USE OF BEST PRACTICES IN DEVELOPMENTAL MATHEMATICS COURSES

By

AFSHEEN AKBAR

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OF THE UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT
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To my mom

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Afsheen Akbar

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Community colleges in the United States are responsible for providing access to educational opportunities for students across all academic and vocational levels. Due to this open access mission, these institutions accept students at all levels of educational preparation. One of the biggest issues the system of higher education is facing is extreme under-preparedness of students in the area of mathematics. This results in an influx of students in developmental mathematics courses. There are certain programs to enhance the developmental mathematics programs at community college level, some more successful than others. This study will assess the use of best or promising practices in developmental mathematics courses across the state of Florida. The findings of the study will support recommendations that can be used to help increase the success rate of students in Florida developmental mathematics courses.

CHAPTER 1
INTRODUCTION

In the United States' higher education system, one of the significant barriers that students face is in the area of mathematics. The under-preparedness of students in the area of mathematics is prevalent throughout the educational system and raises a major concern with respect to the developmental student. This problem is intensified for the students who begin their educational journey in need of remediation with an already low success rate in developmental mathematics. The current situation can be improved by employing more of the best or promising practices discussed in the literature.

Statement of the problem

Community colleges are an integral component of higher education in the United States. The focus of the general mission of the community college is access that is providing post-secondary educational opportunities to students across all academic and vocational levels. This focus has led community colleges across the nation to admit students at all levels of academic preparation. About one third of students entering the community college system are in need of remediation (Ley & Young, 1998), hence classifying them as developmental or remedial students. The goal of remediation is met if these students successfully complete prescribed courses, acquire the skills necessary for success in post-secondary courses and continue to complete their post-secondary education in the form of a degree or certificate program. Literature in the area of developmental studies reflects a high attrition rate for developmental students, especially in the area of mathematics (Hoyt, 1999).

Purpose of the study

The fulfillment of community colleges' open access mission sometimes challenges the balance between access and academic standards. Providing students, who are not ready for

college-level work, access to higher education through developmental education is paramount in support of the community college mission. This commitment to access and high academic standards require constant attention to maintain quality in the area of access and standards.

The purpose of this study is to investigate Florida community colleges' utilization of best practices in developmental mathematics courses. The study is divided into a review of instructional activities employed in developmental mathematics courses, program components, and organizational structures relevant to mathematics. For the purpose of this study the term community college and college will be used to refer to traditional community colleges and newly transformed four year colleges.

Florida community colleges that are employing the published best practices, the study will analyze the frequency of their use. On the other hand, for the community colleges that are not using best practices this study will examine the barriers they face in applying them. Finally, recommendations and suggestions will be provided that may be used to implement the best practices in developmental mathematics courses in Florida community colleges to increase the success rate for these students.

CHAPTER 2
LITERATURE REVIEW

This chapter will review the current literature in the area of developmental education. This review is specifically geared towards analyzing students in developmental mathematics and factors influencing their success.

Developmental Education

The United States Department of Education (USDOE) defines developmental education as "curriculum and services for entering postsecondary students who are not academically prepared to perform college-level work (USDOE, 2006, p 1)." The National Association of Developmental Education (NADE) describes developmental education as "a field of practice and research with a theoretical foundation in developmental psychology and learning theory, that promotes the cognitive and affective growth of all learners, at all levels of the learning continuum (Casazza, 1999, p 9)." Participants of developmental education include recent high school graduates, non-traditional students that are 25 years of age or older, and students who are returning to higher education after being in the work force. The fundamental purpose of developmental education is to help these under-prepared students, as reflective by their entry level test scores, acquire the requisite skills necessary for success in the college-level courses.

History of Developmental Education : Historically, higher education in the United States has provided some level of assistance for under-prepared students. Along with granting post-secondary degrees and certificates, remediation has also been a function of colleges since early colonial days, beginning with Harvard (Casazza, 1999). About one-third of students entering the community college system are not prepared for college-level work. It becomes crucial, in such a case, to not only help these students achieve the necessary skills required for their program of study but also to teach them to be lifelong learners by providing them assistance

through developmental courses. Teaching students to be lifelong learners is an important goal of higher education (Pintrich, McKeachie & Lin, 1987).

Educators at Harvard recognized the need for remediation especially in the area of writing, which gave birth to the concept of remedial or developmental courses (Casazza, 1999). Developmental education is a holistic development of the student and is based on developmental psychology; whereas the commonly used term remedial course applies exclusively to courses considered to be pre-college-level (Boylan, Bonham & White, 1999). Developmental education considers factors such as social and emotional development in addition to students' intellectual development.

A structured developmental education program includes courses to teach reading, writing and mathematics. These courses are referred to as developmental or preparatory courses. The advantage of having a structured course versus individual remediation is that it allows for an opportunity to cover a large amount of information and to disseminate it to a large population of students at one time. Along with these courses it is very important, for the success of these students, to have some other forms of learning assistance available. This learning assistance can be provided in the form of learning labs and tutoring services provided by trained tutors. Also included in structured developmental programs is special advising for students starting in developmental courses.

Boylan and Saxon (1999) compiled 30 years of research in the area of developmental education with a goal of presenting the best practices in the field. Major aspects of successful developmental educational programs that came about from this compilation of research are as follows:

- establishment of specified developmental program goals

- mastery learning techniques
- more structure in developmental courses
- application of sound cognitive theory in the design and delivery of remedial course
- centralized or highly coordinated developmental program
- use of formative evaluation to guide program development
- mandatory assessment and placement
- specific advising
- tutoring performed by well trained tutors
- integration of classroom and laboratory activities
- institution wide commitment to remediation
- assurance of consistency between exit standards for developmental courses and entry or college-level curriculum
- use of learning communities and supplemental instructions
- workshops on strategic thinking and ongoing student orientation courses
- provision of staff training and professional development and integration of critical thinking into the developmental curriculum

Developmental Education in Florida

The Office of Program Policy Analysis & Government Accountability (OPPAGA), an office of the Florida Legislature, wrote a report, *Half of College Students Needing Remediation Drop Out: Remediation Completers Do Almost as Well as Other Students,* that indicates that the purpose of developmental or college prep programs is to "assure that students who do not qualify for placement into college-level courses have an opportunity to bring their academic skills to the appropriate level and proceed in the higher education system (May 2007, p1)." Florida law permits all of its 28 community colleges and one university, Florida Agricultural and Mechanical University (FAMU), to offer developmental courses. "All entering community college students

who are seeking a degree and FAMU students who score below the acceptable levels on the SAT or ACT are given the Florida College Entry Level Placement Test (CPT). This state-adopted test has cut-off scores that determine if students need to take college preparatory courses in reading, writing and mathematics before beginning their associate in arts or associate in science programs (Armstrong, 2005, p1)." According to the report *Developmental Education in Florida Community Colleges* as of June 30th, 1997 all Florida community colleges are required to administer the Florida College Entry-Level Placement Test and follow the current minimum cut-off scores set by the state regulations for students' placement in developmental courses (Armstrong, 2005).

A review of Florida's first time in college students (FTIC) conducted starting in the Fall of 2000 with the new cohort starting in academic year 2000-2001 showed that 65.63% of these students tested into at least one area of remediation the first time they took an entry level test (ELT), thus classifying them as developmental students (Armstrong, 2005). Further studies conducted by OPPAGA reflect that only about 52% of this specific cohort completed the college preparatory requirement by the end of 2004-05, which is reflective of the high attrition rate in developmental courses in Florida.

The May 2007 OPPAGA report further states that the result of a study conducted in Florida demonstrating that about 55% of freshman entering the Florida public higher education system started in developmental classes during the school year 2003-04. Eighty nine percent of these developmental students needed at least one preparatory course in the area of mathematics (OPPAGA, 2007). Statistics from the report also reveals that "over half of the students who successfully completed remediation requirements subsequently stayed in school (p 4)." Considering the students who were not successful in completing the remediation within the two

years of initial enrollment, only 15% of those remained enrolled at the end of two years (p 4). These alarming statistics attest to the importance of program components that positively affect retention and help increase the completion rate of developmental courses. Community colleges offering developmental courses should apply a range of strategies and offer support services to increase its effectiveness. Published best practices could be used as a guideline in support of the developmental programs.

In the state of Florida, community colleges typically grant a two-year transferrable degree, the Associate in Arts (AA) degree or the Associate in Science (AS) and certificates. Students are allowed to transfer to one of the universities in the state university system with the AA degree to complete the upper division course-work and acquire a Bachelors degree. Armstrong (2005) in his policy paper explains that Florida is 46th out of 50 in the nation in producing Bachelor degrees. Some of the high needs areas that were pointed out by the policy paper where the state of Florida is experiencing a critical shortage of producing Bachelor degrees are education, health care and information technology. Due to this shortage of Bachelors degrees the state of Florida legislators had to consider an option of allowing selective community colleges to offer Bachelor degrees also. "The Florida State Board of Education approved a new Baccalaureate Proposal Approval Process for Community Colleges on August 16, 2005 (Florida Department of Education, 2005)." Under this approval, the House Bill 1007.33, F.S. allowed community colleges to a develop proposals to offer Bachelors degrees in the high needs area. "A community college may enter a formal agreement pursuant to the provisions of s. 1007.22 for the delivery of specified baccalaureate degree programs (Holcombe, 2008, p 22)." Under this bill some of the community colleges switched to Bachelor granting institution while, they continue to offer the two years associate degrees and certificate programs. This change also came with a name change

for these institutions. Some of these community colleges are now being referred to as colleges or state colleges. For example the name for “Broward Community College” has changed to “Broward College” and “Daytona Community College” is now being called “Daytona State College”.

Developmental Mathematics

Developmental mathematics consists of the requisite mathematical skills necessary to successfully complete mathematics at the college-level. Based on the NADE’s definition of developmental mathematics, the three major purposes of developmental mathematics are to: remediate students’ deficiencies in mathematical skills, strengthen students’ general learning skills that can be used in areas other than mathematics prior to enrolling in college courses, and to serve as a gatekeeper mechanism .This gatekeeper mechanism is the purpose of developmental courses through which higher education system separate students, based on their academic skills, who do not qualify for further study in academic track and will be better served in a vocational track (Armington, 2002). According to the University of Chicago’s developmental mathematics program, one of the goals of developmental mathematics is to enhance the students’ mathematics background and abilities to help them become independent learners in the area of mathematics (University of Chicago, 2006).

Most developmental students face more difficulty in the area of mathematics compared to reading or writing (Boylan & Saxon, 1999). This is affirmed by research indicating the completion rates of developmental mathematics courses at community colleges to be 74% as compared to 77% for reading and 79% in writing. The National Center of Education Statistics (NCES) confirms that the highest dropout rate is in remedial mathematics courses, where the dropout rate for remedial courses for all institution, for all courses was shown to be at 25% (Boylan & Saxon, 1999). The majority of developmental students have deficiencies in the area of

mathematics not only because of academic inability but also due to improper affective and cognitive skills.

The Developmental Education in Florida Community Colleges report states "that 55% of students are not passing the entry level test in the area of mathematics and are therefore starting with remediation in this area. Out of these students who tested into developmental mathematics and did enroll in developmental mathematics courses, the passing rate was only 53.10% (Armstrong, 2005, p 4)". Some of the developmental mathematics courses that are offered at Florida community colleges are MAT0002 or MAT0012 (Pre Algebra), MAT0020 (Integrated Pre-Algebra and Elementary Algebra), and MAT0024 (Elementary Algebra). The course numbers vary slightly among different community colleges.

Best Practices in Developmental Education

With reference to the field of developmental education Boylan, in his book, "*What Works: Research Based Best Practices in Developmental Education*", explains best practices to "refer to organizational, administrative, instructional, counseling, advising, and tutoring activities engaged in by highly successful developmental programs. These practices are typically validated by the research and the literature in developmental education (Boylan, 2002, p 3)." These best practices could be applicable to the overall organization and structure of any developmental program. Best practices in certain cases could include general practices from courses that are not necessarily confirmed by any scientific methods. Arendale (2005) explains best practices to be as follows:

> Best practices are referred to as policies, principles, standards, guidelines, and procedures that contribute to the highest, most resource-effective improved student outcomes…. Best practices in developmental education and learning assistance are consistent with current student retention theories, professional, standards, contemporary learning theories, and successful replicated implementation with student outcomes that survive rigorous evaluation (p1).

There is a growing body of literature that provides practices that can be employed into any developmental program. However, most of this research pertains to specific intervention methodologies. Boylan (2002) refers to the services, background research and actions that any developmental program can utilize to adopt these best practices. Most of the published best or promising practices are applicable generally to the overall developmental program instead of specifically to the area of mathematics (Schwartz & Jenkins, 2007).

Best practices in the area of mathematics also stems from these general best practices. The programmatic consideration such as centralization of services, mandatory assessment and placement, counseling are consistent but the specific practices that relate to mathematics courses differ. In "Best Practices in Developmental Mathematics", Armington (2003) compiled best practices that were shared by twenty-seven different colleges and universities. Some of the common themes that emerged from the successful developmental mathematics programs were: participatory classroom environment, mastery learning and frequent evaluation in developmental mathematics courses, student centered learning environment, formal training for instructors and a community of developmental mathematics instructors (Armington, 2003). This study will do a general analysis of a list of promising practices that could be particularly applicable to developmental mathematics courses.

In order to increase the success rate of the developmental mathematics courses in Florida, community colleges are sharing the new best practices at the state level and participating in programs as "Achieving The Dream". In addition to participating in these programs to increase the success rate of developmental students, any developmental mathematics instructor could make use of the published best practices. These best practices have emerged from about 30 years of research and practice.

A study conducted by Exxon to assess the efficacy of developmental education, Boylan, Bliss and Bonham (1997) focused on certain aspects of developmental programs. The results of this study reinforced the ideas of "centralization of services, mandatory assessment and placement, tutoring and tutor training, faculty and staff development, advising and counseling, and program evaluation to contribute to the success of the [developmental] program (p 8)."

Characteristics of Developmental Student

Students who enter developmental education are usually under-prepared for the college-level work, as assessed by either a state mandated or local standardized test. These students typically fall in the lower quartile of the distribution for these assessments. Most of these students attend college with the intention of obtaining a Bachelors or an Associate degree. According to Boylan and others a majority of these students are Caucasian, and one-third of them are minority, comprised mainly of African American and Hispanic students (1999). Slightly more than half of these students are female, and the ages of these students range from 16 to 60 with one-third being younger than 25 years of age. According to the same study, developmental students usually have made poor academic decisions in the past. In some cases they attend college without any clear objectives or goals in mind. The following are the seven major characteristics of developmental students: poor choosers, adult students, disabled students, neglected students, limited English proficiency students, students without clear educational objectives, and students in extreme cases. Students who are extreme cases have severe emotional, psychological or social problems that have prevented them from being academically successful (Boylan et al., 1999).

Developmental Mathematics Students

Developmental mathematics students are the students in need of remediation at least in the area of mathematics. These students in some cases already have college-level skills in the area of

reading and writing. Based on the structure of the developmental programs, if students only need remediation in the area of mathematics they are sometimes allowed to take their college-level course work as long as the course work does not require college-level mathematics skills.

Based on the information from the Fast Facts of Student Success, the completion rate of developmental mathematics in Florida ranges from 14% to 78 % (Blomberg & Armstrong, 2007). This is indicative of the high rate of failure in the developmental mathematics courses. According to Hackworth, who has been an active force for innovation in developmental education, ultimately only 12.5% of students entering developmental mathematics in Florida are passing it. Hackworth explained that "Florida is now losing 6 of every 7 students who register needing at least one developmental math course (as cited in Miles, 2000, p 2)." Furthermore, the passing rate for an individual developmental course is 50%. For many of these students who have to take three levels of developmental mathematics, the success rate decreases significantly to only 12.5% . Such a drastic failure rate is a cause of concern especially when OPPAGA study revealed that only 15% students who have not completed their institutional developmental requirements within two years maintained enrolled. Only 1% of such students earned a certificate (May 2007).

According to the program review conducted by the Florida Department of Education (FLDOE) "for student enrolling in required college preparatory courses following testing the lowest academic success rate is in math, with 53.10% passing the highest level of math within two years of taking ELT (Armstrong, 2005, p 12)." Another pattern presented from the study shows that the highest number of students failing the math entry level tests. Some of the recommendations made by the OPPAGA report that studied students' remediation needs suggested that developmental programs to have clear and specific outcomes and performance

expectations; effective communications among administrators; adequate training for faculty and staff working with developmental students; adequate advising for these students; more than one delivery method in developmental courses; and availability of sufficient support including skills leaning courses to improve the success rate (2007). According to FLDOE "the percentage of awards earned is lower when math is an area of need, either singly or with other course areas (2005, p 12)." This shows that developmental mathematics is a pivotal course in determining students' success in college.

The study conducted by Smith, O'Hear, Baden, Hayden and Gorlamn (1996) was an attempt to define the behavioral characteristics that relate to the success of developmental mathematics students. In this ethnographic study, the researchers observed 218 developmental mathematics students in-depth for patterns relating to their success. Some of the factors playing a negative role in students' success were low attendance, low engagement in class, and incorrect perception of success. The recommendations that came forth from this study in order to improve the success rate were the adoption of attendance policies in developmental mathematics courses, adoption of teaching strategies that encourage interaction with the instructor and other students, smaller class size, having a classroom only big enough to accommodate all the students and starting on developmental mathematics in the second semester of enrollment if possible.

Impeccable

Boylan and Saxon write in "Affirmation and discovery: Learning from successful community college developmental programs in Texas" about the study that was conducted in Texas during spring of 1996 by the National Center for Developmental Education (NCDE) and the Texas Higher Education Coordinating Board (THECB). This study concentrated on the use of best practices and its effectiveness. This study not only addresses the value of the use of the

best practices but also the importance that is placed on developmental education as a part of the college's mission. The results of the study claim the following:

> …that quality developmental education results from an institutional culture that values developmental education and considers it a priority. It is possible that, if this culture does not exist, any number of best practices might be implemented without obtaining significant improvement in developmental education. Where the use of best practices is combined with a culture that values developmental education, however, excellent developmental education is likely to result (Boylan & Saxon, 2006, p14).

To understand the role of community colleges in the area of developmental education and the success of the developmental student, the American Association of Community Colleges (AACC) conducted a study in 1998. This study carried out a survey that was designed to provide national data on the policies and practices concerning remedial education in community colleges. Shults (n.d) discusses this study in the article "Remedial Education: Practices and Policies in Community Colleges." It shows that the majority of the institutions indicated policies on mandatory assessment, credit bearing remedial courses, and showed that institutional practices are consistent with suggestions from research studies examining remedial education. Even with that being the case, the failure rate in the developmental mathematics courses is still alarmingly high. The current literature on developmental mathematics presents a gap as to what can be done to increase the success rate in the developmental mathematics courses.

Some of the literature reflects the positive impact of interventional studies that includes study skills. Based on one study conducted by Seon and King (1997) at Prince George Community College, 50% of the students in developmental mathematics were not successfully completing the course. In order to increase the success rate, a two-prong intervention program was initiated. Under the intervention program each developmental mathematics instructor was paired with a counselor to devise success strategies. Secondly, students participated in a series of workshops to learn the study skills strategies in conjunction with the mathematics class. This

intervention program resulted in a significantly higher success rate in the target developmental mathematics classes. “While developmental educators often acknowledge that developmental learners lack the skills to be successful in college, there is little concrete evidence that explains why developmental students have failed to learn the required skills (Ley & Young, 1998, p 46).” Moreover, Pape and Smith (2002) also affirms that teaching students learning strategies or skills on how to learn can have a positive effect on the developmental student’s performance.

The importance of learning skills strategies or study skills cannot be underestimated. One such study was conducted by the Center for Research on Learning and Teaching at the University of Michigan (Pintrich et al,. 1987) with the goal of teaching students conditional knowledge in addition to the declarative and procedural knowledge about study strategies. *Declarative knowledge* is the awareness of the availability of the strategies, and *procedural knowledge* is the knowledge of how to apply it (Pintrich et al., 1987). This study was designed for a freshman psychology course but the methodology could also be applied to developmental mathematics students. One of the major selection criteria for high risk students involved in this study was the scores on a standardized test, as is the case for the developmental student and corresponding ELT. The lecture part of the course introduced the students to the study techniques and how to use them. The lab section allowed students with an opportunity to actually apply the knowledge of these learning strategies which contributed to the conditional knowledge. Some of the major topics covered in the course were learning from reading, discussion, peers, cognitive models of memory and memory strategies, problem solving and creativity, writing , self and time management, motivation and anxiety, and test taking strategies. The findings of the study showed that explicitly teaching students the learning skills with a specific context has a

higher impact. The success of this program shows that this methodology could be employed on a more global level to other subject areas as well.

This literature illustrates the low success rate in developmental mathematics courses specifically for Florida. To provide recommendation for improving the success rate a study was conducted that will be discuss in the later chapter.

CHAPTER 3
METHODOLOGY

The study will examine Florida community colleges' utilization of best practices in developmental mathematics courses and will recommend strategies to be implemented for increasing the success rate for these courses. Since the current literature in the area of developmental mathematics does not focus heavily on programmatic and classroom use of best practices that could be used to improve the student success rate, an empirical approach has been taken to investigate this phenomenon. Some of the questions this study will investigate are how many colleges are using the best practice in the mathematics courses and what the outcomes are. Additionally, for the colleges that are not using the best practices the survey will consider the barriers for the lack of use. Consequentially, the study will provide recommendations on implementing any new best or promising practices to increase the success rate in the developmental mathematics courses.

Participants

The participants for the survey were either the coordinator or person in-charge of the developmental mathematics program of each of the community colleges and newly created colleges as described in chapter 2. The reason for choosing the individual in that position as the participant was because they would be involved in policy making and/or adjusting for developmental mathematics courses and also would be knowledgeable about the departmental syllabus and tests, if applicable. Some colleges do not have one person in charge or a coordinator for developmental mathematics. For these institutions, the responsibilities are often shared among different instructors. In case of such institutions it was decided to send the survey either to the lead instructor or group of instructors. On the other hand, some colleges with multiple campuses have a separate individual responsible for developmental mathematics program for

each campus. Thus, for a few colleges the list of participants included more than one recipient. These recipients either hold administrative or teaching responsibilities or a combination of both.

Emails were sent out mid September 2008 to determine the appropriate person that will complete the research survey for each of the 28 Florida community colleges. Only community colleges were included in the study to be consistent among the participants. Based on the communication that was received from the colleges, the recipient list was finalized by February of 2009 that included 24 confirmed participants.

Instrument

The primary tool used for this research was an anonymous survey, the creation of which began during the fall of 2008. The three major categories under which the survey questions grouped were teaching, learning and assessment, in addition to the demographic section. A through literature review of best and promising practices for developmental courses was consulted in order to create the survey. The survey was evolved using theoretical inputs from previous literature in the area such as: *What works: Research-Based Best Practices in Developmental Education* (Boylan, 2002), "Promising Practices for Community College Developmental Education" (Schwartz & Jenkins, 2007), First and second edition of "Best Practice in Developmental Mathematics" (NADE Mathematics Special Professional Interest Network, 2002, & 2003).

The survey contained both quantitative and qualitative items. The survey was designed to gather quantitative information with regards to the use of most widely published best practices in developmental mathematics courses in each of the Florida community college. The frequency of the use was analyzed with percentages. Some general information about each college's developmental program was also collected to gain a background understanding. Qualitative methods of inquiry were utilized to account for the differences relevant to the various uses of

best practices. This data was categorized based on the similarities and the differences in the answers and, when applicable, was compared to what the expected answer based on literature review would have been. This was helpful in identifying trends for reasoning about the best practices that were not being used by Florida community colleges and also for the new recommendations that were provided by the recipients.

The research survey which comprised of 44 items was uploaded to www.zoomerang.com to make the survey easy to access and user friendly. The online survey was time efficient because it did not require sending the survey in mail. It would have taken a longer time for the recipients to receive the survey and to mail it back after completion. Some of the survey questions branched to different sections of the survey based on the recipients' response. Creating the survey in zoomerang eased this conditional linking process and recipients only saw questions that were relevant to them.

Once the survey was created, it was piloted with ten people during February 2009. This group comprised of developmental mathematics instructors, graduate students in mathematics education program and one developmental mathematics coordinator. Eight of these respondents provided feedback towards the end of February 2009 which was helpful in making some necessary changes to the survey. Some of the major changes were to make the survey more quantitative and some verbal changes to make statements clearer. The order of some of the statements was also changed.

Before the initiation of research, permission was obtained from Institutional Review Board (IRB) at the University of Florida. This was completed during the time the recipient list was being finalized. The IRB protocol was submitted along with the copy of the survey and the

consent form during late February 2009. The IRB protocol was approved by the IRB board on March 17th, 2009 to conduct the proposed research survey with the list of proposed participants.

To analyze the use of best practices in Florida community colleges this survey was created, tested and conducted. The results of the survey are analyzed in the next chapter.

CHAPTER 4
DATA ANALYSIS

To prepare for the survey during fall 2008, emails were sent out to the prospective recipients of the research survey in order to obtain their permission. This process included finding the correct person to complete the survey. The email which served as an invitation to participants had a brief description of the purpose of the study, the approximate time that will be required to complete the survey and the intended use of the results. The permission process was completed by middle of spring 2009 semester. The survey was sent out to 24 participants among the 28 Florida community colleges starting from April 1st, 2009. There were 19 responses that were received by May 19th, 2009 deadline, constituting of a 79% response rate. This allowed the participant a month and a half to complete the survey. The quantitative data was analyzed by using percentages for frequency of their occurrence. The qualitative data from this anonymous survey was used to show the trends in the use of published best practices for developmental mathematics courses. This was useful in the creation of new categories that can be studied further. Even though efforts were made to minimize the bias in the data, since the data is self reported, it lends itself to some bias based on the participants understanding of the survey questions.

Demographics

Forty two percent of the individuals completing the survey were instructors including full-time and adjunct instructors, 26% were supervisors and 21% were administrators. The time frame for the participants' current role ranges from one year to 35 years. Moreover, in any institution policies regarding developmental mathematics were not made single handedly. Consult the table 4-1 for roles in policy making. Most individuals surveyed made policies in

cooperation with other professor(s) or have a minor role in either making or adjusting the policy, except for two participants, who were the main policy makers.

Assessment

All colleges include a mandatory assessment for initial placement purposes. Commercial tests such as Accuplacer, are used by 89% of the colleges, where as the remaining 11% used locally-developed tests. Of the two colleges that uses local tests, one develops their own and other uses a locally developed test.

Advisement

Out of 19 respondents only, 4 (21%) has special advising for developmental students. The rest of the colleges do not have special advising for developmental students.

Testing

The most widely used testing techniques for developmental mathematics courses among the participating colleges were free responses (42%), multiple choice questions (MCQ's) (37%) and one college also used fill in the blanks. As apparent from Table 4-2, none of the participants use explaining the answer or matching the answer. Most of the respondents indicate that their students take at least 4 to 5 tests during the semester and 95% of the participating colleges have Florida State Exit Exam (SEE) as a part of the highest level of developmental mathematics course. Half of the participating colleges have a SEE passing rate passing rate between 51 and 75%, and 36% (7) schools had a passing rate between 76% and100%. However, one college has a passing rate below 50%. Consult the table 4-3 for the SEE passing rates.

Class structure

Sixty eight percent or 13 of the participants indicated that their college has a separate developmental mathematics department. One college is currently in the process of creating an

open entry/open exit developmental mathematics course while the remaining 18 colleges do not have open entry developmental mathematics courses.

Regulations for mandatory attendance for developmental mathematics courses are instituted by 84% of the colleges and 63% of the participating colleges use attendance as part of the final grade to emphasize its importance. There was a mix of responses as to at whose discretion attendance policies are designed ranging strictly from instructor's or department's discretion to some combination of the two.

To maintain the uniformity of class structure for developmental mathematics classes, 74% of the participating colleges follow a departmental designed syllabus, 32% have departmental tests/exams and 58% follow the same grading breakdown between all the developmental mathematics classes. Twenty one percent of the respondents signified that their college uses a departmental final but in-class tests/exam are instructor developed. In regards to the structure of the developmental mathematics class, 63% of the participants indicated that tests and exams are instructor-developed and 42% have instructor-developed syllabus. Some of the barriers towards implementation of uniform class structure among developmental mathematics courses based on the survey were as follows: following the same timeline, agreeing to the importance of uniform structure, difficulty training the new and adjunct faculty to the contribution of the departmental final and different modalities of instructions. Aside from traditional teaching, some of the major techniques used in the courses are: learning through visual stimuli, classroom discussion, and use of computer.

Fifty three percent of the participating colleges required developmental mathematics students to work in a lab in addition to scheduled class time. These lab hours consist of working with different software(s), working in the lab with practice material or obtaining help on an as

needed basis. Only one college requires students to work in groups. Sixty eight percent of the colleges have the curriculum of developmental mathematics highly aligned with the topics covered in SEE, and 32% have it somewhat aligned.

Responses from the survey showed that 84% of the instructors are not mandated to relate the mathematics concepts learned in the class to real-world through simulations and/or hands on learning. Some of the barriers towards implementing the hands-on method included time constraints, training for such implementation, cost associated with manipulative and convincing all instructors of the effectiveness of this method over traditional lecture method.

Developmental Mathematics Instructors

Among participating colleges, 47% have 51%-75% of developmental mathematics courses taught by adjunct faculty, 37% have less than 50% courses taught by adjuncts and about 3% of colleges have in excess to 76 % of courses being taught by adjunct faculty. *Adjuncts* are the teachers or professors that are employed by the college on a part-time basis. They also meet the basic educational requirements as full time professors. Different professional developmental opportunities that are in use for full-time and adjunct instructors at participating colleges are:

- webinars
- workshop/conferences
- American Mathematical Association of Two-Year College (AMATYC) or Florida Developmental Education Association (FDEA) conference
- availability of funds for graduate courses
- training in cooperative learning
- use of learning communities

- strategies for hybrid/online pedagogy
- availability of the repository of best practices in *ANGEL*, online learning management system

Twenty one percent of the participating colleges have these opportunities available only for full-time instructor, but the remaining 79% have it available for adjunct instructors also. Some of the challenges due to which these opportunities are not available to adjunct instructors are related to budgetary situation and scheduling conflicts.

Interventions

Supplemental instruction (SI) or video supplemental instruction is implemented by 79% of colleges. For the remaining colleges some of the barriers to implementing SI are funding and the maintenance of consistency and training of adjunct. Learning communities are offered by 63% of the participating colleges and 58% of these college have mathematics as part of the learning community. Learning skills strategies are a part of developmental mathematics courses for 63% of the participating colleges; the remaining colleges either require or recommend the students to take a separate learning skills strategies course. For most of participating colleges that offers the learning skills strategies courses, they allow any student to enroll in these courses. However 57% of the colleges recommend it highly for students who are placed in two or more developmental courses.

Program Evaluation

Thirty seven percent of the participating colleges have a yearly developmental program evaluation in place, 16% have it bi-annually; and others perform the evaluation at different intervals ranging from ongoing evaluation to every 10 years. One of the responding colleges did not have any evaluation process in place.

Best Practices

A list of the selected best practices presented by the participants is as follows:

- "Students must maintain a portfolio which helps them to acquire the organizational skills they need for higher level math classes. Supplemental Instruction also plays an important role because it helps students to form study groups."

- "Our QEP will be implemented this fall. We are focused on math education. We will be implementing effective questions (dialectics) to have students build their metacognitive skills."

- "Learning communities for developmental math students and supplemental instruction."

- " Students who make a "D" on their first test are referred to an advisor in the Academic Center for Excellence. There they receive advice for improvement like study skills and tutoring."

- "We are conducting an early alert and advising program for first time, first generation students."

- "Using a think-out-loud method to talk students through the strategy of working a particular problem."

- "Perhaps a few best practices include the lab-assisted approach to developmental math; the learning community involving MAT 0024 and SLS 1932; and a one-credit remediation option for students who have failed their first attempt at MAT 0024. In this model, which is taught as SLS 1931 (a one-topic variable Student Life Skills course), students take an intensive, four-week course in which they endeavor to remediate key concepts as they receive instruction in effective math study skills. The students have also benefited from having a Master Student who serves as an SI leader in the course. Lastly, the Master Student Program, based on the SI model, has proven to be helpful in the developmental math program."

Table 4-1. Role in Policy Making

What role do you play in making/adjusting the policies regarding developmental mathematics classes at your college?		
I am the main policy-maker for developmental mathematics at my institution	2	10%
I make policies for developmental mathematics at my institution along with few other professors	11	55%
I do not make policy, but have a major role in policy adjustment for developmental mathematics	3	15%
I have a minor role in making policy for developmental mathematics	1	5%
I have a minor role in adjusting policy for developmental	2	10%
Other	1	5%
Total	20	100%

Table 4-2. Assessment Techniques

What is the most widely used assessment technique in developmental mathematics courses at your college?		
Multiple choice questions	7	37%
Fill in the blanks question	1	5%
Free response	8	42%
Matching the correct answer	0	0%
Explaining the answer	0	0%
Other	7	16%
Total	1	100%

Table 4-3. SEE results

What is the approximate percentage of students who pass the Florida State Exit Exam in mathematics courses at your college?(This could be either passing it in first or second attempt)?		
0%-25%	0	0%
26%-50%	1	6%
51%-75%	9	50%
76%-100%	6	33%
Please explain any exceptions	2	11%
Total	18	100%

CHAPTER 5
DISCUSSION AND CONCLUSION

This section includes the discussion of the obtained data from the survey. The answers for the quantitative data is analyzed with percentages and discussed in context to the literature review. For the qualitative data new trends from the survey are discussed here.

The majority of the individuals completing the survey were mainly instructors which reflect that the developmental coordinators also have teaching responsibilities. Table 5-1 shows that if there is a single position responsible for making developmental mathematics policies at the institution, they are either administrator or supervisor, which is apparent of a highly centralized model. In other cases the teachers, administrators and the supervisor work together to either adjust or create policies regarding developmental mathematics. This presents an avenue for everyone's input and allows a multiple perspective, in policy creation, especially from the instructors who are directly involved in teaching these students.

All colleges include a mandatory assessment which is aligned with the recommendations from the literature. Research also shows that the mandatory assessment is more effective when combined with mandatory placement (Gerlaugh, Thompson, Boylan, Davis & Hildreth, 2007; Schwartz & Jenkins, 2007). This was expected as assessment is mandated by state of Florida law and student placement is also based on the state mandated cut-off scores (Armstrong, 2005).

Among the different testing techniques none of the participants use explaining the answer, however, that is deemed to be one of the good best practices. This technique reinforces the idea that a student learns by explaining their thinking so they can have more control over their own learning. MCQ is the main testing technique used for State Exit Exam (SEE) and was one of the widely used techniques by the participating colleges during the semester. Also the higher frequency of test (having more tests) is recommended in the literature for the developmental

student (Armington, 2002; Schwartz & Jenkins, 2007). In a study conducted in Texas about the developmental mathematics courses Boylan and Saxon (2006) found that frequent testing was connected to higher passing rates on Texas Academic Skills Program (TASP) test. It is important to keep in mind that frequent testing could also include "any activity that requires students to demonstrate their skills and knowledge according to some standard" and it does not have to be an actual test (Boylan, 2002). Therefore, the colleges might be testing students more than they reported in the survey responses.

A centralized or highly coordinated program is recommended in literature by Schwartz and Jenkins (2007) and more than half of the colleges followed such a model. As recommended in the literature, for successful implementation of developmental programs, developmental programs should provide as much structure for the student in the form of regular classes with a specific deadline of enrollment. This is in conjunction to Hoyt's (1999) suggestion which is to abolish late registration. Allowing late registration in the developmental course sends a message that it is possible to register late in the developmental courses and be successful. However, one of the participating colleges implemented an open entry/open exit model for developmental mathematics courses, which is more helpful in allowing students time to learn at their own pace. Such a structure would also be able to provide an opportunity for mastery learning versus performance learning.

At participating colleges the level of coordination among the instructors for developmental mathematics is not as high as is recommended by the literature. With majority of the colleges following a decentralized model for developmental education this was expected to be the result. Not having this recommended coordination among the instructors and administrators working with developmental students leads to lack of the needed structure for

these students. A common theme visible in reasons as to why it is not possible to follow a more central approach is the lack of coordination among campuses. With some community colleges having more than one campus in general it is hard to coordinate among them and specifically to use the same class structure. A recommendation made by a participant to deal with this issue is the creation of college-wide developmental studies council and discipline-specific council in math, reading and writing. Some of the reasons that were provided as to why it is not possible to follow a departmental syllabus or have departmental exams are: the lack of contribution from the adjunct professors for the departmental tests and following the same class calendar. This issue could be overcome if adjunct professors are either compensated on an hourly basis or rewarded in other ways for their contributions outside the classroom. The program can allow the instructors to have flexibility to tailor the calendar to specific needs for their courses while keeping the major deadlines aligned with the department.

In the area of teaching methodologies one of the highly recommended best practices that is not being widely used is journaling and/or writing in mathematics. Armington (2002) explains that journaling in math could be either planned or spontaneous. The goal of the mathematics journaling is for the students to explain their reasoning and steps of the concept and the process that is learned. It can also be used to record students' thoughts and personal experiences about mathematics (p 19). This method reinforces the concepts that one learned and helps student internalize this learning process. Aside from that the combination of different teaching techniques used in the participating classroom creates a healthy variety in order to attend to the needs of different kinds of learners. Taking into account the qualitative data from the survey, most of the colleges are using some combination of use of technology with feedback, class discussion and group activities. This combination of different techniques provides some

structured learning with open discussion to allow students to learn from other's perspective as well.

In a developmental mathematics course in Florida the ultimate measure of success is passing the Florida State Exit Exam, as this is what dictates whether the student is ready to move on to a college-level mathematics course. Even with a high number of participating colleges having the developmental mathematics curriculum highly aligned to the topics from SEE, it is not indicative of the fact that these courses are only teaching the material students will be tested in SEE (Table 5-2). Further in-depth research can be conducted on the curriculum or course to see if these developmental mathematics courses are preparing the students fully or only teaching the material similar to what will be tested on SEE. Half of the participating colleges reported a SEE passing rate in between 51 and 75% . This result is in contradiction with the data disseminated from state of Florida Department of Education on the SEE pass rate. According to the data presented based on a study conducted by state of Florida, the average passing rate for SEE in the area of mathematics is between 43 and 48% (Office of Educational Effectiveness and Research, 2000, p 2). Reviewing the passing rate for SEE with reference to racial grouping, the pass rate is lower for minorities, such as African American, in comparison to their Caucasian counterparts. This disparity in the data could have resulted from the fact that the colleges that participated have a higher passing rate or simply once averaged the passing rate of the colleges in the sample will be closer to reported percentages from state of Florida study.

With the current economic situation it was expected to have a high number of adjuncts professors teaching the developmental mathematics and the survey revealed that. Based on the reported data with such a high percentage of developmental mathematics courses being taught by adjunct instructors (41% of participating colleges have 51-75%), it is more than necessary to

have professional developmental opportunities available for them. Having professional developmental opportunities available for adjuncts illustrates that this practice is in line with what is recommended by previous studies and promising practices considering the trends in the professional developmental opportunities most of them are for attendance to conferences or webinars, workshops for teaching methodologies and different assessment techniques. While professional development opportunities are helpful, Armington (2003) also recommends an informal forum for developmental mathematics instructors to provide for open communication, sense of community building and to demonstrate and share lesson. This was not presented to be the case by any of the participants.

Learning skills or study skills strategies are deemed to be an important contribution to the success of developmental students. Schwartz and Jenkins (2007) state that the courses in study skills strategies "includes guidance on taking notes, group and self study, test taking, time management, and successful education and personal habits (p 10)." These strategies are a part of developmental mathematics courses for 63% of the participating colleges which is in line with the recommended practices. Twenty six percent of the total participants require developmental students to enroll in a separate study skills course. These are mainly the colleges that do not have study skills as a part of the developmental mathematics curriculum. Learning skills taught in isolation might not have the same effect as when they are taught within the context of course material. If the college is offering the study skills as a separate course, it should still have a lab component requiring the students to apply the learned strategies to a specific course. This technique is in practice by some colleges. For the colleges offering the learning skills strategies courses, most allowed anyone to enroll which is recommended in current literature, however current literature does not provide a mandate on what students should take study skills classes

(Schwartz & Jenkins, 2007). For the colleges where it is mandatory to enroll in a study skills strategies the main selection criteria used is testing into two or more developmental classes. According to Zeidenberg, Jenkins and Calcagno (2007) students taking a stand alone study skills course along with the developmental courses still have a higher probability of completion in comparison to those enrolling only in developmental courses.

Research emphasizes the importance of continuous program evaluation for the betterment of developmental education. It is also linked to higher success rate for developmental students (Smittle, 2003). It is unfortunate that more than half of the colleges are not following this recommendations from the best practices, except for two participating colleges. Other Florida colleges have evaluation process either every five or ten years. This presents an area of improvement for community colleges in Florida. Colleges could be evaluating their programs on a more consistent basis as annually or bi-annually.

For the new best practices one of the participants mentioned keeping a "notebook requirement for lecture and lab." Also mentioned was "students must maintain a portfolio which helps them to acquire the organizational skills they need for higher level math classes". As research suggests, organization and structured learning is very important for developmental students, having such requirements for the class and lab enforces that organization.

It is important to not only teach students the mechanics of the subject but also help them with the learning process. This is where the student success and learning to learn courses comes into play. A best practice that is used in developmental courses is to focus on the understanding of the concept by "using a think-out-loud method to talk students through the strategy of working out problems." "Learning strategies are behaviors or thoughts that facilitate learning ranging from simple study skills to complex thought process (Weinstein, Ridley, Dahl & Weber, 1988-

89, p 81).” These strategies consist of cognitive and metacognitive strategies. The idea behind learning strategies, or courses for learning to learn, is to make the learning process explicit. Hence, making it possible for developmental students to learn. Inclusion of study skills and effective questioning techniques (dialectics) to have students build their metacognitive skills, *Writing-to-Learn strategies* and ways to keep on track/ask for assistance were some of the other mentioned best practices that are concurrent with the idea of learning strategies.

Pairing of study skills with the mathematics course in the learning community, use of computer software, group activities, incorporating tutoring as the course requirement, structured standardized lectures, mandatory labs including diagnostic assessment and prescriptive individualized lab were some of the other highly recommended practices.

Counseling or advising is proposed to be an important aspect of successful developmental programs especially when it is continuous. A best practice suggested by one of the participants is reported as follows: “An early alert and advising program for first generation in college students. Students who make a "D" on their first test are referred to an advisor in the Academic Center for Excellence. There they receive advice for improvement like study skills and tutoring.” Also “students who have failed their first attempt at MAT0024 (Elementary Algebra) will take an intensive, four-week course in which they endeavor to remediate key concepts as they receive instruction in effective math study skills.” Both of these portray the involvement of continuous counseling which is deemed to be very effective for developmental students in literature (Armstrong, 2003; Schwartz & Jenkins, 2007).

Some of the best practices suggested the implementation of supplemental Instruction, having ANGEL repositories and access to comprehensive web pages that serve students and

adjuncts with handouts, sample quizzes and exams, class notes, syllabus, assignments to keep everyone on the same page.

Summary: This study examined the use and the implementation of the published best practices in Florida community colleges for the developmental mathematics, to provide recommendations for increasing the success rate for developmental mathematics courses. Results of the conducted study revealed that most of the colleges are using the published best practices. However, there are certain promising practices that could be used to a higher extent. Further studies are required to fill in the gaps of this study which will disclose the actual implementation strategies of the best practices at the micro-level to observe its entire effect.

Some of the areas that Florida community colleges could increase their efforts in order to increase the success rate in developmental mathematics courses are:

- special advising for developmental students
- adoption of a centralized model for the delivery of developmental mathematics courses
- more uniformity and centralization among developmental mathematics courses
- use of more non-traditional teaching and testing methods to reach learners at all level of learning continuum
- implement continuous program evaluation system for the colleges that currently do not have program evaluations in place

List of best practices from participants showed that some colleges are headed in the direction of having a more all-inclusive approach to teaching these students. However, a more conscientious effort from all colleges to include such promising practice as a part of their developmental mathematics program would deem to be more successful.

Table 5-1. Staff role in policy adjustment

What role do you play in making/adjusting the policies regarding developmental mathematics courses at your college

	Total*	Administrator	Teacher	Supervisor	Other
Total	19	4	8	5	3
I am the main policy-maker for developmental mathematics at my institution	2 10.50%	1 25.00%	0 0.00%	1 20.00%	0 0.00%
I make policies for developmental mathematics at my institution along with few other professors	10 52.60%	2 50.00%	5 62.50%	3 60.00%	1 33.30%
I do not make policy, but have a major role in policy adjustment for developmental mathematics	3 15.80%	0 0.00%	1 12.50%	0 0.00%	2 66.70%
I have a minor role in making policy for developmental mathematics	1 5.30%	0 0.00%	1 12.50%	0 0.00%	0 0.00%
I have a minor role in adjusting policy for developmental	2 10.50%	1 25.00%	1 12.50%	0 0.00%	0 0.00%
Other	1 5.30%	0 0.00%	0 0.00%	1 20.00%	0 0.00%

Table 5-2. Alignment of SEE to class teaching

When devising the curriculum for developmental mathematics courses how aligned are the topics to the ones covered in Florida State Exit Exam?

	Total*	Administrator	Teacher	Supervisor	Other
Total	19	4	8	5	3
Highly aligned	13	2	6	3	2
	68.40%	50.00%	75.00%	60.00%	66.70%
Somewhat aligned	6	2	2	2	1
	31.60%	50.00%	25.00%	40.00%	33.30%
Not at all aligned	0	0	0	0	0
	0.00%	0.00%	0.00%	0.00%	0.00%
Other	19	4	8	5	3
	13	2	6	3	2

APPENDIX A
RESEARCH SURVEY

Developmental Mathematics Survey

This survey is part of an effort to improve the learning experience for developmental mathematics students enrolled in colleges and community colleges. The focus of the survey is the use and practicality of best practices for serving these students. Your responses will contribute to the compilation of strategies that can be used to implement best practices in developmental mathematics classes.

1. What is your primary role in the developmental mathematics program at your college? (Check one.)
___Administrator
___Instructor
___Supervisor
___Other; please specify:

2. How long have you been an Instructor/Administrator?

3. What role do you play in making/adjusting the policies regarding developmental mathematics classes at your college? (Check one.)
___I am the main policy-maker for developmental mathematics at my institution
___I make policies for developmental mathematics at my institution along with few other professors
___I do not make policy, but have a major role in policy adjustment for developmental mathematics
___I have a minor role in making policy for developmental mathematics
___I have a minor role in adjusting policy for developmental mathematics
___Other; please specify

4. Does your college's program include mandatory assessment and placement for developmental mathematics classes?
___Yes (Continue.)
___No (Go to question 7.)
Please explain any exceptions:

5. Does your college use a commercial test (i.e. Accuplacr, Compass) for placement?
___Yes (Go to question 7.)
___No (Continue.)

6. Does your college use a locally- or school-developed mathematics placement test? (Check one.)
___Locally developed mathematics placement test
___School developed mathematics placement test

7. Please explain the process for student placement in developmental mathematics classes if a mandatory assessment is not used.

8. Does your college provide separate advising for developmental students?
___Yes
___No
Please elaborate

9. What is the most widely used assessment technique in developmental mathematics classes at your college? (Check one.)
___Multiple choice questions
___Fill in the blanks question
___Free response
___Matching the correct answer
___Explaining the answer
___Other; please explain

10. How many times during a semester do developmental mathematics students take a test? (Check one.)
___Once
___Twice
___Thrice
___Four times
___Five times or more; please elaborate

11. Is Florida State Exit Exam (SEE) a part of the highest level of developmental mathematics class offered at your college?
___Yes
___No

12. What is the approximate percentage of students who pass the Florida State Exit Exam in mathematics classes at your college? (This could be either passing it in first or second attempt) Check one
___0%
___0%-25%
___26%-50%
___51%-75%
___76%-100%
Please explain any exceptions

13 Does your college have a separate developmental department that offers the developmental mathematics classes?
___Yes
___No

14. Are the developmental mathematics classes at your college open entry? Open entry is where a student is allowed to start a class in the middle of semester.
___Yes
___No
Please expand on the conditions based on which students are allowed to enter the developmental mathematics classes. Is it with or without permission?

15. What kind of professional developmental opportunities are available for the developmental mathematics instructor at your college?

16. Are the above mentioned professional development opportunities available only for full time faculty?
___Yes (Continue)
___No (Go to question 18.)

17. Please list the challenges in providing these opportunities for adjunct/part time professors (Adjunct faculty is part time faculty).

18. What percentage of developmental mathematics classes are taught by an adjunct faculty at your college? (Adjunct faculty is part time faculty) (Check one.)
___0%
___0%-25%
___26%-50%
___51%-75%
___76%-100%
Please explain any exceptions

19. Please describe the structure of developmental mathematics classes at your college. (Check all that apply)
___Departmental tests and exam
___Instructor developed tests and exam
___Departmental syllabus
___Instructor developed syllabus
___Same breakdown of the grade
___Other; please specify

20. Do all developmental mathematics classes at your college follow a common syllabus, use departmental tests/exams and follow the same grading breakdown?
___Yes (Go to question 22)
___No (Continue)
21. Explain the difficulties in implementing such a uniform structure for all developmental mathematics classes.

22. When devising the curriculum for developmental mathematics classes how aligned are the topics to the ones covered in Florida State Exit Exam? (Check one.)

a. Highly aligned
b. Some what aligned
c. Not at all aligned

23. In addition to traditional lecture method, please check the method(s) that is/are widely used in the developmental mathematics classes. (Check all that apply)

___Student devising questions
___Students critiquing each other work
___Learning through visual stimuli as computer graphics
___Mathematics journaling
___Classroom discussion
___Simulations and role playing
___Student and teacher providing each other feedback
___Writing in math: group writing, blogs, discussion groups
___Other; please explain

24. Are the developmental mathematics instructors mandated to relate the math concepts learned in the class to real world through simulations and/or hands on learning?

___Yes (Go to question 26.)
___No (Continue.)

25. List the challenges in implementing simulation/hands on learning method.

26. Does your college implement supplemental instruction (SI) or video supplemental instruction?

___Yes (Go to question 28.)
___No (Continue.)

27. What are the barriers for the implementation of Supplemental Instruction (SI)?

28. Does your college offer learning communities (packaged classes)?

___Yes (Go to question 30)
___No (Continue)

29. List the challenges in implementing such a method.

30. Are developmental mathematics classes included in learning communities?

___Yes
___No
Please explain the design of these learning communities.

31. How often does your college evaluate the developmental or developmental mathematics programs? (Check one.)
___No evaluation process in place
___Yearly
___Bi- yearly
___Every 5 years
___Other; please explain:

32. Is attendance mandatory for developmental mathematics classes?
___Yes (Continue.)
___No (Go to question 34.)

33. At whose discretion is attendance polices, in developmental mathematics classes? (Check one.)
___Department
___Instructor
___Other; please specify

34. Is attendance a part of the final grade in developmental mathematics classes?
___Yes
___No

35. Are the developmental mathematics classes at your college self-paced and open-exit?
___Yes
___No

36. Are the developmental mathematics students required to work in the lab as a part of the class?
___Yes
___No

37. Please explain the timing and structure for the lab use.

38. Are the students in the developmental mathematics class required to work in groups?
___Yes (Continue.)
___No (Go to question 40.)

39. Please explain the group structure.

40. Are the learning skills strategies part of the developmental mathematics classes at your college?
___Yes (Go to question 44.)
___No (Continue)

41. Is it a college requirement for developmental students to take a study skills class such as College success (SLS1101)?

___Yes
___No

42. Who is allowed to register study skills class such as a College Success (SLS1101)? (Check one.)
___First time in college
___All developmental students
___Students who are placed in two or more developmental classes
___Anyone
___Other; specify

43. Please explain the criteria used for the students who are mandated to take study skills class such as a College Success (SLS1101)?

44. Please share two best practices strategies your college is using that could be used by other colleges to improve their program.

Thank you for completing the survey.

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BIOGRAPHICAL SKETCH

Afsheen Akbar moved to United States as a teenager with her family. Having to start her education in a new surrounding at the secondary level in this country was a change. That is where she realized her passion for working with numbers and helping students. After the completion of school, she completed a Bachelor of Science in Computer Engineering at University of Florida. To further pursue her love for mathematics and working with students who struggled with mathematics, she pursued the Master of Art degree in mathematics education. She currently works at Santa Fe College as an advisor for college prep students.