basic skills mathematics classes?
(For example, 20% = 400 students need two or more basic skills mathematics courses out of 2000 total students)

______ %       __________ students needing two or more   __________ total students
mathematics courses

Please list the titles of the different basic skills courses that your institution offers.
(For example, Basic Computation, Basic Algebra, Intermediate Algebra, etc.).

________________________________________________________

________________________________________________________

________________________________________________________
What book/program, if applicable, is used for each of your courses?

Basic Computation ______________________________________________

Basic Algebra ___________________________________________________

Intermediate Algebra _____________________________________________

Other __________________________________________________________

Approximately what percentage of the basic skills instruction takes place in settings listed below?

<table>
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<th>Course</th>
<th>Classroom</th>
<th>Math Lab</th>
<th>Computer Lab</th>
<th>Other (describe)</th>
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</tbody>
</table>
What are the approximate class sizes and numbers of sections for a basic skills mathematics class?

<table>
<thead>
<tr>
<th>Course</th>
<th>Class Size</th>
<th>Number of Sections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Computation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic Algebra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermediate Algebra</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Who instructs these courses? (please fill in percentages so total equals 100%)

FT faculty _____ PT faculty_____ adjunct faculty _______ TA _______ Other _______

Do the basic skills teachers participate in professional development specific to basic skills?

_______ yes _________ no

If yes, please provide a brief description (how often, is funding provided, etc.)
Does your math department collaborate with other institutions concerning basic skills mathematics?

________ yes _________ no

If yes, please provide a brief description (how often, with whom, is funding provided, etc.)

Could a follow-up contact with you (if needed) be conducted by the investigator?

________ yes _________ no

Would you be willing to allow me to visit your campus, at your convenience, to discuss your basic skills program in more depth?

________ yes _________ no
Appendix I

Consent form for Chairperson

CONSENT FORM FOR ADULTS

Please read below with care. You can ask questions at any time, now or later. You can talk to other people before you fill in this form.

Study’s Title: American Mathematical Association of Two Year Colleges (AMATYC) Reform Policies in Practice: Implementing Standards in Classroom Instruction for Basic Skills Mathematics at One Four-Year College in New Jersey

Who am I? I am Mrs. Patricia Garruto. I work at Caldwell College as an Assistant Professor of Mathematics. I am also a doctoral student at Montclair State University.

Why is this study being done? The purpose of this study is to examine and understand classroom practices that seem to produce successful outcomes for basic skills mathematics students.

What will happen while you are in the study? You, the mathematics department chair, have received this survey in the mail and are being asked to complete it. This survey is requesting general information questions about your basic skills math program. If you choose to participate in this survey, you will return it to me using the enclosed self-addressed stamped envelope. There is an optional second phase to this study mentioned in the final survey question, and you again have the option to participate in that second phase at a later date.
**Time:** This survey should take no more than 10 minutes to complete, however some of the more specific data items, such as enrollment figures may take additional time.

**Risks:** The risks associated with this study are no greater than those ordinarily encountered in daily life. If any question makes you feel uncomfortable, you may skip that question. Your participation is totally voluntary.

**Benefits:** You may benefit from this study because you will have the option to receive the findings from the study, which could offer suggestions for improving basic skills courses. Others may benefit from this study because knowledge about effective ways of teaching basic skills math classes can be helpful and productive for future basic skills students.

**Who will know that you are in this study?** I will keep your name confidential and all records will be protected by passwords or locked within file cabinets.

**Do you have to be in the study?**

You do not have to be in this study. You are a volunteer! It is okay if you want to stop at any time and not be in the study. You do not have to answer any questions you do not want to answer. Nothing will happen to you.

**Do you have any questions about this study?** Phone or email Patricia Garruto (pgarruto@caldwell.edu or 973-618-3392)

**Do you have any questions about your rights?** Phone or email the IRB Chair, Debra Zellner (reviewboard@mail.montclair.edu, 973-655-4327).
Consent Documentation

One consent document and signature page are for you to keep; please sign and return the second document to me.

If you choose to participate in this study, please fill in the lines below:

Your name (please print): _________________________________________

Your signature: _________________________________________________

Date: __________________

There are some aspects of the study you may not want to participate in. The table below provides you the opportunity to opt in or out of each of these aspects of the study.

Please initial the desired boxes, below:

<table>
<thead>
<tr>
<th></th>
<th>YES:</th>
<th>NO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is okay to use my data (survey answers and comments) in this study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is okay to use my data (survey answers and comments) in future studies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would like to get a summary of this study.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Patricia Garruto  
Name of Principal Investigator  
Signature  
Date

Kenneth C. Wolff  
Name of Faculty Sponsor  
Signature  
Date
Appendix J

Consent form for Basic Skills Instructor

CONSENT FORM FOR ADULTS

Please read below with care. You can ask questions at any time, now or later. You can talk to other people before you fill in this form.

**Study’s Title:** American Mathematical Association of Two Year Colleges (AMATYC) Reform Policies in Practice: Implementing Standards in Classroom Instruction for Basic Skills Mathematics at One Four-Year College in New Jersey

**Who am I?** I am Mrs. Patricia Garruto. I work at Caldwell College as an Assistant Professor of Mathematics. I am also a doctoral student at Montclair State University.

**Why is this study being done?** The purpose of this study is to examine and understand classroom practices that seem to produce successful outcomes for basic skills mathematics students.

**What will happen while you are in the study?** You are receiving this consent form because your institution agreed to participate in the second part of the data collection for this study. Thus, if you agree, you will be interviewed about your school’s basic skills math program in more depth on a day and time that is convenient for you. With your permission, this interview will be audiotaped and the audiotape will be transcribed. However, if you do not wish to be audiotaped, I will honor that request and only take notes during the interview. All identifiers will be removed from the interview and you and pseudonyms will be used in place of real names for you and your school to ensure confidentiality. I would also like to visit and observe classroom lessons and/or math lab
sessions approximately four times at mutually agreeable times. I will observe the classroom and/or math lab environment and the instructor’s teaching style and any classroom or math lab interactions. I will not be observing specific students or making evaluations of teaching. I will take notes during this visit and transcribe these notes into my computer. All computer files will be protected by a password known only by me. All tapes and notes will be kept securely locked in a file cabinet and then destroyed after the federally mandated 4 years.

**Time:** This study will take about one hour and forty-five minutes of your time. The interview should last about forty-five minutes and the classroom and/or math lab observations would be no longer than sixty minutes per session.

**Risks:** The risks associated with this study are no greater than those ordinarily encountered in daily life. If any question or area of discussion makes you feel uncomfortable, you may skip that question or area of discussion. Your participation is totally voluntary. If at any point during this research study you would like to withdraw from this study, your decision will be respected and complied with. You will never be identified by your real name in this study and the data will be kept secure at all times.

**Benefits:** You may benefit from this study because you will be discussing ways to possibly improve basic skills courses at your institution. Others may benefit from this study because knowledge about effective ways of teaching basic skills math classes can be helpful and productive for future basic skills students.

**Who will know that you are in this study?** Your mathematics chairperson or supervisor will know that you are participating in this study but I will not share anything from your interview or classroom observation with them. I will keep your name confidential and all records will be protected by passwords or locked within file cabinets. All identifiers will be removed and pseudonyms will be used in place of your real name. I will be the only other person who knows the link between your real name and your selected pseudonym.
**Do you have to be in the study?**

You do not have to be in this study. You are a volunteer! It is okay if you want to stop at any time and not be in the study. You do not have to answer any questions you do not want to answer. Nothing will happen to you.

**Do you have any questions about this study?** Phone or email Patricia Garruto (pgarruto@caldwell.edu or 973-618-3392)

**Do you have any questions about your rights?** Phone or email the IRB Chair, Debra Zellner (reviewboard@mail.montclair.edu, 973-655-4327)
Consent Documentation

One consent document and signature page are for you to keep; please sign and return the second document to me.

If you choose to participate in this study, please fill in the lines below:

Your name (please print): _________________________________________

Your signature: _________________________________________________

Date: ____________________

There are some aspects of the study you may not want to participate in. The table below provides you the opportunity to opt in or out of each of these aspects of the study.

Please initial the desired boxes, below:

<table>
<thead>
<tr>
<th></th>
<th>YES:</th>
<th>NO:</th>
</tr>
</thead>
<tbody>
<tr>
<td>For the purpose of verifying the accuracy of the interviewer's notes, it is okay to audiotape my interview while I am in this study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is okay to use my data (interview answers, observations) in this study.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is okay to use my data (interview answers, observations) in future studies.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would like to get a summary of this study.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Patricia Garruto ___________________________ ______________________
Name of Principal Investigator Signature Date

Kenneth C. Wolff ___________________________ ______________________
Name of Faculty Sponsor Signature Date
Appendix K

Interview Questions for Chairperson

Institution _____________________________

Code _____________________________

Interview Questions for Mathematics Department Chairpersons

How long have you been the mathematics department chairperson?

What is the purpose of your basic skills mathematics program?

What is your policy if a student questions his/her placement in the basic skills curriculum?

How many students need to take more than one basic skills course?

Do you keep track of the success rate for those who have to take two or more courses?

Has the basic skills program changed during your tenure as chairperson?

Is there a computer/math lab portion to this basic skills program?

What happens to students who fail a basic skills course?

Have you ever been one of the instructors for the basic skills mathematics courses?
In your opinion, what part of the program works well?  
text?  
computer portion?  
class size?  
course instructor?  

In your opinion, what techniques (presently or in the past) have not worked especially well in basic skills mathematics courses? Why?  

How do you determine which faculty should teach your basic skills courses?  

How often are adjunct faculty members selected to be the instructors for these courses?  

Do basic skills teachers engage in professional development? Specific for basic skills?  

Do the basic skills teachers ever collaborate among each other?  

Do the basic skills teachers ever collaborate with other schools?
Appendix L

Interview questions for basic skills instructors

Institution _______________________

Code ___________________________

Interview questions for Basic Skills Math Teachers

How long have you been teaching basic skills mathematics courses?

Describe the classroom environment for a basic skills course:

Lesson Structure?
Class size?
Academic freedom?
Length of class period?

Do you teach mathematics classes other than the basic skills courses?

If yes, what differences do you see between these classroom environments?

Lesson Structure?
Class size?
Academic freedom?
Length of class period?
Is there a computer component to these basic skills classes?
If yes, are you in charge of that?
How is it administered?

If this is a math lab program, is there also a classroom component for students?

In your opinion, what teaching methods seem to work well with basic skills students?
Group Work?
Computer Work?
Lecture?

In your opinion, have you ever seen or used a method that did not seem to work well with students? If yes, please explain.

Have you ever thought that some students have been misplaced in basic skills courses? If yes, please explain.

How do you respond to a student who believes that he/she does not belong in basic skills?

How do you conduct a typical class period?

Are you given time to collaborate with peers regarding basic skills courses?

Are you encouraged by the college to participate in professional development?
Are you encouraged by the college to participate in professional development that specializes in basic skills?

Do you feel you could benefit from participating in professional development for instructing basic skills courses?
Appendix M

Syllabus for Math 001

Site College Math-001

MISSION STATEMENT

Site College is an independent co-educational religiously affiliated college founded and sponsored by the Site Sisters to educate a diverse population of students within the framework of a liberal arts tradition. Its mission is to provide a full complement of learning experiences, reinforced with strong academic and student development programs designed to bring students to their highest potential and prepare them to meet the challenges of the new century with informed minds and understanding hearts. The enduring purpose of Site College is to promote a love for learning, a desire for God, self knowledge, service to others, and respect for all creation.

DIVISION OF ARTS AND SCIENCES MISSION STATEMENT

The mission of the Division of Arts and Sciences is to implement and manifest the Mission of Site College in the Programs of the Division; the General Education Program, the Developmental Educational Program, and the Core by providing the highest quality of instruction at both the undergraduate and graduate level, encouraging students to develop to their fullest potential, to gain skills for life-long learning, and to produce graduates well-equipped to contribute to society. The division achieves the stated mission by using processes of continual improvement, based upon assessment of student learning at all levels, as well as the assessment of the administrative processes and mechanisms.

DEPARTMENT OF MATHEMATICAL SCIENCES MISSION STATEMENT

The Department of Mathematical Sciences supports the mission of Site College by providing the portion of students’ educational experiences dealing with quantitative literacy. The Department supports the mission of Site College to provide a strong academic program by providing rigorous mathematics courses to students in all majors at all levels. The Department supports the mission of the Division of Arts and Sciences by providing a high quality of instruction in mathematics at both the college level and the developmental level. The broad variety of courses offered by the Department of Mathematical Sciences helps bring students to their highest potential by providing theory and practice related to problem solving, logical reasoning, and analytical skills. This will help prepare Site College students to meet future challenges with informed mathematical minds.
Course Number: Math 001  
Course Level: Undergraduate  
Course Title: Prealgebra  
Credits: 4  
Prerequisite: None  
Corequisite: None  
Location & Time: SH 37, MWF 2:35 – 3:50  
Instructor: Loretta  
Email:  
Phone: 201 559-3195  
Office: MH room 3  
Office Hours: MW 11:25 – 12:40 and 4:10 – 5:25; other times by appointment

COURSE DESCRIPTION

This is a refresher course in basic arithmetic and simple algebra. The criterion for placement in the course is failure to pass the pre-algebra portion of the Accuplacer Arithmetic Placement Test. Topics include fractions, decimals, ratio and proportion, percents, rational numbers, and solving equations. You must get a C or higher in this class in order to progress to Math 002.

COURSE CORE OBJECTIVES

Math students will demonstrate Critical Reasoning in Problem Solving and Effective Communication in oral presentation of solutions, and they will apply Quantitative and Analytical Skills to the subject matter.

COURSE OBJECTIVES

Upon completion of this course, you will be able to:  
Classify and describe different kinds of numbers, including whole numbers, integers, rational numbers, and real numbers.  
Identify prime numbers and be able to write the prime factorization of a composite number.  
Perform basic calculations (addition, subtraction, multiplication, and division) on whole numbers, rational numbers, and real numbers.  
Identify equivalencies among fractions, decimals, and percents.  
Recognize and be able to solve all types of percent problems.  
Solve one-step and two-step algebraic equations.  
Evaluate and simplify algebraic expressions.  
Solve problems involving ratios and proportions.  
Find perimeter and area of geometric shapes including quadrilaterals, triangles, and circles.
**TEXT REQUIREMENT**

*Pre-Algebra, A WorkText, 4th edition* by D. Franklin Wright, available at the Site College bookstore for $103.50. In addition to the text, you are required to have the software that accompanies the textbook and to register for online homework. You need the access code printed on the sleeve of the software CD in order to sign in to the Hawkes online homework system; do not lose it!

**COURSE CONTENT**

**Please Note:** This is a tentative schedule and is subject to change at the discretion of the instructor.

<table>
<thead>
<tr>
<th>Week #</th>
<th>Week ending</th>
<th>Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept. 3</td>
<td>Introduction to the course; course requirements; whole numbers</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sept. 10</td>
<td>Operations on whole numbers; applications; evaluating expressions and order of operations</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Sept. 17</td>
<td>Operations on integers; integer applications (average and change)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sept. 24</td>
<td>Introduction to equations and polynomials; like terms; solving simple linear equations</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Oct. 1</td>
<td>Prime numbers; divisibility and prime factorization</td>
<td>Test 1</td>
</tr>
<tr>
<td>6</td>
<td>Oct. 8</td>
<td>Introduction to rational numbers (fractions); operations on fractions</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Oct. 15</td>
<td>Mixed numbers; ratio and proportions</td>
<td>School closed October 11 for Columbus Day</td>
</tr>
<tr>
<td>8</td>
<td>Oct. 22</td>
<td>Continue ratio and proportion</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Oct. 29</td>
<td>Solving equations; applications</td>
<td>Test 2 (midterm)</td>
</tr>
<tr>
<td>10</td>
<td>Nov. 5</td>
<td>Decimals; applications (mean, median, mode, range)</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Nov. 12</td>
<td>Scientific notation</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Nov. 19</td>
<td>More on solving linear equations</td>
<td>Test 3</td>
</tr>
<tr>
<td>13</td>
<td>Nov. 26</td>
<td>Square roots and the Pythagorean Theorem</td>
<td>School closed November 24 – 26 for Thanksgiving</td>
</tr>
<tr>
<td>14</td>
<td>Dec. 3</td>
<td>Percent</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Dec. 10</td>
<td>Geometry and measurement</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Dec. 17</td>
<td>Review/final exam</td>
<td>Monday December 13 is the last day of class</td>
</tr>
</tbody>
</table>

**TEACHING/LEARNING STRATEGIES**
Class lectures, demonstrations, and discussions
Small group work and discussions
Study and homework groups
Individual problem solving
Math Lab (Site) or Center for Learning (Secondary Site) for help with homework or studying

GRADING POLICIES

There are no extra credit assignments. Homework will be assigned every week, some to be completed by hand and some using the online Hawkes System. It is your responsibility to ask for help if you have difficulty completing any homework assignments. If you have problems with the software and/or the homework please visit the Math Lab in Site College. The Math Lab is open every day; the weekly schedule is posted online at

Full credit will be given only for homework completed on time. Partial credit will be given for late assignments. There will be a quiz every Friday, except when there is a test. Quizzes are open-book. There are no retest options for quizzes. You are permitted one retest for each test. You must take the retest in the Math Lab outside normal class hours, and you must review the original test with a tutor before you take the retest. There are no retest options for the final exam.

GRADING RUBRICS

Tests, quizzes, and final exam: You will receive full credit for completely correct answers, with work shown. If you show your work, you will be eligible for partial credit. Homework: You will receive full credit for homework completed on time. You will receive partial credit for homework that is more than four days late. Classwork: Your classwork grade depends on attendance and participation. You receive no classwork credit for unexcused absences. If you have an excused absence, you will receive credit after you have completed all classwork exercises on your own time, within two weeks after the absence. It is your responsibility to find out and complete the classwork you missed. If you are in attendance but do not participate in classwork and class discussions, you will receive partial credit for the day’s class.

Your final grade will be based upon the following:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classwork</td>
<td>15%</td>
</tr>
<tr>
<td>Homework</td>
<td>25%</td>
</tr>
<tr>
<td>Tests</td>
<td>30%</td>
</tr>
</tbody>
</table>
Departmental final exam  30%

Your letter grade in this course is determined as follows:

<table>
<thead>
<tr>
<th>Numerical Grade</th>
<th>Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>95-100</td>
<td>A</td>
</tr>
<tr>
<td>90-94</td>
<td>A-</td>
</tr>
<tr>
<td>87-89</td>
<td>B+</td>
</tr>
<tr>
<td>83-86</td>
<td>B</td>
</tr>
<tr>
<td>80-82</td>
<td>B-</td>
</tr>
<tr>
<td>77-79</td>
<td>C+</td>
</tr>
<tr>
<td>70-76</td>
<td>C</td>
</tr>
<tr>
<td>65-69</td>
<td>D</td>
</tr>
<tr>
<td>64 or below</td>
<td>F</td>
</tr>
</tbody>
</table>

COURSE POLICIES

I expect you to be engaged in mathematical thinking for the entire class period for every class. I expect you to be courteous to your fellow students. Specifically:
Please do not use cell phones or any other electronic devices (except calculators) during class for talking, text messaging, or any other purpose. All cell phones and other electronic devices other than calculators must be turned off during class.
Please arrive on time for every class.
Please be prepared to spend the entire class time working only on mathematics.
You may use a calculator in this class, except for the work on fractions and integers. However, it may not be a cell phone calculator and you must use your own calculator during tests. No borrowing!
Honor Code procedures as outlined in the Site College Catalog will be followed in this course. You are expected to do your own work unless I state that students may work together. Representing the work of someone else as your own work (plagiarism) is a violation of the Honor Code. If I determine that you have violated the Honor Code, you will get no credit for the applicable work, and the violation will be reported to the Honor Council.
Refer to the college catalog for college-wide policies.

DISCLAIMER

This syllabus is subject to change according to the needs of the class as deemed appropriate by the instructor. In case of minor schedule changes, students will be notified in class and via email. In case of major changes, students will be give
<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec. 3</td>
<td>Percent</td>
<td></td>
</tr>
<tr>
<td>Dec. 10</td>
<td>Geometry and measurement</td>
<td></td>
</tr>
<tr>
<td>Dec. 17</td>
<td>Review/final exam</td>
<td>Monday December 13 is the last day of class</td>
</tr>
</tbody>
</table>
Appendix N

Syllabus for Math 002

Site College Math-002

MISSION STATEMENT

Site College is an independent co-educational religiously affiliated college founded and sponsored by the Site Sisters to educate a diverse population of students within the framework of a liberal arts tradition. Its mission is to provide a full complement of learning experiences, reinforced with strong academic and student development programs designed to bring students to their highest potential and prepare them to meet the challenges of the new century with informed minds and understanding hearts. The enduring purpose of Site College is to promote a love for learning, a desire for God, self knowledge, service to others, and respect for all creation.

DIVISION OF ARTS AND SCIENCES MISSION STATEMENT

The mission of the Division of Arts and Sciences is to implement and manifest the Mission of Site College in the Programs of the Division; the General Education Program, the Developmental Educational Program, and the Core by providing the highest quality of instruction at both the undergraduate and graduate level, encouraging students to develop to their fullest potential, to gain skills for life-long learning, and to produce graduates well-equipped to contribute to society. The division achieves the stated mission by using processes of continual improvement, based upon assessment of student learning at all levels, as well as the assessment of the administrative processes and mechanisms.

DEPARTMENT OF MATHEMATICAL SCIENCES MISSION STATEMENT

The Department of Mathematical Sciences supports the mission of Site College by providing the portion of students’ educational experiences dealing with quantitative literacy. The Department supports the mission of Site College to provide a strong academic program by providing rigorous mathematics courses to students in all majors at all levels. The Department supports the mission of the Division of Arts and Sciences by providing a high quality of instruction in mathematics at both the college level and the developmental level. The broad variety of courses offered by the Department of Mathematical Sciences helps bring students to their highest potential by providing theory and practice related to problem solving, logical reasoning, and analytical skills. This will help prepare Site College students to meet future challenges with informed mathematical minds.
Course and Section: Math 002 Section R2
Course Level: Undergraduate
Course Title: Basic Skills in Mathematics: Algebra
Credits: 4 (Credits do not apply to graduation requirements.)
Prerequisite: Accuplacer placement
Corequisite: None
Location & Time: MWF 9:50 – 11:05, MH 105
Instructor: Jaycee
Email: 
Phone: (201) 559-3335 (Office) or 3320 (Math Lab)
Office Hours: See Attached Math Lab Schedule for my hours

COURSE DESCRIPTION

The principal objective of this course is to bring students up to college proficiency in basic algebra skills. The criterion for placement in the course is failure to pass the algebra portion of the Accuplacer Placement Test. This course presumes mastery of the basic computational skills covered in Math 001. Topics include solving equations (with applications), polynomials, factoring, graphing linear equations and inequalities, solving systems of linear equations, and radical expressions. You must get a C or higher in this class in order to progress to a college-level math course.

COURSE CORE OBJECTIVES

Math students will demonstrate Critical Reasoning in Problem Solving and Effective Communication in oral presentation of solutions, and they will apply Quantitative and Analytical Skills to the subject matter.

COURSE OBJECTIVES

Upon completion of this course, students will be able to:
Classify and describe different kinds of numbers, including whole numbers, integers, rational numbers, and real numbers
Graph and solve linear equations:
In one variable
In two variables
Work with functions:
Evaluate functions
Recognize whether a relationship is a function
Understand and use rules for working with exponents
Work with polynomials
Identify polynomials
Perform basic operations on polynomials (add, subtract, multiply, and divide)
Factor polynomials
Evaluate and simplify radical expressions
Solve Quadratic Equations by factoring
TEXT REQUIREMENT

*Introductory Algebra*, 6th edition by D. Franklin Wright, available at the Site College bookstore for $103. In addition to the text, you are required to have the software that accompanies the textbook and to register for online homework. Online homework that requires the use of this software will be assigned. You need the access code printed on the sleeve of the software CD in order to sign in to the Hawkes online homework system; do not lose it!

COURSE CONTENT

Please Note: This is a tentative schedule and is subject to change at the discretion of the instructor.

<table>
<thead>
<tr>
<th>Week #</th>
<th>Week of</th>
<th>Topic</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sept. 3</td>
<td>Review of exponents, order of operations, prime numbers and factoring, and fractions.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sept. 6</td>
<td>Introduction to real numbers, their properties, and operations on real numbers; absolute values.</td>
<td>No school Monday: Labor Day</td>
</tr>
<tr>
<td>3</td>
<td>Sept 13</td>
<td>Algebraic expressions: evaluating and simplifying expressions; converting phrases to expressions.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sept 20</td>
<td>Solving Linear Equations.</td>
<td>Test #1</td>
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<td>5</td>
<td>Sept 27</td>
<td>Solving Inequalities</td>
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<td>6</td>
<td>Oct. 4</td>
<td>Formulas</td>
<td>Percent problems; geometric applications.</td>
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<td>7</td>
<td>Oct. 11</td>
<td>Introduction to the Cartesian coordinate system: graphing points and lines</td>
<td>No school Monday: Columbus Day</td>
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<td>8</td>
<td>Oct. 18</td>
<td>Graphing Linear Equations</td>
<td>Test #2</td>
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<td>9</td>
<td>Oct. 25</td>
<td>Writing the Equation of a Line; Slope Intercept Form</td>
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<td>10</td>
<td>Nov. 1</td>
<td>Introduction to Functions and Functional Notation</td>
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<td>11</td>
<td>Nov. 8</td>
<td>Exponents and Scientific Notation</td>
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<td>12</td>
<td>Nov. 15</td>
<td>Performing arithmetic operations on polynomials; factoring polynomials.</td>
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<td>13</td>
<td>Nov. 22</td>
<td>Factoring continued</td>
<td>No class Wed and Fri: Thanksgiving Break</td>
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<td>14</td>
<td>Nov.29</td>
<td>Solving Quadratic Equations</td>
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<td>15</td>
<td>Dec. 6</td>
<td>Review</td>
<td>Test #3</td>
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<td>16</td>
<td>Dec. 13</td>
<td>Exam Week</td>
<td>Final Exams</td>
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TEACHING/LEARNING STRATEGIES

Class lectures, demonstrations, and discussions
Small group work and discussions
Study and homework groups
Individual problem solving
Math Lab (Site) and Center for Learning (Secondary Site) for tutoring and homework help

GRADING POLICIES

There are no extra credit assignments.
Homework will be assigned every week using the online Hawkes System. There is a separate attachment which explains how to install the Hawkes system. It is your responsibility to ask for help if you have difficulty completing any homework assignments. If you have problems with the software and/or the homework please visit the Math Lab in Site College. The Math Lab is open every day; the weekly schedule is attached to this syllabus. Full credit will be given only for homework completed on time. Partial credit will be given for late assignments. 10% lost for each day late up to three days, then no credit after three days.
You are permitted one Re-Test for each Test. You are not permitted to take a Re-Test if you are absent on the day of the Test. You must take the retest in the Math Lab outside of normal class hours with two weeks of when the graded papers are returned, and you must review the original test with a tutor before you take the Re-Test.
There are no Re-Test options for the Final Exam.

GRADING RUBRICS

Tests and Final Exam: You will receive full credit for completely correct answers, with work shown. If you show your work, you will be eligible for partial credit.
Homework: See Above for homework rules.
Your Final Grade will be based upon the following: Remember that you need a C or better to pass this class

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<tr>
<th>Component</th>
<th>Percentage</th>
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<tr>
<td>Homework</td>
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<td>Tests (3 Tests at 15% each)</td>
<td>45%</td>
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<tr>
<td>Departmental Final Exam</td>
<td>30%</td>
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Your letter grade in this course is determined as follows:
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<td>65-69</td>
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<td>64 or below</td>
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**COURSE POLICIES**

I expect you to be engaged in mathematical thinking for the entire class period for every class. I expect you to be courteous to your fellow students. Specifically:

Please do not use cell phones or any other electronic devices (except calculators) during class for talking, text messaging, or any other purpose. All cell phones and other electronic devices other than calculators must be turned off during class. Please arrive on time for every class. Please be prepared to spend the entire class time working only on mathematics. You may use a calculator in this class. However, it may not be a cell phone calculator and you must use your own calculator during tests. No borrowing! Honor Code procedures as outlined in the Site College Catalog will be followed in this course. You are expected to do your own work unless I state that students may work together. Representing the work of someone else as your own work (plagiarism) is a violation of the Honor Code. If I determine that you have violated the Honor Code, you will get no credit for the applicable work, and the violation will be reported to the Honor Council. Refer to the college catalog for college-wide policies.

**DISCLAIMER**

This syllabus is subject to change according to the needs of the class as deemed appropriate by the instructor. In case of minor schedule changes, students will be notified in class and via email. In case of major changes students will be given a new syllabus.
Appendix O

Math Lab Photos

More coming...
Math Club Meeting

- Officers election for next semester
- Ideas to recruit new members
- Future fundraisers
- What would you like to base the Fall meetings on?
- Improvements to the club?

By Bubbles (Malone)
Appendix P

Interview with Jaycee and Loretta on May 5, 2011

I: Loretta, I guess these first questions are for you. Just so I have an understanding and information of the department. How long have you been the chair of the department?

L: Three years

I: Does that change every three years? And how often?

L: It changes every three years. We are about to have another election. However, I don’t think anyone going to be running except me. I think I am up for another three years.

I: ok. So you will probably do it again. So they do it in three year increments. What do you feel your purpose is for your basic skills math program?

L: Well, for math, we have sort of gotten into separate fields. I concentrate on Math 001, the arithmetic portion, and Jaycee concentrates on the 002, the algebra portion. We probably have different goals for each of these classes. My goal is to besides improving their skills is to get them to feel that they’re good in math and that they could be good in math. I want them to feel that they’re not awful in math and that math is something that makes sense and that it is something that they can actually do. I try to improve their confidence. That is the word.

J. My goal is also to try to prepare them for the college level course that they are going to have to take after this. That is to improve their algebra skills.

I: Would you say that is an Algebra I level?

J: Yeah, we go up to the quadratic equation.
I: So this is the course that helps prepare them for the core mathematics class and improve their confidence for the core class.

I: What do you do if you get a student who you put in the arithmetic class or the algebra class and they question that placement in a basic skills course?

J: The first day of class we give a pretest 12 questions wait, 11 in the 001 and 12 in the 002. 99.99% of the time the student looks at the material and says I belong in this class because I do not know... I could show you the papers that say written on the top: I belong here! And they hand it back blank because they know that they cannot do those questions. 99% of the time

L: That is more algebra...we do occasionally in arithmetic get students who don’t belong there and they do test out. First day or second day... but we do also in 001, and this can be an issue, even after that pre-test we do sometimes notice that after that first week or two that there are some students that don’t belong there. With 001 there are sometimes students who can do the material and you can tell that they are better than most of their classmates and they should have gotten out. I had that last semester with a couple of students who knew the material.

I: Can they get out at that point?

L: No. At that point they just stay there. But they did have the Accuplacer and the test the first few days of class, so they did have two chances at least.

I: Exactly

J: I once had one student who claimed I didn’t realize that this was so important. I just handed it in. I really could have done it. Her parents actually called me and asked for a
second chance in 001, because she didn’t know… anyway, I did let her take it again and she did test out but that was 001.

L: yes, but they do rarely test out of 002.

I: do they know when they are coming to Site college that they are going to have to take a placement test.

L & J: Yes, They do know.

I: Okay so they realize this.

L & J: They are given all that information.

I: So you also have students who need more than one basic skills class.

L: Yes. 001 is followed by 002. Most of them test into 002, I guess. But there are some students who need to do both courses.

I: Do you ever keep track of the success rate of these kids?

J: Yes. We have that report somewhere.

L: We have reports that so many percent of students in 002 passed and went into the next level math class. And we are working on long term reports so Jaycee doesn’t have to try to find out how they are four years later. We don’t have those reports.

I: Since you have been chair, has anything changed with the basic skills program?

L: Well we have had the Hawkes system once I became chair.

I: That is your computer program that accompanies the basic skills program?

L & J: Yes.

L: We still do lectures in classrooms but that is the computerized homework system.

I: Okay
L: We haven’t changed it since I have been chair but we continually look at it and in fact, Jaycee is looking into and maybe I am looking into this summer, checking into other things for Math 001 because some of the arithmetic instructors for 001 don’t think the Hawkes system quite does what we intend it to do.

J: I applied for a summer stipend for research so if I get it, then I am going to look into those issues. I will probably do it anyway.

I: When you say a summer stipend is that something that the site college would issue to you?

J: $5000.00 It was $3000.00 but she just changed it this year to $5000.00. There are six applicants and two are given a stipend so I have a fairly good chance of getting that stipend.

I: So that is great. So if you get this, what are you going to do?

J: I’ll be researching alternative ways of teaching the 001, the basic skills, in addition, I am researching tutor training.

I: And the tutors you have, are they student tutors?

J: Yes, they are mostly math majors.

L: math and business I guess.

J: Prusha is a math major,

L: We have international students from China who come here really good in math but they want to major in business who end up tutoring math.

I: They come from China?

J & L: Yes and their math skills are strong.
I: So let me ask you, if they’re tutors, they can be wonderful in math but how are their verbal skills?

L: Our students have very good English skills. We haven’t had any issues with that.

J: I can’t recall that ever being a problem.

L: Yes, their English is very good.

J: I would say we have half international tutors and half homegrown.

I: So your basic skills are a mix of classroom and computer use?

L: It seems to work well for 002 and then I think the mix works well for 001. It is the content that some people are concerned about.

I: And you said earlier, that some of the instructors were questioning the content for 001?

J: Well some of the instructors of 001 were questioning the content, these are full-time instructors. We have had a couple of full-timers teaching 001 and they are not happy with the content. The adjuncts will pretty much do whatever you want. The full-timers thought there were some issues with the content and the way it was presented in the Hawkes system.

I: Do you notice any difference between your adjuncts and your full-time faculty

J: YEAH

L: It depends on the adjunct and the full-timer. We have several adjuncts that have been doing this for a long time. They’re really good, you know, like retired from schools, maybe, or even currently teaching. They do an excellent job and have no issues with them whatsoever.

I: So some of these adjuncts were seasoned teachers, maybe high school teachers?
L: Yes, well, Victor was a high school science teacher.

J: Barry teaches at Don Bosco during the day and comes here at night.

L: Does she teach math there or science?

J: Math, I think.

I: They both teach the basic skills courses?

J: Yes and then there is Ronnie who is retired and she teaches the 00 courses. There are only a few that we haven’t been happy with. On and off

I: How do you know that you are not happy with them? Is it the students who complain?

L: Yes but we both go in and evaluate them and see what is happening in the classroom. We haven’t had too many but we had a difficult situation last semester when somebody, one of the adjuncts dropped out at the last minute, and then I had to hire someone at the very last minute and she didn’t work out too well. Although it could have been worse. And I also wanted to say that in some cases our adjuncts are more experienced than our full-timers with this developmental stuff. So we can’t say that the full-timers are better and the adjuncts are worse. You have to have a feel for it, some of the full-timers just are not that into developmental.

J: Because they can’t bring it down to the level …. I don’t know how to say it …I know what I want to say

L: They just can’t bring their teaching down to that level.

I: Yes. I can see that.
L: But we do have, like I said, both Jaycee and I are both full-timers and we teach
developmental math and various other members of the full-time faculty teach various
developmental courses.

I: What is your full-time load?

J: It is 12 credits and our classes are 4 credits so there are 3 classes that would be a full-
time load.

L: Which becomes an issue if you teach a mix of three and four credit courses, because
you can never hit it right on the nose.

J: Eighteen is the maximum that we can teach with overload.

I: Ok.

L: So I guess most people teach more than 12 credits. Some go all the way up to 18 and
some just do a credit or two over.

I: What do you do when a student fails?

L: Currently the rule is that they get three attempts allowed before they are thrown out.
But the administration has been talking about if they fail one time, throw them out. And
the rationale is if a student can’t pass math 001, we are taking their money from them
under false pretenses, kind of.

J: I protested but I was outvoted.

L: However, Sister R. was outvoted too. I was at the curriculum meeting when they were
discussing that and she said don’t bother because I already know that the President’s
Council is going to veto that.

J: Really?
L: Yes, so it is not going to be happening yet. So they are not going to that one strike and you are out thing.

I: Jaycee, why did you protest?

J: Because I have seen students who have come the second time and are completely turned around and they became more serious and they knew they had to work…we would be losing these students. I have tutored students in this situation. I have two right now that had failed in the fall and they’re doing wonderfully now, and we would have lost them if we had that rule and they were forced to withdraw from the college. They would be gone now and they are both wonderful students.

L: I can see the other side of the coin too, because I have had students that I feel … they’re not going to pass… and why do we let them think that they ever are. And we have a summer program which we can get into discussing that later but there are also students that if they go to the summer program, Jumpstart, and they start out with 001 and then they fail 001 in the fall that means that they have already failed it twice, although the first time wasn’t kind of official.

J: Last year’s Jumpstart, 100% of the students passed, didn’t they? Didn’t everybody go on?

L: No. Not in 001, in fact there is one student I can think of right now, who is in 001 in the spring, which means they were in Jumpstart, 001 in the fall, and 001 in the spring.

J: I am sorry; I did not mean to interrupt you. I was thinking of the report I wrote for K. that said that students who were in Jumpstart and came to the math lab in the fall all passed their fall math course. That’s where I was thinking about the 100%.
L: But there were some who never came to the math lab and then went ahead and failed.

I: Is the summer program called “Jumpstart”? What is its purpose?

L: It’s for all students who test into any kind of developmental course: math or English. Actually, they send the invitation to everyone because everybody. That is because so many of our students test into one or the other developmental. So it is a five-week program … five weeks of the summer … and they do a couple hours of math followed by a couple hours of English and there is tutoring available and they take the Accuplacer again.

I: Can they do Hawkes?

L: No there is no Hawkes over the summer because they have to buy the book and the software and access code. So this is a money-loser for the college, because they only charge the students $200.00 each. They get a text book; we bring food. They have small classes, only 15 students most in a class and they get to take the Accuplacer again at the end of the program. Fifteen is also the limit for all of our developmental courses. So the classes are nice and small.

J: Very small.

L: which is nice.

I: Do you think that is good for the students?

J & L: Yes, yes.

L: When I first came here, I taught a math class 002, and they had 27-30 students in it and it was awful. It is so much better being smaller. You get to know them; you get to get after them. Let them know that you were aware when they don’t show up. So, Jumpstart
is a good program and as Jaycee said most of them do better and when they take the Accuplacer at the end and most of them test up at least one level. Sometimes they get out of developmental math all together, or at least they move up one level.

I: So the Jumpstart program helps the student improve their original placement sometimes.

J: and there are even a small percentage of those who start in 001 and go right into college math. I mean, perhaps they were misidentified in the beginning but at least it has helped their placement.

I: How about the older student?

L: Well, I can think of a couple who came back now … veterans and some of them are doing well in math but we have one who has really been struggling in developmental.

J: Well, he has a brain injury. He was wounded in Iraq. He can’t retain any information. You can show him something and he’ll do it, but tomorrow he will totally forget that you taught him that.

L: He did very well in 001 but he is struggling in 002.

J: But he has an excuse… he won’t have to complete any future math courses. He will be exempt from college level math.

L: He is working with our 504 person on that issue.

J: They took him out of my class and JS tutors him privately every day.

L: Which is really nice of JS.

I: Does JS teach basic skills?

L: occasionally but this semester he teaches college algebra.
L: When he first came here, he came highly recommended, with the kinds of qualities that we have looked for. He is really dedicated. They said that we might not want to give him the lowest level of basic skills because his English might not be perfect. Although, I think his English has improved and our students haven’t complained about it. Plus we have a number of students whose first language is Spanish and then he is great.

I: do you have a high percentage of students whose first language is Spanish?

L: a fair amount... not really high but not insignificant either.

J: We have an EOF program that has a high percentage of Spanish speaking students.

I: Do you find a higher percentage of minorities in the basic skills?

L: I really don’t notice that because such a large majority of our students are in basic skills I don’t notice any difference.

I: So your teaching methods include a text, a computer portion small class sizes, and you pick your instructor?

L: We have learned that certain instructors are not going to be teaching Math 001 anymore.

J & L :(LAUGHTER)

I: How did you make that decision?

L: Well, I think we were dealing with instructors who could not come down to the level of detail for the basic skills courses.

I: How do you know that?

L: We know that from even talking to them and observing them. In fact, the one guy last semester three of us full-time people taught the 001 course. Two of us were sort of
running an experiment. I was running my experiment trying to be based on what we did in Washington, DC. So I never get 100% of what I want in my classes and I didn’t even get close to half of what I hoped to include. But I did a little bit of this project kind of stuff working together on those types of projects they had there. Our other full-time guy was working on his own ideas about teaching 001 which was theoretical-based I guess you would say. He was talking about going at it from theory. He started with theoretical rules and what are the implications of these rules and he had trouble with it and he never admitted to you (Jaycee) but he admitted to me this experiment did not work.

I: That is good to know too. You need to know what works and what doesn’t work.

L: right. So we felt we tried it and so okay we have I did say, so we can have a write-up at the end and then say how things worked. But we never did do the write-up. We agreed that it didn’t work.

J: That’s why I took that out of my summer stipend application when I put the various things that I was going to research and I took out the part where I was going to ask him for assistance. (LAUGHTER)

I: How did your experiment work?

L: It wasn’t as great as I wanted it to be, in fact I was going to talk about this in the NADE presentation that I didn’t get to go to which reminds me Jaycee, I need to resubmit that application. I submitted another application for another talk at NADE. They accepted it but then I didn’t go because at the last minute because they had a budget crisis and they took away my funding, so this year I am going to go whether I get my money or not.
J: Well, they are going to Orlando, and I applied for the same thing. I applied for the pilgrimage to Assisi so if I get that, I am not going to be able to attend the NADE conference.

I: Where are you going?

J: Assisi. Site College does that but I don’t know that I will get that. They select two men and two women. Every year. I don’t think I will get it. It is around October near the Feast of St Francis. I don’t think I stand a chance to go.

I: So the college does support items like professional development.

L: Oh yes. The college does support stuff and that is what I was going to say. The talk that I was going to give was about what happened in 001 and it wasn’t as successful as I hoped.

I: Tell me what you did and what you tried to do.

L: I did, let’s see, I can think of the activity with the stones representing the horses, remember that? When they did the wild horse survey. They catch a bunch of wild horses and they tag them. Well we did that with stones and we marked them and then we did the percentages and ratios to calculate total population. Well, you know they were a nice group they dutifully did what I asked them to do, but there wasn’t really that much engagement in the activity. Then I did what I thought was a great activity involving sharing cookies and sharing pizzas and here we are going to make a table and you are going to say if you got this many cookies and you are sharing with that many people what proportion size is this; how many servings can you make; and then they figured out the answer and then they generalized it and they said “Oh, if your cookie size is a/b then you
are going to multiply by b/a! because they were dividing and they discerned that you had to do the upside-down part. And I said YEYAY! You have discovered the division algorithm and they said HUH? (LAUGHTER EVERYONE) None of them had ever even heard of the division algorithm, so they claim. It was like, so what. Let’s have pizza! But that was disappointing to me. Those were two of the main things I tried. Another thing I did was the pi. I had everybody measure circles and I brought in many lids and things of different sizes. We measured the circumference and we measured the diameter and then we found the ratio of circumference to the diameter and everybody got somewhere in the range of 3.14. What did we just do? Nobody quite figured out what we had just done. Look you always get the same thing for big circles, little circles, but it didn’t move them. The one thing that did move them I remember, was on a nice day, we went outside, and we measured heights and shadows and we predicted the height of the tree based upon the shadow of the tree.

J: Similar triangles

I: How did you have the time to arrange outdoor activities?

L: and that is one thing about MA001, Arithmetic. That syllabus is not overloaded. We have time to do that stuff. The 002 is more intense. You have to finish a certain number of things and you really have to reach a certain point because you are going to take college math after that. The arithmetic, the syllabus is decent and we can get through stuff.

I: Could I get a copy of those syllabi, just to see what you need to cover?

J & L: Sure.
L: send us emails and we can send you all this stuff.

J: Yes, we can send it as an attachment.

I: Generally speaking can you tell me of any techniques that you have found haven’t worked in the basic skills courses?

L: Well, the things we talked about, the other experiment. Formulas and theory. That did not go over well with the Math 001.

J: And one year, I used the mathematics in action text and that based everything on a word problem. Every single solitary thing you teach was a word problem and it was based on cooperative learning. So the class met three times a week and there was once a week of lecture and the other two, they were in their little groups and they were supposed to be in the same group for two semesters. 001 and 002 and it was a complete failure. Like you are learning about adding fractions and it was only taught by all these word problems about adding fractions. They were supposed to collaborate in the group how to solve these problems and it just didn’t work.

L: That sounds like what M. was telling me yesterday with A. who it was?

J: oh yeah, Mr. A.

L: I know what they’re going for with that but you really can’t just say go out and discover. You have to be there and watch and pay attention to what they are getting wrong and guide them without actually telling them everything. And it is hard. And groups are hard too because you get the leader and then you get the people who don’t do anything.
J: and as much as I tried to change them around, you can’t be in the same group every week and they tried to just work with their friends or some of them didn’t want to participate.

I: I see that with my own students during group activities. How often do basic skills teachers engage in professional development?

L: That varies. The two of us do it a lot. We go to conferences we go to workshops and all. The adjuncts do not really. We do not have any professional development for adjuncts. We give them their little adjunct handbook. Other members of the department do not really go to conferences for professional development.

J: except C.

L: That’s right but she’s computer science. One member has a small kid and really doesn’t have the time to do that stuff. Another guy has other obligations. The new guy does go to conferences but he is not developmental so it is basically the two of us.

J: It is good for us because no one else applies they always say yes to us.

I: I see.

L: We also have in-house professional development. Every year there is the faculty development day and any of us can talk on any topic. I am going to give the talk that I would have given at NADE, if I had gone there. People, even adjuncts could go to that.

I: Is it all topics when you do the in-house professional development?

L: Yes.

J: Technology, anybody can do it. It is the second year we are doing it.
L: There are also local things I have to mention. There are conferences but there are also local MAA meetings. We don’t have to put in for them. They have Saturday meetings and we just go.

I: Who pays for that?

L: We pay for those ourselves. It is like 25.00.

I: yes I have seen those and attended some, like at SH over in SO.

L: Last month the one was at Essex County which was really close. It’s math but not necessarily developmental. There are sometimes talks on developmental and little workshops or something.

I: Essex County would also be very in tune with developmental issues. I know you two collaborate. Do the basic instructors of other course sections ever collaborate?


L: That is something that we talked about looking into, not blogs but similar things. The things that you can do on-line. Basically that is all through you, J. You go after them and say where you and what are are you doing. It helps being here. We have small offices but we’re all together.

I: and the adjuncts are all here too?

J: they hang out at the math lab basically. They don’t have their own cubicles except for J.

I: Our adjuncts are located in an entirely different area, whether it is history, English, math so I don’t see them
L: Our daytime adjuncts we see all the time. They come and hang out with us in the math lab.

J: In the evening I see B. before I leave. She might say I am having trouble with blah, blah, blah and we will talk about it.

I: Do you do collaboration with local areas?

L: One of the things that Jaycee might look into and I will look into is this new homework system sponsored by the MAA, Web Work. I already signed up for it although I haven’t done anything with it. The idea is a new free on-line system where you kind of generate your own homework problems or you can use theirs. Now they have talked about it like there is Calculus I and Calculus II and so on, but there is nothing to stop you from using it in arithmetic.

I: So they have all levels?

L: Well, they probably don’t have any Math001 problems yet. So that would be me. I could it to setup my problems but it a nice alternative and currently it is free.

J: It is not going to remain free, right?

L: They will charge if you have a whole lot of usage of their system, of their server. But you can also get it onto your own server if you want to get the IT people involved. I am only talking about my class of 15 students in the fall so it is not like we need a lot. So that is my plan to try this in the fall so my students don’t have to buy anything.

I: How did you hear about Web Works?

L: It was one of the MAA meetings the fall meeting in Philadelphia. Eastern Pennsylvania Delaware meeting (EPADel) section of the MAA. It was a joint meeting
with NJ and they had a discussion about Web Works there from two people from TCNJ who use it.

I: That is the first I heard of that.

L: That is why I think going to these meetings is valuable. Jaycee and I are the only ones who do it.

I: J, did you go to Philly as well?

J: No.

L: J went to Philly. He lives even farther than we do.

J: So we will still be using Hawkes for the fall. I just got a call from the rep and told them that we are currently still using it.

L: I will see if I can augment or I will just have to see how much I actually get done between now and the end of August.

I: Do you work through the summer?

L: Well, I will be doing the Jumpstart this summer. J, you are teaching in Summer I.

J: I don’t know, there are only two students in it now.

L: Wait till exams are over. Then you will get more.

I: In your opinion, what do you think works well with basic skills students?

J: You have to vary it. It should be a mixture of group work, computer work, lecture.

L: With 001, I spend as little time as possible with lecturing, but I do lecture. I will circulate while they work together.
J: That fact that we have small classes makes that easier, because if we had 27-30 students you couldn’t circulate as easily. This semester I had 9 and 7. A total of 16 students in two sections.

L: I had 7 in my 001 in the fall.

J: I have only 1 who is going to fail and 15 who will be passing.

I: So you can keep on top of your students

J: Oh yeah.

L: Some of the problems are attendance. They don’t show up.

I: Yes.

J: It’s that freedom that they just can’t quite get used to that first year of college. Wow! This is great. I don’t HAVE to be in class, like in high school where the bell is ringing. Because we talk about that in FYE I teach FYE

I: Wait, what is FYE?

J: Freshmen Year Experience. One of the things we talk about is the transition from high school to college. What do you feel is your biggest issue in getting used to college and that’s what they said. It is that freedom like, we’re not used to that fact that there is no bell ringing telling us we have to go to class like if you don’t want to go, then you don’t go.

I: Do you find they could be better the second year?

J: yes even in the second semester I notice an improvement.

I: Is FYE the entire year or the first semester?
J: It depends on your major. Arts & Sciences and Nursing Hopefuls take it an entire year. Education and business and nursing only take it one semester. How they came upon that conclusion I have no clue.

L: I didn’t know that. How about that.

J: See, you learned something.

I: What barriers do you see for these students, you mentioned before, attendance, anything else?

L: Overall, they lead complicated lives. They have financial issues. They work too many hours; they take too many credits. A big thing we complain about a lot is they have financial aid and sometimes their financial aid does not come through in time through no fault of their own and the Treasurer’s office tells them you can’t go to class. So they miss like the first three weeks of all their classes and then they are allowed to come in once the financial aid comes through but they have missed 20% of the semester. That is just unfair. That is just not right. We tried an experiment this semester where I told all the developmental instructors if anybody is on your roster and doesn’t show up call them and tell them to come to class regardless of what they heard from anybody else. Sometimes they are afraid to.

I: How do you know that your basic skills program works?

L: Well, because of the number of students who end up passing.

J: I have to find a report that I wrote that states the passing rate was around 80%.

L: There was once a study I think.
J: The 001 was a slightly lower passing rate than the 002 rate. And then we did a study of if you came to the math lab or did not come to the math lab and what percent passed and that was even higher.

I: Is math lab required?

J: Hawkes is required. The English department has required lab. They can do the homework at home if they have a computer. They can put the Hawkes system on there. Not all of them have computers. Many of them like to come in and get help but they could do it at home.

I: Once they leave basic skills how do they do in the core math class?

L: Mostly. Now that is the thing I started to say, some years ago somebody did some kind of study where it didn’t seem like the retention rate for developmental students was much lower than the retention rate for everybody else.

J: We were on that task force.

L: We need updated statistics on that which we don’t have yet. So the jury is still out on that.

I: so the developmental students compared with the students who go right into a math core class sometimes are almost even?

L: As far as we can tell, yes. On average they do not seem to do worse than anybody else.

I: Would you say that you are able to get to know your developmental students?

L: oh yes. That nurturing part is very important for 001. This is something you can do when you have very few students. It is sort of a technique I learned when I was in graduate school. When I was in school, and I am a math person, and I go to get an EdD in
Math Education. So I don’t know this education stuff. So I go to this class, they asked me to do some kind of analysis of what just happened on this video you are watching of these kids doing math. I say something that sounds totally stupid and wacky to me and my instructor says oh, in other words, and pearls of wisdom comes out of his mouth and he is rephrasing my thoughts. I have watched him do this with other students no matter what they said, no matter how stupid it was, he could make it sound like they did something really smart. That is my goal. I found out that, with the right frame of mind, no matter what a student does no matter how awful and ridiculous their answer is, you should find something positive to say about it. And that is really important. So there is always something good, you can circulate and you see something where they did something wrong but you see something good in it.

I: so you focus on something positive that they have done?

L: yes. And if you try hard enough you can always do it.

I: Even if they sort of give you the wrong answer…

L: but there is always something positive you can find. Of course you can do that in any class but it is really important in a developmental class.

I: Because the students often come to class with a low estimation of what they can do in math classes.

L: Yes, they think that math is something that I cannot do.

I: Do you try to reflect on the AMATYC guidelines? Things like getting funding

L: yes I do. I have not done a lot of that in terms of asking for things I ask for conference money and encourage people from the department to go to conferences and workshops. I
have just started applying for stuff, but not necessarily just for developmental. Like geometr’s sketch pad, just for the math department to have, the Web Works thing, and SAGE which is really a cheap version of Mathematica. It is free actually. I took a course in SAGE since we like Mathematica which is really for math majors not for developmental students. But it could work for anybody but Mathematica is expensive.

I: So you actually go to a lot of these workshops, find out what would be good for your department and then you take the steps necessary to do it and get the stuff done.

L: Actually I should also mention the certification too. This came not from us but from the Division of Arts and Sciences. They wanted so many members of the Division of arts and Sciences to get certified in Developmental Education somehow. Nobody from the English department has ever done anything and they never go to conferences they never do anything. It is just math! We can’t say why they never do that stuff so they won’t go to certification and apparently they can’t make them. So they said they want at least two people certified so they will both be math because they are the only ones willing to do it.

J: So I got certified from NCLCA. (National College Learning Center Association) and I got level 3.

L: and I just applied for level 2.

J: Level 4 is lifetime and that is the highest you can get. And I got level 3.

L: She got her certification and I and in the process of getting mine. We have to take it one step at a time.

J and then I am going to get certified in Association of the Tutoring Profession which I just went to in Orlando. Because every session that you went to you got a signature, from
the presenter and they count as continuing education credits. You have a certain amount and then you have to do other stuff you put all that together and then you can get certified there too.

I: so the College is asking for these certifications?

L: the Dean of Arts and Sciences. That was part of his plan for the division. It’s good for J because she runs the math lab. It is sort of off to the side for me because I teach developmental but I am the chair and I teach other courses too. I am going to get certified as a tutor because the English department won’t do it. It is still interesting.

I: Thanks. I can turn this off now.
Appendix Q

Interview with Jaycee, September 16, 2011

I: okay, this is working. So you are going on this amazing pilgrimage

J: Yes

I: Jaycee, how did they select you?

J: There was a memo sent out, last spring and it said, if you would like to be considered for this pilgrimage, you have to write a letter to Sister TM, the President. It was an essay saying why you think you should go, and what you can bring back to the college. So I did that and I wrote and said, I am not an eloquent writer; I am a mathematician but this is from my heart and this is why I think I should go. Then, it was a couple of months, all of a sudden I was at my mother’s and called to get my messages from home, and there was this message to call Sister TM. I called and she said, Jaycee, you were selected. I was like, WHAT! I was very happy and surprised.

I: Oh my! Where do you go?

J: Okay, this is the itinerary.

I: How long will you be gone?

J: Ten days, October 6th to October 16th but it is really 8 because you have two traveling days.

I: Yes.

J: Because when you leave it is Thursday night, so by the time you get there it is Friday. That is really day two. So you arrive in Rome and you take a bus to Assisi, and then, we go to San Domiano
I: Wow. I am just going to copy some of these destinations down. Now what do they expect to teach you there?

J: I will actually be walking in the footsteps of St. Francis.

I: So you are going to do the things St. Francis did?

J: Yes I am walking his path. I have this great book back home, the footsteps of St. Francis and St. Claire. It tells you things to do, like it says when you go to this spot just sit there and just look up and just imagine that St. Francis was actually walking in the same spot at one time.

I: I would think that an English professor, Religion professor, a Theology professor, a Philosophy professor would be much more likely to attend than a math professor. You must have written some really great things to be considered for this pilgrimage.

J: I just said, (pause) the Site College isn’t a job to me. I am immersed in it because I am part of the Site College Associate program that meets once a month.

I: It is actually very touching.

J: maybe that is partly why I was selected. She sees me as well. Sister TM sees me in church every Sunday and like if a nun dies, I am at the funeral and I am at the wake.

I: So you are very involved.

J: Yes.

I: Now tell me, when you come back, how do you think this will affect your teachings in your math classrooms?

J: That is what I was trying for… the Franciscan mathematics. Did I tell you about that? My trip to Boston?
I: something about that

J: That was with Sister Barbara Reynolds.

I: and you went to something up in Boston for that?

J: yes this was called the Clavius Mathematics group.

I: Okay. And they have a way of injecting some of the Franciscan values?

J: Oh yes. I wanted to show you that other part…flipping pages… that was in my report to the Math department where I put about the Clavius mathematicians. They meet for one month every summer at a different college. They are not Franciscans; they are Jesuits; they can bring their families and they go to a Catholic college.

I: Okay

J: and they meet and they do research.

I: Do they rotate the college?

J: yes next year it is at Fairfield College. And they’ve actually gone out of the country. I could get you that paper.

I: Okay

J: and they research and they pray together. They have mass every single day. They eat together; they pray together; they get apartments with kitchens so they cook, so they don’t have to go out to eat and waste too much money. It is amazing and they are just so nice.

I: Wow. Are they math teachers?

J: They’re all math professors. Right now, some are retired. Now I have to get you that.
I: Now does this affect the way you conduct your classroom? Possibly how you deal with your students?

J: That’s kind of what her thing was.

I: Who? Sister B?

J: yes Sister B. You know she is trying to teach the students to express compassion, respecting each person’s dignity and making peace. You know, she looks to name the values without taking too much class time out but to integrate those values into her classroom. That’s the lecture I went to.

I: very nice.

J: This goal is to infuse classroom with Franciscan values.

I: Is Father Tom going with you on this pilgrimage?

J: no. We are all lay people.

I: No nuns?

J: No. There is a religion professor. She is actually the head of the Religion department. And myself. We are the only two professors. Then there are two secretaries not really secretaries. What do you call them? Administrative Assistants? Chris, who is the head of the IT department and Jerry T and I do not even recall his actual position but he is staff.

I: So it is staff, administration and professors. Is this related to your mission statement?

J: Yes definitely

I: Even your syllabus talks about the mission of the college. What are they doing for you for your class? I know you teach.
J: It is tough… so tough getting subs. Like I kept asking, “Can someone cover? Can someone cover? I got Loretta to cover and Jose, the guy you met outside. Everyone else didn’t volunteer so…

I: I see.

J: But I ended up with only three classes left totally uncovered that I have to cancel.

I: That is not bad.

J: and the others are being taken care of.

I: Okay. What is this here?

J: OH. This is a little more about that Clavius group. See, they’re from all over the world.

I: Is it just Franciscans?

J: No there are Jesuits too. Some of the countries are Italy, France, Columbia, Brazil, Spain, Dominican Republic, and Germany. They are from all these different countries.

I: I don’t know why I have never heard of that group.

J: They’re really fascinating. This is their mission: they have taken on the obligation to bring the good news to the professional mathematics world and into the surrounding lay community. The daily mass is a sharing experience. I mean they asked me to read, it was my first time there, and they said we want you to do the first reading since you are a guest.

I: wow! Were you nervous?

J: YES I was nervous! Laughter

I: Has this group met in many places?
J: Yes they’ve been to Notre Dame, New Orleans, Mexico, Washington DC; the attendees have benefitted enormously learning geography, history and local cultures. It brings in some culture but I was only there for two days so I would imagine that during that month they do a lot more. B. was telling me when they have the weekend off and then Monday, Tuesday, Thursday Friday they have lectures, they visit each other’s lectures, they eat together, they pray together, and they tour the area, they go sightseeing.

I: So they have people like you who come for a couple days

J: Yes

I: and then just leave

J: Right. I want to go again next year. It was fascinating.

I: Yes I can see that. So the material says it is a team of thirty mathematicians who spend four summer weeks together doing mathematical research, while sharing work, prayer and summer recreation. The point of the meeting is to interact with the members of the host mathematics department. So there is some religious, lay, and they travel all over the world.

J: When I went to the lecture, there were more people there than just the thirty. And all thirty weren’t there when I went. There were people from the college, Boston College, that actually were attending the lecture.

I: Yes, I see.

J: You can get a copy of this. These two lectures that I went to, I was like whoa, and what is he talking about? I couldn’t even write a summary because I was so lost.

I: Oh okay. I see.
J: Then Sister B. told me the session after that, the one I missed because I had to leave, wasn’t as abstract. It was on mathematics and art and I was disappointed that I did not hear that lecture.

I: Is this what you wrote up?

J: No. I just googled this, that was the Clavius group. I wrote this part and this next part I wrote. This part was the excerpt from her syllabus.

I: Is this next part about the summer stipend?

J: yes, that is the summer stipend.

I: That is the other topic I wanted to discuss with you. Tell me about the summer stipend research and what it revealed.

J: I looked into all these different and various ways of teaching Math 001 the developmental course. Did you ever hear of Ed L. from Ohio State?

I: Ed who?

J: (Shows the correct spelling and name.) He does a lot of publishing. He does a lot of talking at conferences as well. So I looked into some of the stuff he said about how the brain functions and how we should question, and things like pattern building and teaching developmental mathematics from the function approach. So then I just looked into all different researchers and models and a lot of them I wasn’t crazy about. This was something published by Community College Development.

I: Wow! You looked into a lot of different research.

J: Yes and then this was put out by the MAA Webwork, which is free, but I didn’t find that very useful for developmental mathematics.
I: Yes.

J: So what I concluded was that I was going to try this ‘my mathlab’ in action instead of the Hawkes that we use and try that in one class and see if it makes a difference. Does that particular method give the students a better background rather than what we have been using.

I: So the other classes will still use the Hawkes. So this is sort of an experiment.

J: It is a pilot class.

I: What made you choose this?

J: I liked the fact that it is based on problem solving. Everything is based upon a real-world situation. They call it activity or problem-solving so when you learn fractions you are learning a lot. This is for basic math.

I: This is for the Math 001?

J: Yes.

I: OK

J: It is very difficult, I don’t know why, getting them to buy the book and get themselves online.

I: I know. It is always a struggle. Why did you think that maybe you wanted to divert from the Hawkes Learning System?

J: This one, you don’t need a CD. Once the student buys the book, and gets the access code, you can go to any computer, anywhere you want, go to mymathlab.com put in your name and you will get to the site. Where Hawkes you can only do that if that if that
program is installed on that computer. So if the kid is visiting his father for the weekend and his father doesn’t have Hawkes on his computer then he cannot do his assignments.

I: I see.

J: Hawkes’ contention is that well ours is software driven, meaning that if you don’t have access to the internet you can still do your homework. But you still have to have the software.

I: Oh, I see.

J: So I cannot tell you yet how successful it is because it is the second week.

I: What made you even investigate this situation? Why did you investigate? Did you get complaints?

J: OH yes. The people who were teaching the basic math, which I haven’t taught in a couple years, they didn’t like the curriculum, didn’t like Hawkes, didn’t like the book. So they complained. That is why I started looking for something else for them. They said that they liked the Math 002 but didn’t like the 001.

I: What was their main complaint? Just that it was….

J: Dr. B. didn’t like the way they taught certain things. They didn’t like the curriculum, although I didn’t really change the curriculum.

I: Yes. It is the same curriculum.

J: But you really have to change only one thing at a time to see what worked and what didn’t work.

I: so some of the kids are still using Hawkes and then one class is using “my mathlab”. Is my mathlab hard to use?
J: NO! Very easy. You can use it on any computer and just go to mymathlab.com and you get on immediately.

I: but you could use it here if you wanted to.

J: Now the math lab lets you use Hawkes or mymathlab.com

I: and Hawkes is already loaded on these.

J: yes.

I: Do the teachers seem happier, whoever was complaining?

J: Loretta is still teaching a section with Hawkes and B. loves Hawkes, so she is still using Hawkes. So what I would like to do in the spring is, I would like to see how these students do when they take the next course. The Math 002.

I: yes

J: Then I can see if they do better, worse or the same, than the ones who had Hawkes in 001.

I: Right. Well that is good. I mean, you are looking at the program and you are hearing what people are saying and then you are making changes that you think would benefit the students. So it is good assessment of the courses, re-evaluating them and then changing things when necessary.

J: Yes and the other thing I did was with the tutor manual during my summer research.

I: oh. There is a tutor manual?

J: Yes but this was not written by me. The tutor manual was written by Dr. F. So I just went in and changed some things.

I: You did this over the summer?
J: Yes. I just took her tutor manual and made some additions about the mathlab.

I: Good, that keeps it up to date.

J: Yes and she did a very nice job on this and then I put in these diagnostic tests for the tutor to see what level they are able to tutor.

I: Oh, I see.

J: and again, I asked over the summer for help but not many people send me questions for the diagnostic tests.

I: So when somebody comes and says they would like to be a tutor, you have to figure out their level.

J: Yes we have to see what they can tutor.

I: Of course.

J: So I put this into her tutor manual. She also requires the students to come for training before you are allowed to tutor.

I: I see.

J: In fact, some of the students are there today.

I: for training…

J: Yes. And the training is really simple stuff. You know, they should have a dress code, the way you should greet the student when he comes in the door.

I: Oh, I see.

J: She has some things about learning styles. She has them do some activities during this training where they discover their own learning styles. It is a really nice workshop.

I: I see and you are predominantly the one who runs the lab.
J: Yes. And I also added a section about Hawkes, if the student is using Hawkes and the tutor is going to help them, it explains what you should do and I showed them what a progress report looks like as well.

I: I see.

J: Yes. I just showed the tutor what the report looks like and what to expect. I also put in little hints about making sure they hit the Certify button and how to write the answers.

I: Now these are commands?

J: Yes. Those are commands in Hawkes. I put a little blurb in there as well if they come in to use MyMathLab, as opposed to Hawkes and I explain how they should sign in.

Then, Sister R. has been on us about the English department has a credit bearing course of developmental English. They combined a developmental English with a regular college level English and she made it like a six credit course. Three of the credits counted and three didn’t. So they’re on us about doing that.

I: Oh. Mmmm Our developmentals don’t count for credit.

J: Neither does ours.

I: so she wants you to maybe come up with some sort of a hybrid type course?

J: Right. So we decided that you can’t do 002 and college algebra. It’s just too much material. So Loretta and I came up with this idea of combining 001 and 002 for the students that score borderline, but it is still not a credit bearing course.

I: Yes because neither one of them was a credit bearing course to begin with.

J: I put that into the research as well. The credit bearing course that we thought about would have been 002 with 110 which is financial decision making. Because Carol M who
sits right here, did something like that with the cohort. It would be possible for the student who tested into 002 and borderline to give them this course which we think would be five credits and have three count for college credits and two would be like your review of 002.

I: Yes

J: and then in one semester you could get through and actually have college credit and not have to take the entire 002.

I: I see.

J: But that is not done yet.

I: yes just a possibility.

J: Yes. And that was the end of the research. This next page is just the syllabus for the 003 course which is not a credit bearing course.

I: Do you have this (mission statement) on every single syllabus?

J: Yes you have to.

I: really? Regardless of the subject?

J: You have to put the mission statement then your division’s mission statement and then your department’s mission statement.

I: I found that very interesting.

J: You don’t have to do that?

I: no but I think it is a good idea. It sort of brings around the whole purpose of the college,
J: and then the rest of the syllabus is normal. Meeting times, objectives, blah, blah, blah and then you have to put in this rubric…. I don’t know…. For grading.

I: yes

J: and I haven’t turned this summer stipend research report in. No one has asked for it.

I: Oh. For them to review?

J: Yes. I don’t know

I: It looks beautiful. How nice this is.

J: Thank you. I put lots of documents like this is one of the things I researched I just stuck it in.

I: When do they want that from you?

J: I don’t know. August 31 was the deadline for …I mean I don’t know if I am actually supposed to turn this in or wait for her to ask me. Because last year, Professor N., he did a praxis review and he got the research stipend and they granted it to him and they never asked him when he came back in the fall for the report. He never submitted it to anyone no one asked him for a report and he asked someone else who got a stipend and that person told him that he was never asked for a report either.

I: You’re kidding.

J: So I don’t know…. After all this work I mean you want someone to see it.

I: sure. It is wonderful.

J: Thanks I think I will turn it in.
Appendix R

Interview with Victor on September 23

I: Okay, this should be recording. This is pretty good. I have students who use these, too, in my classes.

V: That’s fine.

I: All right. How long have you been teaching the basic skills math classes here?

V: I think I started in ’04.

I: Around 2004?

V: And most every semester – there was one semester where I did not because we were having major work done on the house and I just was too busy.

I: So you’ve been consistent…

V: Yes, my normal schedule here is two sections in the fall semester and the spring semester one or two, depending upon enrollment. The enrollment is stronger in the…

I: Yeah, in the fall, when they have to fill –

V: In the fall.

I: Which ones do you teach of those basic skills?

V: I teach both Math 001 and 002. However, I can’t tell you the exact number, but I’d say for at least the last four semesters, it’s all been 002.

I: And that’s the algebra?

V: That’s the second level. That’s introductory algebra, rather than pre-algebra.

I: And then the other is the pre. Do you ever teach non-basic courses?

V: No.
I: You’re always the basic skills. When you’re in the classroom, in your basic skills class, how do you structure a lesson? Or let’s say you want to teach them something, whatever kind of topic. How do you go about doing that?

V: Well, the normal thing that I do in class is I will usually take a few moments to go over some homework from the night before.

I: Review.

V: Unlike a lot of math teachers, which I don’t like to be critical but I’ll be judgmental in this. I think a lot of time is wasted going over homework when it’s too easy, put it on the board, put it on the board, put it on the board. And most of the session is based on homework, and you rush the last ten minutes through the new material. I don’t do that. As you know, here we have the HLS system, which is computer-based. Are you familiar with that?

I: Is that the Hawkes…

V: The Hawkes Learning System. I do not use that for the first chapter. For the first chapter, I use traditional paper and pencil assignments for a couple of reasons. Number one, not everybody can afford the book and have it ready to go on the first day. Some of the kids don’t have access to computers the very first day, or have computer expertise.

So, I tell them that we’re doing paper and pencil assignment, the traditional homework assignments, the first chapter. Once we have finished with the first chapter, then we start with the computer, and the computer must be ready – you’ve got to get it done starting a particular date. And then that’s it, there’s no fooling around.

I: Starting with Chapter 2, or so.
V: With the paper and pencil homework, what I do is I tell them – first of all, I do not collect it. I tell them that I will check it and we will discuss it. For example, I will put two, three, four problems on the board and they are to be working those problems while I’m walking around individually, checking each student’s homework. And what I tell them, I say they will get full credit if they show me an honest attempt on every single problem that was assigned.

I: Even if it’s wrong.

V: I don’t even know it’s right or wrong. And I will ask them, “What problems did you have difficulty with?” And as I’m walking around, I literally am carrying around a grade book and a piece of paper and, “Okay, Johnny, okay, you get it. Susie, you get it. Susie, you having trouble with that? Number seven and number four.” So I write seven and four. “Johnny, okay, same thing.” So, I find out the problems that were troubling on the homework, and those are the only homework problems I go over. The other ones I ignore because in my mind, if they weren’t trouble for the kids, why bother wasting time on something they already know. So, that’s what I do with the paper and pencil homework, and I find it successful.

What it does is it gives them immediate feedback on what’s going on. They’re getting some additional practice because after I go around, I’ll review some of the things on the three or four problems I ask them to work. So, they get a review there. But to me, it’s meeting their needs right away. In all honesty, it lightens my paperwork load. It lightens my paperwork…

I: And they know they have to do their homework.
V: Yes. And one of the things that I like about it, which I think is a drawback on the computer thing, is – maybe this is the wrong word, but I call it a face-to-face intimidation. Because if you’re the kid sitting there, and I’m over the top of you like this, “Let me see your homework. Oh, you don’t have it? Why not?”

I: I know, right? And so then, you can be on top of that.

V: In my mind, if the homework assignment is appropriate, you shouldn’t have to go over the majority of the problems.

I: And take up a lot of the class time.

V: And take up three quarters of the class time. So, that’s what I do. Now, the HLS system, when I’m working with that, the drawback on that is, of course, that I don’t have that intimidation factor because I can’t stand right next to them and say, “Where is it?”

What I do, however, is, I check online before I come to class to see if they’ve done it. So, I do that.

And in most cases, if a kid misses one assignment, I’m not going to be on his case. But I’ll say, “Hey, I checked the last few times, the homework hasn’t been done, and it’s not going to go away.” And I remind, and that kind of thing. And what I also tell them to do is to make a note of the problems that they had difficulty with, or the type of problems they have difficulty with, and if they’ve copied the problem directly from the computer, we’ll put it on the board. If not, then we’ll take a problem from that section in the book because they’re familiar with it.

Let’s say their assignment from the computer was 5.3, Section 3 of Chapter 5. If they didn’t copy the problem that they were having difficulty with, we go to that chapter,
find one similar to it, so we can go over that. So then, we can go over the homework.

Depending upon the nature of the homework and the class and whatever, twenty minutes on the homework, no more than that.

I: And how long is the class period?

V: An hour and fifteen.

I: So you could spend about twenty minutes on homework, and then you start showing them some material?

V: Showing – Then we – Then we go on. Maybe a half an hour. Twenty minutes to a half an hour, no more than that. And from that point on, it’s new material. And usually what I’ll do with the new material – it depends upon exactly what it is – is I always try to tell them how it relates to what we did before.

I try to, when possible, give them the big picture because I know for most people, myself included, if you give somebody the big picture, they get a concept and then they can understand the detail and put it together, rather than a whole bunch of fractured pieces and not knowing how it puts together. Because how do you know how to put together a puzzle if you don’t know what the final picture’s going to look like?

I: Absolutely. No, I like that.

V: You know, that’s basically it.

I: Sure, give them a good overview of the whole thing.

V: And then, what I also try to do is, whenever possible, I try to relate it to something that they are familiar with because these kids…I tell them, “Look, the reason you’re here is because math is not one of your best subjects. Let’s be honest. But it’s something that
you’re going to have to know. I don’t care if you’re an English major and you figure you’re not going to need this stuff.

“You’re going to be living in a world where you’re going to need it. By the way, anybody know what a 401k is? Anybody know how a CD works in a bank? How they figure out mortgage payments? How they figure out your property taxes?”

I: And that can affect all of them. Hopefully.

V: You know, so I try to relate it as much as possible. What I also do is in the beginning of the semester, usually the first or second session – usually the first session, I have them fill out a student information sheet.

I: Student information sheet?

V: And they’ll give me contact information. I know I can get it online, but I like to get it from them.

I: So it’s contact…

V: Contact information, and what the highest level of math is that they took when they were in high school and what was your approximate grade in that course, so I know what my audience is. The other thing is, I ask them about do they have a part-time job and how many hours it takes.

And if I see somebody who says they’re working 35 hours a week, I’m going to ask, “How are you going to fit the time in?” So, I’ll spot that right away. The other thing is, I will ask them for hobbies, interests, aspirations, that kind of thing.

I: Why?
V: The reason for that is that gives me a clue as to whether they’re realistic or not. I’m not going to try to have a kid’s dream blown out of the water, but if the kid in this class who says he wants to be a brain surgeon. But the other thing is, if I find, for example, that a whole lot – a very popular program here is nursing.

So if I find out that a whole lot of the kids are going to be in the nursing program, if I can use things that relate to nursing in my examples, it helps. And for me, as a bio person and as a chem person, I can pull things in there pretty easily that relate to nursing.

I: So it’s making connections?

V: Sure. Those are the reasons why I use that other stuff.

I: And your science background helps with that a lot. You can just seamlessly go from a problem to an example.

V: Well, another example that I use, and it’s really from earth science, not – or geology, not from what I usually teach – is you know that if you graph an equation, because they do basically simple equations and linear graphs and so on, slope, whatever, one of the key things, of course, is that if a point is on the line, it’s a solution to that equation. Okay? However you doctor it up, that’s it.

Then I say, “Some of you may wonder why in the heck do we ever use this, or who uses this, or why, blah blah blah blah.” So I say, “Well, one thing is, have you ever seen something on television, when you’re watching the weatherman and they’re saying, ‘Well, there’s a storm coming up the coast and if it follows this path, we’re going to get snow, but if it follows that path, we’re going to get rain.’
“And they talk about, we’ve got one model here, one model there, and so on and so forth. Well, they have a whole lot of complicated equations, not just one or two like we deal with, and those equations, the common solution, that’s the kind of thing where it’s used.”

I say, “A better example, and one that’s more easily understood, is does anybody in here know how they locate where an earthquake is? How do they know, for example, that the center of the earthquake is such-and-such a spot in the Pacific Ocean? Nobody was standing over here at the time.” So I don’t know, do you know how they do that?

I:

V: You see, well, basically what it amounts to is this. When you have an earthquake and the earth starts shaking, different types of waves are generated. Some of those waves go fast, some go slow. I try to minimize the detail on the science. Some go fast, some go slow. Now, by comparing the time span between when the first one arrives and the second one arrives, they can tell how far away the earthquake is.

I say, for example, “Have you ever seen a track meet?” Most of them, yes. If you go look at a 100 meter dash, that’s a short distance, and usually the time or the space between first place and second place in a 100 meter dash is not much. But if you watch a track meet and you see a mile run, the distance between first and second is much greater because there’s a greater opportunity to show your superiority. The fast guy really is much further ahead.

So, with an earthquake, if the difference between the first wave and the second wave is great, you know it’s far away. If you know the difference, you know that it’s
close. Now here’s the deal. If you take a seismograph, and it measures these waves. If you take a seismograph, and that’s the seismograph, they have charts and this – we’re not going to go into where the charts came from – and they know there was a 15-second difference. That may translate, when they look it up on a chart, to say that that earthquake was 500 miles away from there.

But, that’s 500 miles from here. It could be 500 this way, 500 this way. In other words, circle radius five. So anywhere on that line, that’s where the earthquake could be. That’s nice, but it doesn’t really tell you where. But let’s say this seismograph was in Tokyo.

I: Oh, they space them around.

V: Let’s say there’s one over here in San Francisco. And the one in San Francisco says it was 1200 miles away because it took longer to get here. So now we have a circle here…

I: Different radius.

V: 1200 radius. So, it goes like this. Now, what’s the importance of that spot and that spot?

I: You’ve got your intersections there.

V: Those are the only two places on Planet Earth that are 500 from here and 1200 from there. In other words, it’s a solution. Now, that’s nice but we’d like to know where, not one out of two. So what do you think we need?

I: Another one.
V: Well, let’s do one over here, and let’s say maybe this one is in Singapore. So, maybe that’s only 400 miles away. There it is. That’s how they locate an earthquake. It’s a solution to the equation: where the lines intersect, that’s the common solution. That’s how I teach them to graph two equations and what the meaning of the significance is.

I: Oh, I really like that. That’s very nice. So, when you do the lessons, you bring in a lot of authentic examples. All right. And then after you do that and you go over, do the students work on problems in class?

V: Yeah, usually what I’ll do is, in any one lesson, it’s not just me talking. I’ll make a presentation, I’ll talk, and then I will assign problems, usually from the book. Or maybe there’s a handout. I may have a handout, depends upon the lesson. Then they’ll be working on it, and I’ll give them a couple minutes’ start, and I literally go around the entire room. “You have any trouble? You know what you’re doing? You okay? You need any help?” And that kind of thing, for every kid.

I: So you actually are able to –

V: Oh, I’ll literally circulate around the room and talk to each kid in the class.

I: And then assign homework for the night.

V: And then assign homework for the night. And sometimes, depending upon what the assignment is and what the lesson is, sometimes I’ll present new material, they’ll do some homework – I’m sorry, they’ll do some seatwork, and then I’ll assign some additional new material and then some additional seatwork.

I: Depending upon the timeframe.
V: Depending upon the timeframe and what the lesson is.
I: Absolutely. So, for you to be able to circulate, my next question – that actually is a good – how big are your classes that you’re teaching? Are they – I mean, you couldn’t be doing this if you had 100 students.
V: No, oh, certainly not. The study site, in the past, has had a maximum number of 15 in the developmental. Most of the time it’s been less than that. This semester, for whatever reason, the numbers are larger. I think they increased it to the maximum of 18. Out of the two classes right now I’ve got 16 in one, 18 in the other. But in all honesty –
I: They’re still small. Do you notice a difference?
V: Oh yeah, you can tell a difference. In all honesty, I think in the 18, there are two or three that are on the list that have never showed up, so I got to let the Registrar know. There’s always that kind of stuff going on.
I: And then bills, and all that question, when who has paid and – So that’s certainly manageable. Do you find you’re given academic freedom here?
V: Oh yeah, I pretty much do what I want. The only limit that I have is that there is a departmental exam that I have to make sure I cover the material. If I wanted to do the whole book from backwards order, unless somebody complained that it screwed everybody up, I could do it. Nobody tells me exactly what I have to do.
I: And so your tests can be your own, but the final exam is…
V: The only thing that, in fact, comes from above is the final exam is departmental. The final exam must be 30 percent of the semester grade. The other 70 percent is my –
I: Is your jurisdiction.

V: My jurisdiction.

I: Now, how much do you – what about the Hawkes? Do you consider that part of the grading, homework…

V: Oh yeah, that’s 20 percent. In my class, that’s 20 percent of the grade.

I: So it is a good chunk.

V: The Hawkes is 20 percent of the grade and tests are 40, quizzes are 10. And everything counts –

I: What was tests?

V: Tests are 40 percent.

I: And quizzes were…

V: 10. That gives you 50. Plus the other 20 for Hawkes is 70. Plus the 30 for the exam, that’s where you get the grade.

I: V, tell me your educational background. You got your degree in science or in math, or both, or…?

V: I went to Patterson State College…

I: Patterson State.

V: Because, in all honesty, the only ones we could afford were either Patterson or Montclair, and the bus connections from Fair Lawn were better. And it was science. The idea there was you had a concentration in bio, but you also took other science courses so you came out with a degree any science.
I: To a range of sciences. So chemistry could be taught.

V: I, in fact, my first two years, I taught algebra and chemistry. Now, the way I got the math certification, I wasn’t the star, but I was pretty good in math in high school. And on SATs and placement tests, Patterson put me not in with the math majors, but not in the standard freshman math.

I: So, they knew you had math capabilities there.

V: So, I was told that at that point, if I wanted to switch for a math major, or a math minor, I could use that course towards that and I could take calculus the following semester, which I did. And my thought was in terms of jobs, maybe it’s arrogant, whatever you want, my thought was that if I’m going to go for a career – and I felt I wanted to be a teacher – but if I wasn’t a teacher – let’s put it this way. If I didn’t like it, if I had too many days in a row I went, “Oh God, I got to go there again,” I wasn’t going to do it.

And in all honesty, my favorite subject in high school was history, and to this day, my recreational reading is history, history and philosophy. So that my thought was, if I am a history major, yeah, I’d enjoy that in teaching. But being somewhat sarcastic, if I didn’t like it, what am I going to do? “Give me a job; I know a lot about the War of 1812?” So for that reason –

I: Some good forward thinking at a young age, though.

V: For that reason, I was thinking science, and tied in the math with it. It created some difficulties in the scheduling because you weren’t supposed to have a minor with that science thing because your minor supposedly was all those other sciences. So, what
happened was, Patterson you got a BA, not a BS. So, that meant you had a bunch of other required courses, but to try to squeeze everything in was next to impossible. So, what I wound up doing was taking my math courses to the exclusion to some of the humanities things…

I: But weren’t they required, like core?
V: Yes. There was one summer I had the thrill of taking American Lit I, American Lit II, and Music Appreciation, all at the same time.

I: How can you take American Lit II when you haven’t had American Lit I?
V: That doesn’t make any difference. So, that was the only way that I would be able to get it done.

I: To fulfill those core courses.
V: Also, for most of the semesters, I was taking more than the number…

I: Yeah, 18 or 21 instead of 15 or…
V: Yeah, I think if you counted the summer stuff and the other things, I think I graduated with about 140 credits.

I: Wow, that’s a lot.
V: Something along those lines, 140, 142 credits.

I: That’s a lot of credits.
V: So that’s the way I was able to generate the math certification. And my masters is from Syracuse.

I: Syracuse?
V: Yes.
I: Oh. How did you wind up up there?

V: Because I got a full scholarship.

I: Nice.

V: National Science Foundation – this was in the ‘60s – academic year ’68 - ’69 – I had been teaching for three years and I knew about National – my first year of teaching, I didn’t take any graduate courses.

I: NSA? This is National Science is –

V: NSF. National Science Foundation.

I: NSF. Foundation.

V: I didn’t take any graduate courses because I figured first year of teaching, that can be busy enough. But from that point on, I started taking courses, usually in the summer or on Saturdays. I had two years of taking Saturday courses at Stevens.

I: Oh. That’s engineering, actually.

V: Yeah, I took chemistry, thermodynamics, stuff there. One summer I took organic chemistry and selected topics in chemistry at Bucknell, so I took those at Bucknell during the summer. And then I took – Dumont ran a program – I don’t know if it was a course or not, but I took a course in Fortran.

I: Oh yeah, computer language.

V: Computer language. And I knew that as a teacher, you’re never going to get wealthy, but the way to at least make more is you want to get to the right-hand side of that –

I: Sure. Of the pay scale chart.
V: Chart as quickly as I could, right? So I had taught for three years, had several credits, but nothing leading to a degree. I had made applications to a whole bunch of colleges and so on, and got accepted to all of them. The only one that put me on a waiting list was Brown. But anyway, for logistical reasons and other reasons –

I: You wouldn’t probably ended up there, anyway.

V: I wound up going to Syracuse. And Syracuse was an MS in Science Education – or General Science, there you go. MS in General Science. So, I had everything from immunology to biochemistry to physics to astronomy…

I: What did you do about teaching if you were up there getting a masters?

V: I was full-time. I was full-time in Syracuse.

I: So you took a leave, or…?

V: Well, that’s interesting, too. I asked for a leave of absence. The superintendent was willing to give me a leave of absence, but the Board of Ed said no.

I: Oh?

V: The Board of Ed said they would not give me a leave of absence because I didn’t have tenure. I only taught for three years; tenure is three years and one day. The superintendent, who was willing to have me come in, take attendance one day, and give it to me, but the Board said no. So basically, I gave up my tenure rights.

And again, I was single, and I was arrogant enough to figure –

I: You can get tenure anywhere.

V: If I’d been teaching for three years, and I come back with a masters degree in science and can teach math, I’d be able to get a job somewhere.
I: I agree.

V: So the way it worked out was Dumont was able to get somebody for that one year who was only interested in one year, and I came right back to Dumont again.

I: And they gave you tenure.

V: No, I had to start over again.

I: So you started with year one?

V: Yeah. So basically, I had taught six years in Dumont before I got tenure. There was three, and start over again three, and then –

I: But you got moved over on the pay scale.

V: Oh yeah. In fact, after I got out of Syracuse – I don’t know, I got the degree in May –

I: Did it take a year to get the degree?

V: Yeah, I did the whole thing in one year. And the other thing was, I did not use any of my other credits in transfer, so I did the whole thing in one year at Syracuse. You haven’t lived until you – at 9:00 at night, taking microbiology. So anyway, you go from Syracuse, getting the degree in May.

I then went back to Patterson State, took two more grad courses there. One was ecology and one was environmental science, technically not the same. No, no, it was environmental science and biochemistry, organic chemistry – it was a chemistry course. And that gave me enough credits so that I now had the masters.

I: Plus.
V: Those credits that I got at Patterson, plus the other ones that I didn’t use in
transfer, I was now masters plus 30. So, after four years’ teaching, I was masters plus 30.

I: Oh my God. Is that the end of the pay scale? It has to be, right near it.

V: Yeah, for Dumont, that’s what it was. I was on the extreme right-hand column
starting with year four. Actually, not year four. Actually – yeah, year four. Yeah, three
years. Three years, and the fourth year.

I: Unbelievable. That’s great. That’s great.

V: And then for a number of years after that, I wound up taking additional courses
and additional programs. I took three summers – this is all NSF stuff – three summers in
cellular biology at Seton Hall. I took molecular genetics, or something like that, at
Princeton. That was Howard Hughes Medical Institute that funded that one.

I: Wow. This is very impressive actually, you know.

V: Well, that’s where the money was. I enjoyed –

I: For somebody who really liked history, who was a history buff.

V: And then the other thing was, one year I was one of three teachers statewide who
got a chance to do research at Hoffman-LaRoche because they had the Roche Institute of
Molecular Biology.

I: Was that in Nutley –

V: Bordered Nutley Clifton, yeah.

I: Bordered Nutley Clifton.

V: Yeah. I was there for a year, and –

I: You didn’t teach that year?
V: Well, that was the summer.

I: Oh, it was the summer.

V: That was the summer. All these things I’m talking about are summer. And I did that. We did that on ribosome function and change the genetics of cells.

I: You did it on, what were you saying? Rimon…

V: Ribosome.

I: Oh, ribosome.

V: Ribosome function.

I: Ribosome functions.

V: And had my name included as one of the authors on a paper.

I: Oh, very nice.

V: Made a contributor – made a contribution. Not a whole lot, but that was it. That was it.

I: But still, I mean. Yeah, you had your hand in it.

V: The lead guy was Jim Offengand, was the lead researcher on that. He was in charge of it. Yeah, I did that. And that’s where I learned a lot about gel electrophoresis, polychromide electrophoresis, are you familiar with any of those?

I: No, I’m not.

V: Well, electrophoresis is the method by which they can separate fragments of molecules. You’ve seen things where they sequence DNA?

I: Yes.
V: That’s the process they use. You may have seen pictures where they have bands to show what DNA looks like?

I: Oh sure, yeah.

V: That’s the process.

I: My daughter does research in that, with DNA sequencing.

V: So then she would know.

I: She would know.

V: Yeah, then she would know. Because in fact, believe it or not, that stuff gets done at the high school level. I had high school kids doing that in the AP classes.

I: Wow. Wow. That’s something.

V: And as a result of that, I was able to get some money from Roche so that we were able to get the equipment to do that kind of stuff in Dumont. That’s where the equipment came from.

I: Nice. So, was it sort of like a grant that Hoffman-LaRoche gave you to get this equipment to bring to Dumont?

V: Yes.

I: Very nice. I’m not even sure they’re located as much in Clifton Nutley…

V: No, much of their research they’re out to Stanford, in California.

I: Yeah, yeah. They’ve kind of moved some of that. Yeah. Well, that was very nice. Well, that’s great. That’s a very strong background you have as an adjunct. I might say that’s incredibly strong. V, you told me the class was an hour. Are both of your classes hour and fifteen minutes in length, or are they –
V: Yes, they’re both the same.

I: Both. Back-to-back, do you have them?

V: Twenty minutes between. In fact, one of the things that is good is, I’m a morning person.

I: Me too.

V: And I’m retired. I do this because I want to. I’m not saying that the money isn’t nice, but this is not rent money, this is not food money, okay? And I do it because I enjoy it. And they have been very cooperative here with scheduling because at one point, I remember, they asked – they had two classes, would you want to take – one was morning, one was mid-afternoon. I said, “Do the morning, forget the mid-afternoon. I don’t want to screw up my day.”

Or whatever – I’ll pretend – it’s not like I’m playing hardball, it’s just –

I: It’s just the way you want it.

V: It’s just the way I want it and again, I don’t want to play hardball but they know that this is – I’m retired, I don’t want to tie up all my time with this. So, they’ve been very cooperative, and when I have one section, just about always it’s the first one in the morning. And when I have two, they’re always back-to-back.

I: So it’s not like you’ve got three hours to kill here on campus, and then go on –

V: No. If that’s the case, I wouldn’t be here.

I: Right. Yeah, I agree. I agree. All right.

V: So, in terms of what you would call the work environment, no problems at all. Very very supportive.
I: So it’s a nice work environment for you.

V: Yes, very much so. Very much so.

I: Department-wise…?

V: Oh yeah. All that. Even when I was teaching, my thought was that I spend as little time in Central Office as is necessary. If they need me, they know where they can find me.

I: Exactly. You know your role.

V: I didn’t look at it as arrogance, It’s the way I like. I don’t want to get involved with all the politics, he said, she said, somebody did this, somebody – I could care less. And in fact, that’s one of the reasons why I retired when I did because I got to the point where I was saying to myself too many times, “Do me a favor. Get out of my way and just let me teach.”

I: Exactly. I know. All right. Now with the basic skills, you don’t teach non-basic skills.

V: Correct.

I: So, you said there’s the computer component, there’s the Hawkes computer. Is that something you assign every night, once you pass Chapter 1, or is it done weekly, or…

V: I would say practically every time we have a class session, they’ll have that.

I: After every class session, practically.
V: I tell them 90, 95 percent of their homework, after that first chapter, is going to be online. There are times when, for whatever reason, I may give them a handout or some other things that have to be done. That’s rare, compared to what –

I: And if they’re having trouble, do you tell them to come to the lab and –

V: Oh yeah. And in fact, I didn’t even think of it, if you had come today, I gave a quiz – by the way, have you seen the book?

I: I have seen, I believe I actually have one at home. I think it’s the book. Not – do you have it there? I don’t know if I have the right edition.

V: Now the kids get a paper version. We get the hard copy.

I: I think I have the paper version. So, you probably have the –

V: It gives the features and some of that kind of thing. But the way the thing is organized –

I: Structured.

V: Is the first chapter is not Chapter 1, it’s Chapter R for review. They got a quiz today on this. And what I told them was that the hallmark – and I, from day one of the semester – first of all, I tell them, like a lot of other instructors, I cannot tell you that on such-and-such a day you’re going to get a test on Chapter 3.

I: Yeah, I don’t do that either. You don’t know how fast you’re going to –

V: Because I don’t know how quickly or slowly you’re going to grasp a topic. So what I will do is, I will tell you we’re getting close and you’ll have a test, your quiz, the end of next week. And as we get closer, then I set the date. That’s the way I do it.

I: Good. So they had a test…?
I gave them a quiz. This isn’t…

I: Quiz.

V: Terribly difficult. If you want, I can later show you – pull out the quiz. But then, what I did was, their homework for today was, at the end of Chapter R – I pointed out features of the book. At the end of Chapter R, there’s a review and it says these are the things in Section 1, these are the things in Section 2. And then they give you a test like this.

So what I told them was, your homework assignment due for Friday is you have to pick any 15 problems you want, but 10 have to come from this section, 5 have to come from this. And here’s my suggestion: don’t take the easiest ones. The idea is this. Take the ones you’re not sure of, and we will take 15 minutes before the quiz and I can respond to your questions because you’ll know I need help on this, I don’t need help on that. We’ll take 15 minutes before the quiz.

I: That’s great. That’s very good.

V: So, that’s what we do. And I am, I can’t say fanatical, but very attentive to time management. So, for this, here’s what we do, folks. We’re going to go over this. Now, when I hand out the papers, I make sure they’re separated and so on, in seating. When you’re done with the quiz, you bring it up to the front desk. And when you bring it up to the front desk, you bring up the homework, and we can check it at the same time. That way, I’m not wasting time walking around and everybody’s wondering what they’re doing. And whenever they’re taking a test, I have on the board, “Complete test. Check
work.” And I put, “Reasonable” question mark because I make a big deal on, is your answer reasonable?

I: Is the answer – right. It’s a biggie.

V: Like, for example, one type of question that they had was, “A bus has 40 people in it. That’s five-eighths of capacity. What’s the capacity?” So, let’s think this through. 40 is five-eighths of capacity, and they want to know the capacity. So right away, is the answer going to be more than 40 or less than 40?

So, you know that working with the numbers, it’s got to be bigger than 40. Okay? And in fact, let’s look at it even a little bit more closely. Five-eighths. Well, instead of five-eighths, if it were four-eighths, that would be a half, wouldn’t it? So, if half of something is 40, what’s the something? 80. So you know, this has to be somewhere around 80. So, if you get an answer that’s way the heck away from 80, then you made a mistake.

I: Check your reasonability here. Right.

V: Does it pass the reasonability test? So then, “Check your – complete the test. Check your work. Reasonability. Bring paper to the front desk. Bring homework to the front desk. Read Section 1.1,” which is the next thing. “Do the practice problems in 1.1 for the early finishers.” And the practice problems are really quite simple, these things.

And then we spent approximately a half an hour – a little more, a little less – approximately a half an hour using the SMART Board because I hooked up the computer – well, it’s already hooked up, but you have to use it – but it’s got the software in there for the Hawkes program. So, what I was doing was, I was showing them the features of the program the day before they had to do the assignment.
I: So they knew how to use Hawkes, too.

V: So, I already showed them. Now, I told them, “I am not going to show you how to set it up because it’s already set up on this one and everybody’s computer’s a little bit different, so we’d be wasting time on that. I’m assuming you either have it set up or you know how to set it up, but this is how you work the software.” And we did the software.

I: That’s very nice. Very nice. So your classroom has a SMART Board?

V: Yes.

I: That’s nice.

V: Oh, and by the way, another one that is good, and I pointed it out to the kids, that you might want to use, too. Have you ever heard of the website Khanacademy?

I: No.

V: No. This has got to be one of the best things since sliced bread.

I: Really? What does this have on it?

V: A phenomenal number of very good tutorials. Everything from basic arithmetic up to differentials.

I: How did you find it?

V: About a year or two years ago, I was watching the news on Channel 4 and they periodically do a thing on Education Nation, they specialize – they’ll do a series on education. And it was Brian Williams, I guess – it was only like a, I don’t know, maximum two-minute blurb.
But what this is is it’s a website with a bunch of tutorials, and each tutorial is no more than ten minutes. Most of them are about five minutes. In fact, I could show you on the computers before you leave.

*I:* That’d be great.

*V:* And very clear. You don’t see anybody’s face at all, but you see the writing on a dark board and you hear a verbal explanation. When things are a little bit complicated, he uses different colors; this is a substitution for that, when you’re doing the math.

And it not only is math. They’ve got civics, finance, statistics, biology, chemistry, astronomy. And the way this thing started – the guy’s last name is Khan, K-H-A-N. I don’t remember what his first name was. It started out – he obviously is a sharp guy in college, and there was a family member who said, “Can you help my daughter, can you help my cousin?” Whatever.

And he was in one part of California, she was in another. So, he set this kind of thing up just to help her. Not on this magnitude, of course, but that’s how it started. Somebody talked to somebody, it grew, and blah blah blah blah blah. The big thing was, Bill Gates found out about it and gave them a couple million dollars, and then it just blossomed. And it’s completely free.

*I:* That’s wonderful. I can’t wait to check this thing out.

*V:* And I told the kids this. In fact, the second class today, I had a little bit more time at the end than first class, so the second class I actually was able to get this and go through a very simple one using Khan. And they could see. I said, “Look, I’m not saying that you have to use it.”
But I’m saying, the items that I seen – there are hundreds of them. So, I’m not going to lie to you and say I’ve looked at all of them. But I’ve looked at a number of the math ones, some of the bio ones, some of the chemistry ones and so on, and they’re good. So, I said, “It at least deserves your attention to look at it and evaluate it, and find out whether it’s something you could use.”

I: Absolutely. What a good find that was. I’ll have to look at that. Maybe we can take a peek at it.

V: Yeah, I’ve got it here. In fact, on the computer that’s for faculty, I saved it.

I: Now, V. I want to ask you. What, in your opinion, what teaching methods do you think works well with basic skills students? Developmental students? Because they’ve seen this before. They had to have.

V: I see – another way of quote saying success – a variety of things in no particular order, just as they’re coming to mind, is I try to remember that my function is to get them to learn something, not to try to impress them. I try to minimize the fancy language.

I: That you might have used in an AP class?

V: Of course. If you can put it in everyday terminology – as I said before, I also try to give them an overview first before any kind of detail and frequently, whenever possible, try to relate using the examples. Where I use examples, I do not use the examples from the book. When I use examples, I use very simple examples because I want them to get the concept.

If I wanted to show them – here’s an absurd example. If I wanted to get them to know the distributive property, I’m not going to do an example that involves fractions.
Because you get bogged down in math with fractions, and they forget that you’re trying to do the distributive property. Again, that’s a very ridiculous example –

I: No, that’s a very good example.

V: But that’s the idea. And I’ll be the first to admit that I can remember numbers, but I’m not real good with names. But what I can do is I can remember that this one is interested in nursing and that one is interested in whatever, so – and also, you get a flavor of the nature of the class. You look at the sheets – now, I can show you the sheets, a lot of them for nursing, somebody for education. Same thing. So when possible, you relate it to that.

I: So their interests, too. And how do you juggle the different levels? I know they’re all low, but some are very low and some are better at math. How do you juggle that?

V: What I will often do, when they’re working with – at problems at their desk, I will encourage them to check their work with somebody else. So, I’ll hand them a problem and I’ll say, “When you finish, check your answers with somebody next to you. If you both agree, you’re probably right. If you disagree, try to resolve the difference.”

I: Right. So sometimes group work, or working in pairs, or comparing answers?

V: Yeah. Well, usually I don’t tell them to start working in pairs.

I: Right, do it yourself. Finish it.

V: To finish. They’re going to work on their own, and then when you’re finished. Because working in pairs frequently means you work and I watch.

I: Exactly. I’ve seen that, too.
V: So I don’t usually – I can’t remember, at least in these classes, giving them any kind of group work.

I: Now have you seen things or ever, in your history, have you seen things that don’t work well? Techniques that maybe go over their heads or they glaze over?

V: If you go too quickly and you focus, again, on trying to impress them rather than trying to teach them. I joke about it. There will be times when I’ll tell them, “I teach by the KISS method, and it has nothing to do with sex.”

I: What’s that?

V: Keep It Simple, Stupid.

I: There you go.

V: And the word “stupid” doesn’t apply to them, it applies to me. Keep it simple.

I: You can do that for many things in life, not just math, right? So, going too fast, trying to impress them. Maybe if your vocabulary is above them? That’s the keeping it simple.

V: Again, as I said before, the simple examples, like if you’re going to work a problem, use simple numbers. Because often what I will do is, and frequently in terms of word problems, especially in the beginning, I forget – there was one –

V: There’s one –

I: Do you think some of the stuff in here is too hard?

V: No.

I: So the book is appropriate.
V: Yeah. The book is appropriate. There are times, like for example, when I think what the book does is not necessarily the easiest way, and I show them something different. Oh, here’s one, for example.

I: The product –

V: Both of these. A study shows…

I: We’re left-handed.

V: Oh no, okay, no, this one. This one. I’m sorry. The product of five-sixths with another number is that. Which number is the product? What’s the other number? So, you look at that, and these kids are going to look at you like you have four heads.

I: They’re not – with too many fractions, and…

V: They may be able to tell you that the product of the number is this, so they won’t be able to tell you that that’s the product.

I: Right. So they know that.

V: But this one…

I: What’s the other number?

V: What’s the other number. So, what I will do is I’ll say, “One strategy that you can perhaps try is to make up a problem of your own that is similar to it, but you know the answer. So, for example, if I say ten times what equals twenty?”

I: And you already know the other answer –

V: “What’s the answer to that?”

I: Two.
“Two. So, now if we have five-sixths times what equals two-fifths, and you don’t know what to do with this, let’s look at this. This is patterned after the same. So, suppose you don’t know this. What can you do with ten and twenty to get two? You take this one and divide into this one. So, that’s how you get the question mark. How do you think you get the question mark over here?”

And this is much more difficult.

“You divide this one into this one.” And that’s what I mean about keeping it simple, and try to make –

The patterning and making it easy.

Right. And what I tell them is my objective – and it can be phrased in any way you want, in a number of ways – my objective is to get you to learn how to think and understand, not to memorize. And the example that I use with that, and that’s right from the beginning, is something from science class.

Because I tell the kids a little bit about my background, too. I don’t go into as much detail as I did with you, but my experience is high school science and math, and mostly science, and blah blah blah. “Most of you have heard the word hypothesis, right? You’ve heard that? Now, if I asked you, ‘what is a hypothesis?’ what are you going to say? What’s the standard response?” And the standard high school response is, it’s an educated guess.

Now, you know what I used to do when I taught introductory biology? These kids are coming out of other science classes, they’re either ninth or tenth graders. I would say what is it, and they’d spit out “educated guess,” and think they’re fine. “Now, you have
an assignment. I would like you to write at least two paragraphs telling me what a hypothesis is, but you’re not allowed to use the word ‘educated,’ and you’re not allowed to use the word ‘guess.’ Tell me what it is.”

Now, if you understand what it is, you can do that. Because I said, “How many times – and I don’t need a show of hands here or a response, just think for a minute – how many times have you had a class – it doesn’t always have to be science – where you had a definition or you had a phrase that used the answer for so-and-so, you put it down, but you really didn’t know what it was. But you got a full credit on the answer because you memorized ‘educated guess,’ or something like that?”

That’s the difference between understanding and memorizing. Another example. I don’t play a musical instrument. All I know is on, off, loud, or soft. But if all you know how to do, when you’re playing an instrument, is you know how to play this one song and you practice that one song and you’re great at it, that’s fine. You’re good at that. But if you can read music, then what’s the difference?

I: Play any song. Absolutely. There you go. So, do you tell them that?

V: Yes. And they won’t always hear the same little speech, but the idea that we’re looking for concept, understanding, not just memorizing, they’ll hear that throughout the semester.

I: Good. Because you can easily forget what you memorize, but if you understand something, you have…
V: Well, the other example that I’ll sometimes use is, do you remember in elementary school and maybe even high school, you had vocabulary rules. You get the list on Monday, you write it out, blah blah blah, you get a test on Friday.

I: Memorize it.

V: And maybe you got a 100 on the test the beginning of October. But if you had to take that very same test in May, you’d flunk it because you didn’t use it any more, and you forgot it.

I: Absolutely. Yeah. Vocab. All right. Vin, let me ask you this, too. Did you ever have any students in your basic skills classes that once you’ve met them, think that they’ve been misplaced, that they’re in the wrong section?

V: No, because one of the things that we do is we give them a pre-test. Now, the reason they’re in here is because they got a particular grade on a placement test.

I: Originally.

V: I don’t know the grade, I have never seen that test, but I know that’s the basis for their placement. But usually on the first day of classes, I will tell them that the next time we meet, we’re going to take a pre-test or what might be a challenge test. And no, it doesn’t count for grade.

But we’re doing this for two reasons. I say, “Number one, you will take something similar to this at the end of the semester, so hopefully we see improvement. But the other thing is, you are here because of how you did on a placement test. We all know that there are sometimes where you just simply have a bad day.
“So, if maybe you know this stuff, but you had a bad day on that placement test. Maybe you were nervous. If you do well on this placement test, it is possible for you to quote test out of this course, and then you can go onto the appropriate one for your curriculum, whether it’s science or whatever.”

I: So you give them a pre-test as well, but it’s not counted for any credit grade.

V: Yeah. That pre-test, for them to place out, they have to get 9 out of 12 correct.

I: So they have to be able to get like a 75. You, as a basic skills teacher, do you ever collaborate with other basic skills teachers?

V: Not in a formal way, but we exchange things like, for example, I found the whatchamacallit, the khanacademy. They now know about that.

I: So you shared that with others.

V: Yeah. The same thing with the information sheet. I think Loretta does something like that now. The student information that I get from the kids.

I: What’s the information – oh, where you ask the students information. Loretta did say she used your thing, your information sheet.

V: Another thing that we were finding out was that when the students took the post-test at the end of the semester, since it didn’t count and they really didn’t put too much focus on it, so what I suggested to Jaycee was let’s make, since you want 12 questions, let’s take 12 questions from a post-test – and it’s fair – make them the first 12 questions on your final exam. And we can just come up with a separate number for those first 12, and that’s a more effective pre- and post-evaluation rather than doing a separate one. Because you know they’re going to –
I: So they’re focused on the exam…

V: We don’t tell them that. We don’t tell them it’s part of that. And I have never had a kid say, “Hey, when are we going to take that post-test again?”

I: So it’s the first 12 questions of the final. Very nice.

V: So that way –

I: So you collaborate informally with –

V: Yeah, yeah. And as far as – Jaycee is the one who’s in charge of the developmental program so when it comes to the syllabus, she’s the one who pretty much does the syllabus.

I: So she –

V: As a standard thing. We all kind of modify it to some degree by saying what room we’re in, when the office hours are, and all that kind of stuff. The heart of it, she does. And she’s the one that puts together the final exam.

I: And she puts together the final exam. Let me ask you, are you encouraged by the college here to participate in professional development?

V: We are, through e-mails that go out to the general faculty, I see it on that. Other than that, no.

I: Through general –

V: General faculty mail

I: Oh, general faculty mail.

V: General faculty announcements. And if I showed up, they’re not going to throw me out. But in all honesty, there’s no push.
I: And that’s general professional development. Are you ever encouraged to particulate in professional development that just specializes in basic skills?

V: No. I’m not saying I’m discouraged, it’s just no big deal.

I: Right. Do you feel you could benefit from participating in professional development for your instructing of these basic skills?

V: I might. In theory, I would say you never know, you can always learn something. But the reality is – and I don’t mean to sound egotistical, but I know this stuff and I think I’m pretty good at it – and just the interchange and the conversations we have back and forth, I think is satisfactory.

I: Do you enjoy the basic skills classes?

V: Yes.

I: You do?

V: Yeah. If I didn’t, I wouldn’t be here.

I: And working here? You enjoy?

V: Yeah, yeah.

I: And you like the students?

V: Yeah, the students are good.

I: Do you get to know them? I know you say you do the sheet. Do you get to know them personally and their personal lives a little bit?

V: Slightly, but not much. Some more than others. But I know that there are some faculty, whether you’re here or when I was teaching in high school, that are very much involved in the kids’ quote other life. But I’m not.
I: I think that that is it. I think we’ve covered everything that I was hoping to cover here. And I can – let me turn this off.

[End of Audio]
Appendix S
Lesson Plan for Discovering Pi

Objective: Use circular objects to approximate $\pi$.

Materials: several circular objects, such as jar lids, hula-hoops, and plates; meter stick or tape measure; string

Introduction:

Ancient civilizations knew that the ratio of the circumference of a circle to its diameter was fixed, and that this ratio was approximately equal to three. In this activity, you will explore the ratio.

Recall that the diameter of a circle is the distance across a circle through the center, and the circumference is the distance around the circle.

Preparation:

- Work in groups of two or three

Explore:

1. Use a metric ruler or tape measure to measure the diameter of one of the circular objects. Measure to the nearest millimeter.

2. Measure the circumference of the object by wrapping a piece of string around the outside of the object. Then measure the length of the string to the nearest millimeter.

3. Record your measurements in Table 1. Then calculate the ratio of the circumference of the circle to its diameter. Write this ratio as a decimal rounded to hundredths.
4. Repeat these measurements and calculations for two other objects. Record your observations in the table.

<table>
<thead>
<tr>
<th>Object</th>
<th>Diameter (millimeters)</th>
<th>Circumference (millimeters)</th>
<th>Circumference Diameter</th>
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5. What do you notice about the ratio of circumference to diameter for all three circles?

6. Does the ratio change with the size of the circular objects?

7. Find the average of your three ratios.

8. The exact ratio is an irrational number known as π (pi). Its value is approximately 3.1416. How close is your average ratio to this approximation? If it is not very close, explain why not?
Appendix T

Lesson for Approximating the Height of Inaccessible Objects

Lesson Goal: By using this lesson, students will be able to learn how to estimate the height of various trees using proportions and similar triangles.

Materials: tape measure, yard sticks or string, calculators

Introduction: Students will work with similar triangles using proportions to solve for a missing side. See example 1 below:

If Triangle A is similar to Triangle B, calculate side x.

Students will use proportions to determine the length of side x on Triangle B.

\[
\frac{5}{8} = \frac{7.5}{x} \quad 5x = 60 \quad x = 12
\]

Similarly, this can be done with similar right triangles:
Students will use proportions to determine the length of side x on Triangle D.

\[
\frac{7}{2} = \frac{x}{3.5} \quad 24.5 = 2x \quad x = 12.25 \text{ cm.}
\]

Procedure for lesson:

1. Make sure that the weather is sunny since shadows cast by the sun will be used to determine the height of the tree.

2. Have students work in groups of two or three where one student is the recorder, one student is the measurer and one student calculates the final height of the tree.

3. Measure the height of one of the students using the meter or yard stick or string, if available.

4. Record this information and drawing on paper.

5. Measure the length of the tree’s shadow using the meter or yard stick or string.

6. Record this information and associated drawing on paper.

7. Use calculator, pencil and paper to set up proportion and solve for the height of the tree.

8. Repeat process for another tree or object (such as flag pole) and calculate height for new object using proportions.

Connect:

9. Use the same process to estimate the height of other indirect measures of real-world applications, such as radio transmission towers, flag poles or water towers.
Appendix U

Lesson: Division Algorithm

Objective: determine a model for division of fractions

Materials: Cookies, ribbons, paper or any material that can be divided into pieces

Introduction: Students will work with drawings, cookies and ribbons to develop a model to understand division of fractions. To begin, students will consider the following two problems:

You are to get $5.00 in quarters for a friend. How many quarters should you have?

You are to bring four buckets of water to the backyard, however, you are only strong enough to carry half a bucket at one time. How many trips do you need to make?

First Problem:

Use a fraction strip to represent one dollar.

\[ \frac{5}{\frac{1}{4}} = 5 \times 4 = 20 \]  The answer would be twenty quarters.

Second Problem: Use a fraction strip to represent one bucket.
4 ÷ 1/2 = 4 × 2 = 8  The answer would be eight trips.

Note with students that both of these problems use the common rule for division of fractions: invert the divisor and multiply by the reciprocal. What is the connection to division of fractions?

Procedure for lesson:

1. Have students work in groups of two or three to work on the division problems.

2. Have students work with an easy starter problem such as 15 ÷ 3 = 5 and remind them this is true because 3 × 5 = 15.

3. Have students verbally define the mathematical statement above, such as, “how many groups of 3 items can be made out of 15 items?” and the answer tells us that when we have 15 items we can form 5 groups of 3 items each.

4. Let students work with cookies and begin with a problem with integers. If there are 6 cookies and 2 friends want to share them, what is the division problem?

\[ 6 ÷ 2 = x \] which implies 2 times x must equal 6, ie, 2x = 6 or 6 × \frac{1}{2} = 3

5. Repeat this for integers and then rational numbers several times using similar examples:

If there are 13 cookies and 3 friends want to share them, what is the division problem?

\[ 13 ÷ 3 = x \] or 3x = 13 and this leads to \[ 13 × \frac{1}{3} = \frac{13}{3} = 4 \frac{1}{3} \] cookies for each friend.

If there are 9 cookies and 18 friends want to share them, what is the division problem?
9 ÷ 18 = x or 18x = 9 and this leads to 9 × \frac{1}{18} = \frac{9}{18} = \frac{1}{2} cookie for each friend.

If there are 4 cookies and 14 friends want to share them, what is the division problem?

4 ÷ 14 = x or 14x = 4 and this leads to 4 × \frac{1}{14} = \frac{4}{14} = \frac{2}{7} cookie for each friend.

If there are 8.5 cookies and 10 friends want to share them, what is the division problem?

8.5 ÷ 10 = x or 10x = 8.5 and this leads to 8.5 × \frac{1}{10} = .85 cookie for each friend.

6. Have students examine each of the problems to identify the multiplicative inverse for each of the divisors in the above problems. Have them determine a general formula for the division algorithm for variables.

For example, generalize this concept using a, b and c such that

\[ a ÷ b = c \text{ if and only if } c × b = a \text{ and this implies } a × \frac{1}{b} = c \]
Appendix V
Lesson for Estimating Wildlife Populations

Materials: Identical beads (a few hundred of one color and a smaller number of another color), container for mixing beads, small scoop (optional)

Introduction: In 1900, there were about two million wild horses or mustangs, in the western United States. By 1950, there were fewer than 100,000, and at the start of the 21st century only about 37,000 remain. Many horses end up in pet foods. Each year, a large number are slaughtered and shipped to France and other countries where people eat horsemeat and cattle ranchers object to wild horses competing with cattle for grazing lands. However, groups like the Humane Society are concerned about the decreasing numbers of horses.

Various public and private organizations keep track of the numbers of horses, turtles, moose, and other wild animals. But how are animal populations counted? It would be almost impossible to actually count the 18,985 horses that were estimated to be in Nevada in 2005. Instead, a technique called capture-recapture (or mark-recapture) is used.

A number of animals are captured and marked in some way. Fur can be trimmed, toes can be clipped, and collars are sometimes placed on deer. Horses are often branded on an easily seen part of the body. Then the marked animals are released. After they have had time to mix in with the rest of the animals in an area, a second group is captured. By finding the fraction in this group that are marked, an estimate of the entire population can be made.

For example, assume that a group of branded horses has spread out evenly throughout the horse population. Then for any size group of these horses, the fraction that is branded should always be the same. For example, see Figure 1. Figure 1a represents a smaller group of the herd pictured in 1b. There are 4 marked horses out of a total of 12 in the smaller group. There are 16 marked horses out of a total of 48 in the herd. The ratios of \(\frac{4}{12}\) and \(\frac{16}{48}\) are both equal to \(\frac{1}{3}\). In any random collection of horses from this herd, you can expect the fraction of marked horses to be about \(\frac{1}{3}\).
Preparation:
- Work in small groups of 2 or 3
- Obtain a container of beads or other small objects that are one color.

Explore:
1. Capture and Mark
   a. Use the small beads or other small objects in your container to represent a horse population. Each bead in your container represents one horse in a population to be estimated. Scoop out some of the beads and count them. How many beads did you scoop out of your container?
   b. Let the beads that you scooped out represent the horses that will be branded. To simulate branding horses, replace each bead that was removed from the container with a bead of a different color. Then put the “marked” beads back in the container with the “uncaptured” beads. Mix the beads in the container well. This is equivalent to letting branded horses mix in with the population of unbranded horses. How many “marked” beads did you put back in your container?

2. Recapture and Use a Proportion
   a. After the beads have been mixed, scoop out a second group of beads and count the number in this group.
   b. How many of these beads are second-color beads that have been “recaptured”?
   c. Complete Table 1 to summarize your findings so far.

<table>
<thead>
<tr>
<th>Table 1</th>
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<tr>
<td>First Captured Group</td>
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<tr>
<td>Number captured and marked</td>
</tr>
<tr>
<td>Total population size</td>
</tr>
<tr>
<td>Second Captured Group</td>
</tr>
<tr>
<td>Number captured</td>
</tr>
<tr>
<td>Number that were marked</td>
</tr>
</tbody>
</table>
3. What is the ratio of the number of marked (recaptured) beads to the total number of beads in the second group?

4. If the marked beads were well mixed with the unmarked beads, any captured group should contain the same \( \frac{\text{marked beads}}{\text{total beads captured}} \) ratio as the entire population.

A statement that two ratios are equal is called a proportion. Complete the proportion below by comparing the ratio of branded horses to total horses captured for the whole population.

\[
\frac{\text{marked beads (in second captured group)}}{\text{total beads captured (in second captured group)}} = \frac{\text{marked beads (in the whole population)}}{\text{total beads (in the whole population)}}
\]

\[
\frac{?}{?} = \frac{?}{\text{population}}
\]

Notice that since the whole population is unknown, the word population is written in the appropriate place in one of the ratios.

5. Since the two ratios in the proportion are equal, you can think of them as equivalent fractions. But one denominator is unknown. What number must the numerator of the known fraction be multiplied by to give the numerator of the other fraction?

6. Use this number to estimate the total number of beads in the container.

7. Repeat parts 2-6 to find a second estimate of the bead population. Is the result similar to your first estimate?
Connect:

8. Suppose a similar procedure is used to find the number of horses in large grassland. Twenty horses are initially captured and branded. Then, they are released into the grassland. After a week, 80 horses are captured. Three are found to be branded. Write a proportion that models this situation.

9. Use your proportion from part 8 to estimate the population of horses in this area.

IR Notes to the Instructor

This activity is based on the Petersen method for estimating animal populations. C.G. J. Peterson was a Danish fisheries biologist who in 1896 first used mark-recapture protocols for such purposes.

- Any small identical objects can be used in place of beads, but the total number for each group should be large. White beans can be used, and then marked with a magic marker.
- Any kind of container that allows thorough mixing can be used, such as paper bags or plastic mild bottles.
- Instead of using a scoop, students can just grab a handful of beads. The number need not be consistent between the first and second sampling.
- Decimals can be used in parts 5 and 6. A calculator can also be used here without obscuring the mathematical development of solving a proportion.
- Three will not necessarily be close agreement between the two estimates in parts 6 and 7, variations of 20% being common. This variation does, however, provide an opportunity for a discussion of how this kind of estimate can be improved by repetition.
Appendix W

Information Handout for Students

For Your Information

My name is Patricia Garruto and I am a doctoral student at Montclair State University. I am currently conducting research on teaching techniques used in Basic Skills Mathematics and Algebra classrooms. I am here today to observe the particular math lessons being presented to the class in learning about ______________________. I am not collecting any data regarding the students in this classroom/math lab. My goal is to observe the methods and procedures used by the instructor to aid students in learning about _____________________. In gathering data of this nature, I hope to add to the existing research by learning what classroom/math lab techniques could be effective in the basic skills mathematics classrooms.

If you have any questions or concerns regarding my presence in the classroom, you may contact the Montclair State Institutional Review Board by phoning or emailing the IRB Chair, Debra Zellner (reviewboard@mail.montclair.edu 973-655-4327)