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**Developmental Education  
Summer Bridge Program 2007:  
The Texas Southern University Math Academy**

**Report to the Texas Higher Education  
Coordinating Board**

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# **Developmental Education Summer Bridge Program 2007: The Texas Southern University Math Academy**

## **Summary**

In 2006, the General University Academic Center (GUAC) of Texas Southern University held its first Math Academy Summer Bridge Program for students identified by their high school and test scores to be in need of intensive academic assistance in the area of math. The program consisted of two distinct groups: a TAKS Cohort and a THEA Cohort.

The goal of the Math Academy was:

- (1) To assist high school seniors in passing TAKS Math; and
- (2) To prepare college-bound students place into College Algebra based on their THEA scores.

Both groups utilized some form of AGILE Math (A Guided Individualized Learning Exercise Program), a Kumon-style approach developed by the senior Math Laboratory Facilitator in GUAC's Learning Assistance Center, Mr. Jason Guo,

Overall, the results of the Math Academy program were favorable, especially for the THEA cohort, which saw a 53.2% passing rate. The key to the program's success was the low staff-student class ratio, which permitted intensive tutoring and mentoring, while working on the AGILE Math exercises. The gradually increasing levels of difficulty from one module to the next, allowed students to gain confidence in their abilities while building a solid foundation in mathematics.

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**The Problem**

It is widely held that mathematics is a fundamental subject without which educational advancement in many critical areas cannot successfully proceed, yet Black and Hispanic minorities continue to lag behind other students in mathematics in Texas and in the nation. According to the Texas Education Agency (TEA), 16% of Texas high school seniors in the Class of 2007 failed to pass all sections of the TAKS exam and will not earn a high school diploma.

In Houston, 39% of HISD high school juniors in the 2006 – 2007 school year have not attained the college readiness standard on at least one subject of their exit level TAKS exam, and must retest during their senior year in order to graduate. Furthermore, 23% of HISD high school juniors in the 2006 – 2007 school year have not attained the college readiness standard on the math portion of their exit level TAKS exam. Of the top five schools that are feeders to Texas Southern, from 36% to 61% of their students did not meet college readiness standards on at least one portion of TAKS during 2005-2006 school year: Yates – 61%; Willlowridge – 55%; Marshall – 46%; Worthing – 38%; and Madison – 36%. Moreover, 29% to 52% of the juniors at TSU's top five feeder schools have not met math the TAKS college readiness standards: Yates – 52%; Marshall – 38%; Willlowridge – 36%; Worthing – 36%; and Madison – 29%. Thus, while the overall TAKS failure rates require improvement, failure rates in math at TSU's top feeder schools, which constitute a large proportion of the overall TAKS failure rates, have reached critical proportions. Consequently, too many high school seniors do not continue on to postsecondary education. From 2004 to 2006 in the state of Texas, from 49% to 51% of high school seniors did not go on to college, with an average of 50%. While in Houston ISD, the percentages are much higher – from 64% to 66%, with an average of 65%, did not continue on to higher education. However Fort Bend ISD, with a range of 39% to 41% had a much lower average of 40%. The average three-year non-college going rates for TSU's top five feeder schools are also high: Madison – 67%; Worthing – 64%; Yates – 62%; Willlowridge – 52.7%; and Marshall – 52%. These statistics describe a clear need for intervention.

For incoming students at Texas Southern University, failure rates in mathematics continue to be a problem. An institutional analysis of TASP/THEA scores for the 11 year period from 1993 to 2003 showed that all three component scores were declining, but that TASP/THEA Math scores were the lowest and showing the greatest rate of decline. A new institutional analysis of TSU's failure rates in freshman courses from fall 2003 through fall 2006 shows average failure rates in mathematics courses were 49.0%. For developmental students, average four-year failure rates in mathematics courses were 50.5%. TSU has therefore embarked on a number of efforts to reduce these disturbing trends.

## Related Literature

Historically, minority students have been underrepresented in the fields of math and science. This is largely due to the intense aversion minority students tend to have towards math. Many black and disadvantaged students are educated in inferior elementary and secondary schools, and end up beginning their college careers extremely under prepared for college level coursework, especially in the field of mathematics. This failure to achieve in math results in missed opportunities in promising career fields such as computer science, architecture, engineering, chemistry, etc. Many reasons have been attributed to the failure of minorities to pursue math/science degrees and careers. According to Griffin (1990), the primary reasons include: impoverished socioeconomic background, inadequate academic preparation, inability to adjust and integrate into campus life, the absence of mentors, low expectations for minority student achievement, and a lack of well-organized and aggressive recruitment, selection, and retention programs. This review found seven effective programs spanning high school, community college and four-year undergraduate institutions.

### 1. A Better Chance (ABC):

ABC is a 27-year old national nonprofit organization that identifies talented minority students from predominately inner-city families and places them in some of the leading preparatory schools (Griffin, 1990). The organization has found that the success of ABC students in the fields of math and science is not necessarily predicted by standardized test scores. They found that the primary reason for avoiding mathematics was student perception; low self-efficacy and the perception of the difficulty of math curricula. ABC found that the pursuit of, and success in math was more closely tied to excellent and dedicated teachers, a strong academic atmosphere, high quality math curricula, the availability of appropriate courses, parental encouragement, and student self-confidence.

Since a lack of self-confidence is a key factor in minority students' aversion to mathematics, math preparation programs should strive to improve the faith students have in their own ability, while at the same time showing them how math can and will be used in their every day lives. Pima Community College in Tucson, Arizona, has developed an experimental summer course which merges two remedial math classes and emphasizes reading and writing (Everett-Hayes, 2006). The program's director, Ron Woggon, based his program on the belief that students need a new, real-world approach to learning math. He has given up on the belief that it is possible to inspire people to learn math, and instead focuses on addressing how people learn. Each student in the Pima Program is required to create a portfolio of algebra problems, rewritten in the context of life. For example, while an art student's portfolio describes how to paint on a canvas using algebra, another student created a portfolio of gardening math problems. Students in the Pima Program are taught to think of mathematics as a story. They are given assignments outside of class using math to make recipes, project mortgage payments, and figure out when their car will run out of gas. The newest element of the program is the use of EnableMath, an Internet-based tutoring program that also tracks student progress.

## 2. *The Emerging Scholars Program*

This program strives to combat the high drop-out rate of college students, specifically minorities, in calculus courses. When developing the program for Berkeley, Uri Treisman first began by attempting to understand why minorities, especially blacks, were failing at such high rates (Fullilove & Treisman, 1990; Selvin, 1992). He found that at top schools, low SAT scores and failure rates had no correlation. He also found other reasons usually cited for failure rates, such as lack of motivation and little parental support, were irrelevant at these schools. Instead, Treisman observed that Black students tended to study alone, while Whites and Asians usually studied in groups. To counter this trend, Treisman designed his program to operate as an honors class. Students identified as needing remediation attended regular lectures and were responsible for normal homework and assignments, but were also required to attend intensive, 6-hour-per-week sections instead of the usual 2 hours per week. Remediation was accomplished by working in groups on very difficult problems. Treisman found that this method allowed minority students to feel welcome, and provided them the extra assistance necessary by working in groups.

## 3. *The Algebra Project*

The goal of the Algebra Project, designed by Robert Moses (Moses and Cobb, 2001) is to motivate students to embrace math and encourage their peers to do the same. It reaches about 10,000 students at 28 sites around the country, mostly in the south. Members of the YPP (Young People's Project) see themselves as math-literacy workers and seek to demystify the science of numbers, in this case, through a blend of rap, civil rights history, and games. The program's curriculum materials, which can be integrated with what schools already use, emphasize experiential and in-depth learning. The cornerstone is a five-step process that helps students make the often difficult transition between what's familiar and the abstract language of math. Students take a trip, riding a bus or walking through a neighborhood, and then construct a model of their travels. They write about the event in their own terms and learn to identify the numerical elements – the math – such as speed. They then construct a symbolic representation of the whole process. The idea is to make real world connections with the kids' environment.

## 4. *Jaime Escalante Math Program*

Another program, recognized for its impact on under prepared minority students, is the Jaime Escalante Math Program in East Los Angeles, California (Escalante & Dirmann, 1990). After years as a teacher, the program's creator, Jamie Escalante, realized that students learn faster when learning is fun, when it is a game, and a challenge. Participants in the Escalante Program were not recruited based on test scores or grades. The only requirement for acceptance was the desire to be in the program and a sincere desire to learn math. Both students and parents were required to sign a contract that binds their active participation in the program. The goal of the Escalante Program is to greatly accelerate students' exposure to math. Students are required to arrive to school early to work on math studies. They study over lunch, each afternoon, and even in special Saturday morning classes. On random days they are required to recite formulae out loud in order to gain entry into the classroom. There is frequent board work, brief daily

quizzes, and regular tests. This scheduling is intentionally intensive, enabling students to overcome their previous lack of academic preparation and poor study habits.

Teachers in the Escalante Program understand the importance of active communication with students, rather than lecturing to them from the blackboard all day. The program is run using a team approach, relating the self-discipline, devotion and hard work necessary for success in the classroom to that of professional and student athletes, a concept young people can easily relate to. Parental involvement is a vital component of the Escalante Program. Parents are expected to uphold their commitment to their student's success. At the first sign of problems with a student, parents are contacted and asked to help.

#### 5. 4<sup>th</sup> Hour Algebra Project

At the University of Texas, Pan American, 65% of the largely Hispanic freshman population failed college algebra on the first try and thus were in danger of not graduating. The 4<sup>th</sup> Hour Algebra Project began as a pilot program with Title III funds to increase the course passing rates without lowering standards (Torres and Fleming, 2005). Both student enrollment and faculty involvement were voluntary. The teaching of college algebra was redesigned to continually diagnose students' conceptual level of comprehension, to intervene with the proper remediation, and to teach for mastery in the following ways. A fourth hour was added to increase time on task. Student group work became a primary focus; quizzes were given frequently and before tests, rather than afterward; critical test items were used for reteaching and retesting. For the 8851 students enrolled in 280 sections of college algebra from spring 1998 to Fall/Spring 2003, 46.3% of the student population was enrolled in the 4<sup>th</sup> Hour Project. Students in the 4<sup>th</sup> Hour Project were 25% more likely to achieve passing grades, 9% less likely to achieve failing grades, and 16% less likely to drop the course. Furthermore, student attitudes became significantly more positive toward mathematics. The number of sections and participating students has increased steadily since 1998 so that the 4<sup>th</sup> Hour Project has become the primary teaching method. Overall, close to 67% of the students in the project now pass college algebra, and the Math Department's passing rate has risen from 35% to 60%. The program is now fully institutionalized and no longer depends on Title III funds.

#### 6. Summer Institute in Mathematics for Undergraduates (SIMU)

Medina and Rubio (2000) describe a successful mathematics program for Latino and Native American undergraduates at the Summer Institute in Mathematics for Undergraduates (SIMU) at the University of Puerto Rico, Humacao, designed to increase the numbers of such students earning undergraduate and graduate degrees in mathematical sciences. Their model engages students in quality undergraduate mathematics research that involves intensive interpersonal interaction as well as post program mentoring.

The program objectives include:

- engaging students in research at the undergraduate level, familiarizing students with research protocols and techniques,
- collaboration with peers,
- learning to utilize faculty as effective resources,

- creating an undergraduate research community that stimulates students to reach their fullest potential,
- offering a series of skills workshops,
- assisting in the building of a network of researchers and peers, and
- monitoring the progress of students for at least five years after the program.

One of the overarching goals is to help students understand the quality and quantity of work that is expected of them, and become self motivated to meet these expectation. Their immersion in research activities, the inclusion of additional study sessions and structured work, with the support of peers and researchers, provides a preview of the lives they will lead in the future. Program follow-up indicates that, although none of the students had research experience prior to the Institute, 71% of the participants were accepted into graduate programs in mathematical sciences.

### 7. Other Programs

The literature search also uncovered reports of four older programs that, despite their age, describe wisdom, practices and outcomes similar to those of more current programs. For example, Lasley (1954) at the University of North Carolina, found that the key to improved success in mathematics is a closer cooperation between high school, colleges, and university teachers. UNC developed an approach to bridge the gap. The program's major objective was to find students with the capacity for mathematical training while they are in secondary schools, and involve them in a program of study that provides them with proper training and guidance all the way through their college years. The major thrusts of this approach included:

- *High school mathematics contests* – A thousand high school seniors participated in this contest, with awards for the winner and runners-up. As students visited the University's campus on High School Day, they were introduced to the mathematics staff, given the opportunity to tour the department, and viewed any projects or exhibits on display, with the goal of increasing their interest in mathematical studies at the collegiate level.
- *Contacts between high school and university teachers* – The North Carolina Education Association developed a math component that allowed secondary math teachers and college math instructors to meet frequently, holding formal talks and small discussion groups. The goal was to develop a better understanding of the mutual problems facing math teachers on all levels.
- *Distribution of mathematical information* – Pamphlets such as "Why Study Math?" were developed using a direct style that appeals to students. These pamphlets were distributed by teachers of math in all colleges and high schools in the state, in hopes of increasing the interest in the mathematics.
- *Special courses and fellowships* – High school teachers and college instructors were given the opportunity to receive more training during the summer months. There were also 12-week fellowships available which offer financial compensation.

Pre-calculus courses at the University of Nebraska, Lincoln, used to be held three days per week, with about 120 students in each section. Under a new approach, introductory math modules were taught in 8-week periods with two periods each semester and classes not exceeding 25 students (Masat, Meyer & Mientka, 1975). There were three modules offered during each 8-week period, and each module is worth two semester hours of credit. Administrators observed that students who completed one full semester (two or even three modules) earned 4-6 credits in math, as well as a more solid background in mathematics.

The Crossover Mathematics Program at Milwaukee Area Technical College was designed to improve the skills of recent high school graduates, primarily from inner-city schools (Roberts & Michels, 1971). The majority of students in the program were deficient in high school math, and about half were deficient in elementary school math. The Crossover met for two 50-minute periods each day, 5 days a week, for six weeks. The students also had two 50-minute periods of communication skills per day, 4 days per week. The curriculum consisted of 17 programmed booklets, each containing a self-evaluation exam and unit test. Students who successfully completed coursework in the Crossover Program earned 2 college credits. Participants were divided into three categories based on pre-test scores: slow, regular, and fast. A student could move from one category to another based on his continuing performance in the program.

- Fast students – The fast students did their assignments in an unsupervised room. They worked at their own pace on booklets and self-evaluation tests, which they also graded themselves. If a student's work was satisfactory, they were given a unit test. Successful completion of that test was rewarded with free time rather than more work. Those students who did not maintain high scores were sent to the group of regular students.
- Regular students – Those students in the regular group were supervised by an instructor and at least one teaching assistant. In order to ensure more contact with students, instructors graded the self-evaluation tests, and provided more aid to students in correcting their errors.
- Slow students – The slow students were assigned to a special room with one instructor and one TA. They used the same routine of programmed learning booklet, self-evaluation test, and unit test. A failing score meant the student must repeat the process until a satisfactory grade was achieved, yet only the first grade counted. High levels of improvement meant a student could move to the group of regular students.

No lecturing was done with any group in The Crossover. All teacher-student interaction was in the form of tutoring. This close interaction is vital in determining the student's true problems with learning. Lecture-discussion methods of teaching do not allow enough contact for instructors to truly diagnose the student's problem. The learning center concept used in The Crossover proved effective because of the high level of student contact. It is necessary to observe the learning rate of individual students through frequent evaluations and then set reasonable goals based on their skills. Those students in the fast group required much less interaction with instructors, which freed up time for the instructors to work with those students who needed more assistance.

The ideal teaching situation for mathematics involves designing a specific program around the skill level of each individual student. Unfortunately, this is not

economically feasible for colleges and universities where thousands of students are enrolled. Most colleges use a lecture-discussion method of instruction. Spangler (1971) argues that this approach is not ideal for math courses for the following reasons:

- (1) The instructor does not have control over each student's learning.
- (2) It is impersonal.
- (3) Slower students become discouraged by the pace, while faster students are held back.
- (4) Lecture method does not allow for true remedial work.
- (5) Tests are generally given whether the student is ready or not.
- (6) Little can be accomplished in the way of recognizing weaknesses or in helping to overcome them.
- (7) The teacher can only hope that the information being presented is being caught by all. However, is usually not the case.

The Lower Columbia College Mathematics Laboratory has developed methods of teaching that modify the traditional lecture-discussion method (Spangler, 1971). Programmed mathematics courses are available as an alternative to the traditional classes. Instruments such as teaching machines and programmed learning materials are available in the math lab, freeing the teacher from strict lecture duties so that he may devote time to instruction on a one-on-one basis. A variety of machines are required since students learn best with different types of presentations. If students do not score satisfactorily on a unit test, they are directed to the remedial aides, such as filmstrips and tapes. The benefits of this math lab structure include allowing students to work at their own pace, taking tests only when ready, while not holding back the rest of the class if more attention is necessary. Furthermore, the math lab proves economically efficient for universities as an increase in personnel for the lab is rarely necessary, although a larger room may be needed to accommodate the number of students.

The aversion to mathematics displayed by minority students will continue to result in many missed opportunities. The continued growth of programs designed specifically to bridge the gap for under prepared students is vital to break the chain of math avoidance. Students can learn to appreciate math with appropriate teaching and teachers. A report by the National Research Council (1989), *Everybody Counts*, reaffirms the practices in effective programs. Effective teachers are those who can stimulate students to learn. Students must be encouraged to construct their own mathematical understanding, and this is usually seen through group work, engaging discussions, and in students making presentations themselves. Teachers must learn to listen, and resist the urge to control classroom ideas. This enables students to take control of their own learning. Memorization of math algorithms tends to fade quickly, but the ability to find and use math tools is what builds confidence. Teachers should view themselves as learning moderators, not just presenters. In the long run, less teaching yields more learning. By taking responsibility, students learn how to learn as well as what to learn.

## **Best Practice**

The foregoing programs yielded a list of best practice program characteristics that include the following:

- Avoidance of the traditional lecture method; the less lecturing the better (Escalante & Dirman, 1990; National Research Council, 1989; Roberts & Michels, 1971; Spangler, 1971).
- High level of interaction in classrooms, either teacher-student or student-student (Torres & Fleming, 2005; Medina and Rubio, 2000; National Research Council, 1989; Roberts & Michels, 1971).
- Students work and study in groups rather than individually (Torres & Fleming, 2005; Fullilove & Treisman, 1990; National Research Council, 1989).
- Increase time on task (Torres & Fleming, 2005; Medina and Rubio, 2000; Fullilove & Treisman, 1990; Escalante & Dirman, 1990).
- Students are allowed to work at their own pace, with instructors available to offer one-on-one assistance, using programmed instructed (Roberts & Michels, 1971; Spangler, 1971).
- Small class size that does not exceed 25 students (Masat, Meyer & Mientka, 1975).
- Availability of variety of learning tools, i.e. computer programs, videos (Moses and Cobb, 2001; Spangler, 1971)
- Teach using real world examples, allowing students to see how math is important in real life (Moses and Cobb, 2001; Everett-Hayes, 2006).
- Make math confidence a specific program goal Develop students' (Griffin, 1990).
- Divide participants into groups based on pre-test scores (Robert & Michels, 1971; Spangler, 1971).
- Award college credit to participants who successfully complete the program (Roberts & Michels, 1971).
- Involve parents (Escalante & Dirman, 1990; Griffin, 1990).
- Develop partnerships between university instructors and high school math teachers (Lasley, 1954).

Texas Southern University sought to employ a majority of these best practice components in designing its Summer Math Academy by minimizing lecture, facilitating high levels of SI to student interaction, increasing time on task, providing self-paced exercises, creating small class sizes, developing math confidence through mentoring by tutors, using pretest scores to determine grouping, and developing partnerships with local high school instructors. The use of real-world examples and significant parent involvement are components still to be incorporated.

## **Math Academy 2007 Program Approach**

### **Program Description**

The Math Academy was a six week program held June 14<sup>th</sup> through July 26<sup>th</sup>. Classes were held from 9-11 AM. The THEA group met in the TSU's new Science Building, and the TAKS group met in the Martin Luther King (MLK) building. The staff consisted of Program Coordinator, Shannon Hilburn Thomas and two math instructors,

Mr. Jason Guo and Ms. Peju Ibitayo, both GUAC Math Lab Facilitators. In addition, eight TSU students, all Juniors and Seniors, were hired as Supplemental Instructors (SI), each receiving extensive training in AGILE Math and in the supplemental instruction approach to tutoring, based on the University of Missouri, Kansas City model (UMKC, 2006). Supplemental instructors also served as mentors for program participants.

Both groups utilized some form of the AGILE Math approach developed by senior instructor Jason Guo. AGILE Math allows students to begin at their own level of competence determined by pre-test scores and progress at their own pace. Each successive module increases gradually in difficulty, and students do not proceed to the next module until they have displayed mastery of the current exercises. SI leaders assist the instructors by sitting in on classes, answering student questions, providing encouragement, and monitoring student data.

Two academic enhancement seminars were offered during the summer, providing students with information on class registration and financial aid. These seminars were conducted by GUAC Academic Advisors and Enrollment Management staff.

### **Program Participants**

The program consisted of two distinct groups: a TAKS Cohort and a THEA Cohort. The TAKS group contained those students who had not yet earned their high school diploma due to failure to successfully complete the math portion of the TAKS exam. The THEA group consisted of students preparing for the THEA exam as they enter their freshman year at TSU or another institution of higher education. The program began with a total of 88 students: 35 in TAKS cohort and 53 in THEA cohort.

### **Recruitment**

The Math Academy was promoted to the various high schools in the Houston area. The program coordinator worked closely with high school counselors and administrators to identify those students in need of intensive academic support in mathematics. Presentations about the THEA component of the program were made in 12<sup>th</sup> grade classrooms and during senior class meetings.

Recruiting students for the TAKS cohort proved more difficult. Notification was not received from the Texas Higher Education Coordinating Board about the funding for this component of the program until the last week of the school year, making it an extreme challenge to get student commitments. Eighteen students preparing for TAKS participated at TSU. One instructor and four tutors from the Math Academy went to two area schools (Yates and Milby High Schools) to work with students in the TAKS prep programs already being hosted on those campuses, thus resulting in three different TAKS cohorts within the overall Math Academy program. The groups that met at Milby High School and at Yates High School really did not use the AGILE Math approach. Because the programs held at Yates and Milby were already in session, AGILE Math could not be used from beginning to end and the students never completed all of the exercises. Nonetheless, the SI leaders were available to provide assistance and support to participating students. This unfavorable loss of control over the curriculum and student attendance was evident in the test results.

## Program Curriculum

Both groups utilized some form of AGILE Math (A Guided Individualized Learning Exercise Program), a Kumon-style approach to providing exercise modules with gradually increasing levels of difficulty. The program, developed by Jason Guo, GUAC Senior Math Lab Facilitator, consists of a series of math, pre-algebra, algebra, and calculus modules. A pretest determines the level at which a student begins. Thereafter the accompanying exercises are designed to gradually develop increasing skill at a pace that is not frustrating. Each module consists of ten exercises graduated for small but increasing levels of difficulty. As each module is mastered, the student moves on to the next module. While the instructor provides an introduction to the module, the Supplemental Instructors assist students with the accompanying exercises. In theory a student may progress, at his own pace, from basic math through calculus using these exercises.

## Evaluation Data

For the THEA cohort, a THEA test was administered on the second day of the program and those scores were used as pre-test scores. Students who missed that test day were allowed to use THEA scores from previous exams, or were administered the pre-TASP exam, which was scored by GUAC staff. The exit THEA exam was administered on July 25<sup>th</sup>. Attendance and participation rates were tracked by Math Academy Supplemental Instructors.

For the TAKS group, pass rates were obtained from the participating high schools.

## Results and Conclusions

### TAKS Cohort

TAKS Pass Rates. Overall, the TAKS cohort of 34 students exhibited a 20.5% passing rate on the exit exam (See table 1). Two of the six students (33.3%) participating at Yates High School passed, two of the 11 students (18.2%) participating at Milby High School passed, and three of the 17 (17.6%) students participating in the program at TSU passed the exam.

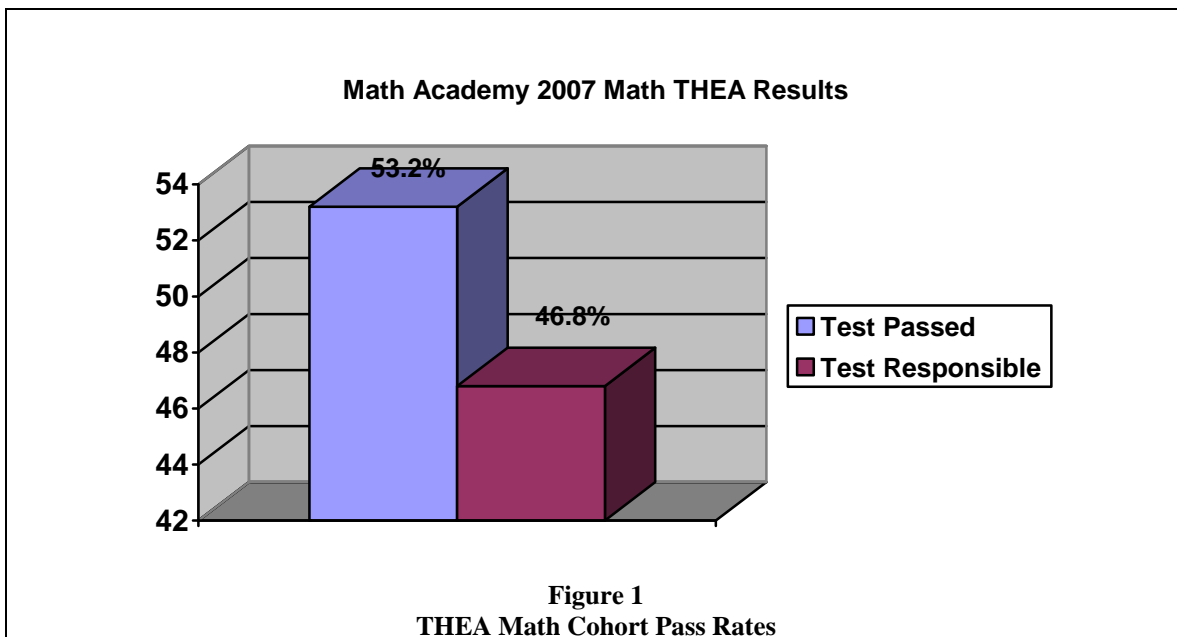
Location	Number of Students	Number of Students Passing TAKS	Pass Rate
Yates	6	2	33.3%
Milby	11	2	22.2%
TSU	17	3	17.6%
All TAKS Students	34	7	20.5%

TAKS Pass Rates by Participation Level. It was not possible to determine accurate attendance figures for locations outside of TSU, and therefore not possible to determine whether pass rates increase with regular attendance. However, at TSU accurate attendance records were kept (See table 2). Among the ten students with low attendance, none passed; for the three students with moderate attendance, none passed; but for the four students with regular attendance of 20 or more sessions, 75% passed ( $p < .01$ ).

Table 2 TAKS Math Cohort Pass Rates at TSU by Participation Level				
	Low Attendance (15 or less days)	Moderate Attendance (16-19 days)	High Attendance (20+ classes)	Total
Passed Math Exit TAKS	0% n = 10	0% n = 3	75.0% n = 4	17.6% n = 17
Note. Accurate attendance records could not be obtained from Yates of Milby High Schools. $X^2 = 11.84$ $p < .01$				

**THEA Cohort.**

THEA Pass Rates. The THEA cohort displayed far more favorable results as a result of the Math Academy and the AGILE Math approach (See Figure 1). Forty-seven students took the Exit THEA exam, and 53.2% received passing scores.



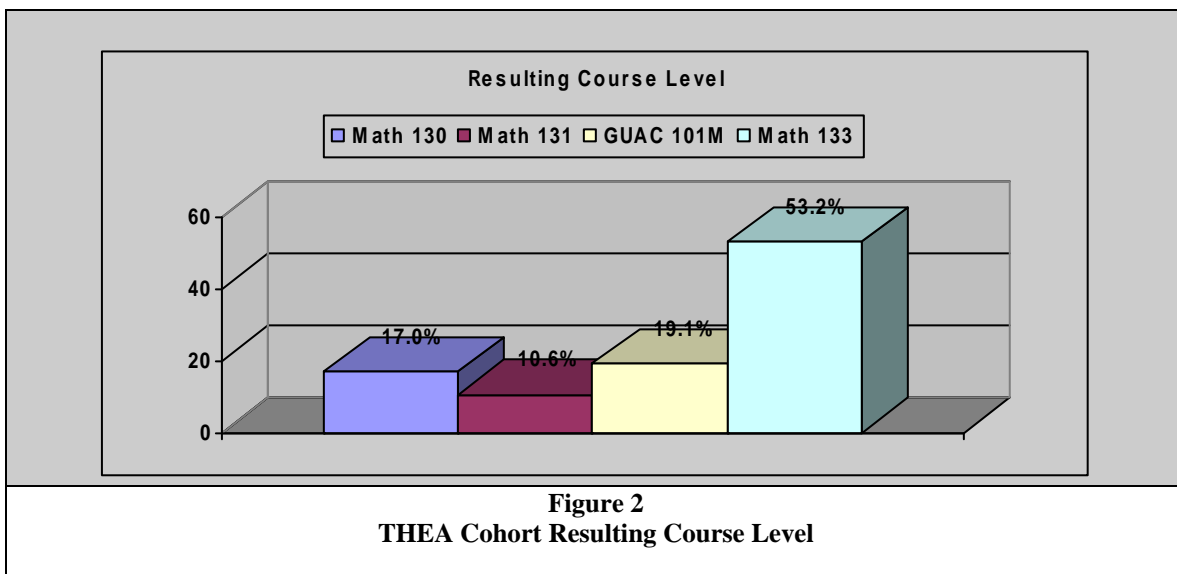
THEA Pass Rates by Participation Level. The Math Academy consisted of 26 class days. Test score analysis by participation level showed that those students with high attendance (20+ days) were significantly more likely to pass THEA Math than students with moderate attendance (15-19 days) or low attendance (less than 15 days) ( $p < .05$ ). Table shows that of those students with high attendance (20+ class sessions) the pass rate was 65.6%.

Table 3 THEA Math Pass Rates by Participation Level				
	Low Attendance (15 or less days)	Moderate Attendance (16-19 days)	High Attendance (20+ classes)	Total
Passed Math Exit THEA*	16.7% n = 1	33.3% n = 3	65.6% n = 21	53.2% n = 25
Did not Pass Math Exit THEA	83.3% n = 5	66.7% n = 6	34.4% n = 11	46.8% n = 22

\*  $\chi^2 = 6.63, p < .05$ .

Resulting Math Course Level Placements (Figure 2 & Table 4). The program goal was to prepare students for college level mathematics courses. Thirty-four, or 72.3%, of the 47 THEA cohort participants in the Math Academy scored high enough to take College Algebra in the fall semester. Twenty-five, or 53.2%, passed THEA Math and placed in College Algebra. Another nine or 19.1% were within several points of passing and were therefore eligible to take College Algebra, but they were also required to take the GUAC 101 Math Lab as a supplement to their math class. GUAC 101 Math Lab tutorial classes meet twice a week to provide students with additional academic support. A total of 13 or 27.6%, of the students placed in developmental math courses. Eight (17.0%) placed in Math 130, and five (10.6%) placed in Math 131.

Note that in previous years of the eight-week Summer Academy, an average of 62.8% of students tested placed into college algebra, with 19.7% of those students requiring a GUAC 101 math lab. These results show success in achieving the program’s overall objectives of preparing students for the ASSET/THEA exam in only six weeks using the AGILE Math program, and thus reducing the number of students required to take developmental education courses upon entering the university.



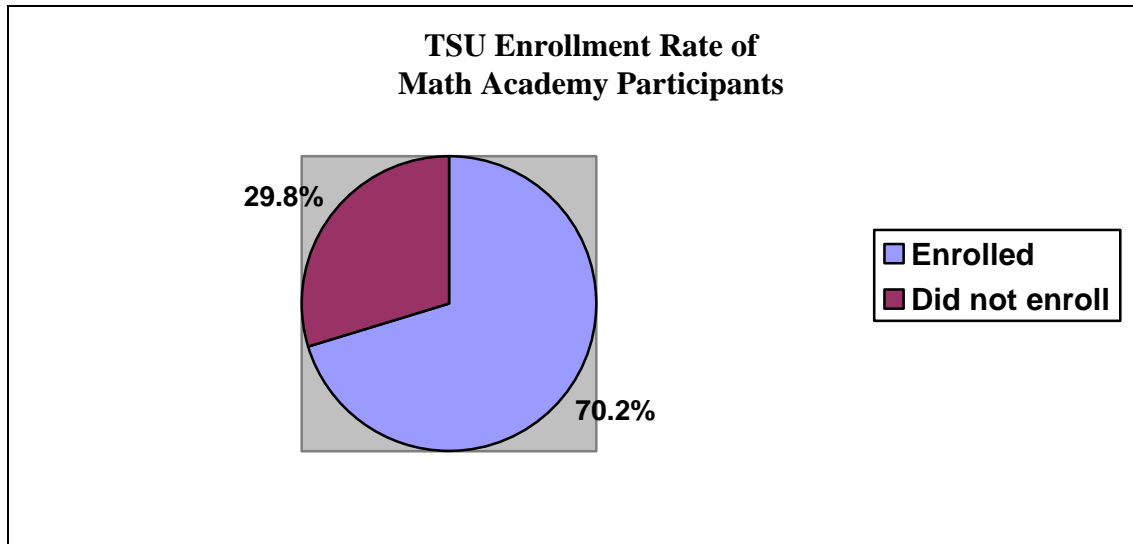
<b>Course Level Tested Into</b>	<b>Number of Students</b>	<b>Rate</b>	<b>Category</b>
Math 130	8	17.0%	Developmental: 27.6%
Math 131	5	10.6%	
Math 133 w/ GUAC 101M	9	19.1%	College-Level: 72.3%
Math 133	25	53.2%	

Resulting Course Level Placements by Participation. Table 5 shows that regardless of participation level, the percentages of students who placed in college level courses were similar. This is due to the fact that college-level includes two categories of students: those who placed in college algebra and those whose test scores were within a few points of passing and were allowed to take college algebra with a GUAC 101 math tutorial course. Among low attendance students, 66.7% placed at college level, compared to 66.7% for moderate attendance students, and 71.8% of high attendance students.

	<b>Low Attendance (15 or less days)</b>	<b>Moderate Attendance (16-19 days)</b>	<b>High Attendance (20+ classes)</b>	<b>Total</b>
Math 130	33.3% n=2	11.1% n=1	15.6% n=5	n=8
Math 131	0% n=0	22.2% n=2	9.4% n=3	n=5
Math 133 w/GUAC 101M	50% n=3	33.3% n=3	9.4% n=3	n=9
Math 133	16.7% n=1	33.3% n=3	65.6% n=21	n=25
<b>TOTAL</b>	n=6	N=9	n=32	n=47

Participant Completion and Retention Rates. Forty-seven of the 55 students (85.5%) who enrolled in the THEA cohort of the Math Academy completed the program. An accurate completion rate for the TAKS cohort was virtually impossible to track due to the late start and the lack of control over data and attendance at the two groups held at Milby and Yates High Schools.

Thirty-three of the 47 students in the THEA cohort (70.2%) who completed the program were retained and went on to enroll in TSU for the Fall 2007 semester (See figure 3). Participant retention will continue to be tracked every semester.



**Figure 3**  
**THEA Math Cohort Enrollment in Texas Southern University**

### **Recommendations for Math Academy 2008**

While the Math Academy proved to be an effective program, improvements can be made to continue and increase the rate of success. The following are recommendations offered by the program staff or participants:

- Early recruitment is necessary to gain greater participation on TSU's campus where tighter program controls are possible. Early recruitment is thus contingent on timely grant notification.
- Keep the two-hour per day class schedule rather than the four-hour daily schedule used in previous Summer Academy years. This year's program experienced far fewer attendance, punctuality, and behavioral problems. Students appeared more focused and attentive, and actively participated throughout the entire class period. The break between classes was eliminated, and instructors and SIs reported few problems with students leaving class and not returning promptly. Students frequently stayed after class to receive additional tutoring.
- Participants should be divided into classes consisting of no more than 25 students, with one instructor and at least four supplemental instructors per room. This low student/staff ratio is the key to the success of the Math Academy, allowing for personalized, one-on-one tutoring. This may require the addition of more supplemental instructors to the Math Academy program staff for upcoming years.
- Funding should be designated to purchase computer based test preparation software for Math Academy students. This approach will meet the varying learning styles of students, offering them another opportunity to put to practice the strategies learned in class.

- More academic enhancement seminars should be offered to the students, covering topics that directly influence the success of new college students (time management, study skills, etc.).
- Math Academy participants requested at least one social event which would allow them to network and interact with their peers in a less formal setting.

## Conclusions

The General University Academic Center of Texas Southern University offered its first Summer Math Academy devoted to the AGILE Math method of instruction in the summer of 2007. The effort was supported by a grant from the Texas Higher Education Coordinating Board for Developmental Education Summer Bridge Programs. A search of the eleven available reports on effective math programs yielded a list of 13 best practices, ten of which were incorporated into the TSU Summer Math Academy. The heart of the TSU instructional program was the AGILE Math Program. AGILE Math allows students to begin at their own level of competence determined by pre-test scores and progress at their own pace. Each successive module increases gradually in difficulty, and students do not proceed to the next module until they have displayed mastery of the current exercises. Four student tutors, trained as Supplemental Instruction Leaders according to the University of Missouri, Kansas City model, assist the instructors by sitting in on classes, answering student questions, providing encouragement, and monitoring student data.

Program outcomes were favorable for the 47 student in the THEA preparation cohort. The THEA is a state-mandated college entrance placement test which students must pass in order to take College Algebra. While the overall pass rate for the THEA cohort was 53.2%, students with regular attendance of 20 or more days showed a pass rate of 65.6%. Furthermore, 72.3% of these students were eligible to take College Algebra, including the 53.2% with passing scores and 19.1% with near passing scores who are eligible with a GUAC 101 math tutorial class. This eligibility rate is 10% higher than in previous math components of the TSU Summer Academy program which is eight weeks duration for four hours per day. Thus, the Math Academy approach achieved better results in fewer weeks and with fewer class hours.

The TAKS preparation cohort did not fare as well. The TAKS test is required for students in order to graduate from high school. The overall TAKS pass rate for 35 students was 20%. The AGILE Math program could not be implemented at two area high schools although SI Leaders offered tutoring and mentoring support. At Texas Southern, where the AGILE Math program was offered, students who attended regularly for 20 or more days were significantly more likely to pass TAKS Math with a 75% pass rate. The program outcomes suggest that the TSU Summer Math Academy is an effective approach to enhancing math skill and math test pass rates, but only when the AGILE Math program can be combined with the interpersonal interaction provided by at least four SI Leaders per class. Future programs should include parent participation in order to provide students with increased interpersonal support for mathematics.

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