

DRAFT REPORT

STREAMLINED MATH TO ELIMINATE THE NEED FOR REMEDICATION AT THE COLLEGE LEVEL

By

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ABSTRACT

The original problem for this exploratory research study was to ascertain if a short, intensive six-week project in basic math and introductory algebra would produce a recognizable improvement in the math performance of entering UDC freshmen students as measured by the UDC math placement test.

The students were admitted on a first-come, first-served basis with no prior screening and carried a stipend of \$500 to be paid in two installments. Students also received \$100 as a bonus for perfect attendance, barring any medical emergency and/or any prior medical appointments.

On the pre-test for basic math (005), the mean score for the group (N=10) was 35.6, with the passing score being 70. On the post-test, the mean increased to 63.4 showing an improvement of 78 percent. The results for 015, Introductory Algebra, the pre-test mean for the group (N=11) was 34.45 with a passing score of 86 on the university's placement test. On the post-test, the mean increased to 49.1, and the median improved to 44.0 suggesting that the workshop profited some students more than others. While the difference between the means was not as great for the Introductory Algebra course as for the Basic Math course, the overall percent improvement was almost 43 percent.

Based on the UDC placement test, three students were able to skip the two remedial courses; three others were able to test out of the basic course, and the remaining six showed marked improvement in their readiness for the basic math course. Our own analysis and observations showed that two additional students could have been placed in math 015 (skip one course), but the team decided against it because the students themselves said they needed extra practice. One student, who had passed both the remedial courses placement tests, had many gaps in her math preparation and was grateful for the "refresher course".

Instruction and extensive practice in math alone is insufficient. Ongoing attention must be given to study habits, individual responsibility, attitudes toward authority, organization, and classroom behavior.

We are convinced more than ever before that the students from the District Public High Schools can skip the below-college remedial math courses but more time is needed. We theorize that a period of eight-weeks will be sufficient.

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STATEMENT OF THE PROBLEM

The original problem for this exploratory research study was to ascertain if a short, intensive six-week project in basic math and introductory algebra would produce a recognizable improvement in the math performance of entering UDC freshmen students as measured by the UDC math placement test.

SELECTION OF STUDENTS

Eighty applications were sent to the students who had already been admitted as freshmen for the Fall Semester 2006; five of them could not be delivered because the addresses were incorrect. Most of these students either already had jobs or hadn't yet found a job for the Summer, 2006. Applications were sent out on June 16, 2006 with a deadline to apply of June 28, 2006. The reason for such a short time-frame for students to apply was due to the short notice of funding provided for the project. The students were admitted on a first-come, first-served basis with no prior screening and carried a stipend of \$500 to be paid in two installments. Students also received \$100 as a bonus for perfect attendance, barring any medical emergency and/or any prior medical appointments.

DESCRIPTION OF STUDENTS

The group selected consisted of 18 African American students, but only 12 showed up on the first day of the project. Three of the remaining six tried to enter the program the second week, but could not be admitted because they had missed too much of the program. The six-week project, therefore, consisted of 12 African American students who had applied and been

admitted to the Fall 2006 Freshman class at the University of the District of Columbia (UDC). Apart from their ethnic origin, they were a very diverse group ranging in age from 18 to 50⁺. The 18 to 20 years old students (half the class) had graduated from the District of Columbia Public High Schools (DCPS) during Spring Semester 2006. All of the others had either graduated in prior years from DCPS or completed their GED's recently. There were four males and eight females. One of the females was in a wheel chair and on special medication. Three of the females had very young children (ages from 2 to 18 months), and a fourth one was a grandmother. The males did not divulge any information about children. All of them had some kind of job during the program. Three of them worked the graveyard shift (11:00 PM – 7:00 AM), and therefore often had a very difficult time just staying awake during the class.

Their preparation in basic math and algebra was generally poor with one exception. Study habits, attitudes towards authority, and classroom behaviors at the beginning, with the exception of two of the older students (the veteran, the grandmother) and a younger woman in her thirties were singularly inappropriate for the college classroom and learning. The dress of the younger female students was basically that of going out to a disco on a Saturday evening: tight skirts or slacks, low-cut blouses, lots of splashy jewelry, and spiky heels. The males generally were garbed in baggy pants, oversized sweatshirts, and flashy sneakers.

On the first day of instruction, the lead trainer of our team, Dr. Khatri, discussed with the students the “rules of the road” for classroom behavior, i.e., turning off cell phones, refraining from eating and drinking in the classroom, remaining in one's seat and just plain not getting up and leaving the classroom, and roaming the halls or disappearing in the restrooms, waiting to be called upon to respond to a question or make a comment instead of calling out, refraining from talking or arguing with one another during the classroom presentation or just going to sleep. Easier said than done! With regard to arguing, one day two females loudly cursed each other out and very nearly came to blows. The teaching team immediately responded by stating that this behavior was completely unacceptable and pointed out they were interfering with everybody else's learning, even if they didn't care about their own. This incident apparently had a very sobering effect on them. They became aware they were wasting their own time as well as that of others. Nevertheless, constant reminders had to be given, and sometimes direct challenges to authority had to be dealt with immediately in the class. By the end of the third week, the

progress in class etiquette had dramatically improved although the unacceptable behaviors still erupted from time to time throughout the remainder of the project.

Another difficulty we faced was that the students were easily distracted. The two worst distractions were talking and arguing with each other or talking to themselves instead of listening to or silently thinking through the problem to be solved. These behaviors were particularly difficult to deal with over the course of the project. By the end of the project, however, most of these behaviors were practically gone. Another problem that was hard to control in the beginning was students disappearing to the bathrooms right in the middle of the presentation. Yet another characteristic of the students at the beginning was their giving up quickly when they couldn't immediately see the answer to a problem. One male student commented, "I never studied in high school. I don't know how to." And more than half of the other students nodded their heads in agreement. A week or so later, this same student commented, "I want to learn how to study." Gradually, improvements in their problem solving began to emerge, and their attention spans lengthened.

PROCEDURES

On the first day of the project, the three professors who were in charge introduced themselves, briefly described their backgrounds, and explained each professor's primary responsibility. The goals of the project were explained as well. Placards with the students' names on them had been prepared and were given to them to display during the first three days of the project. Then the students introduced themselves, described their interests and identified their possible majors.

The testing aspect of the project was then explained to them. The pre-test was being given to see where they were in math at the beginning of the project and to help us plan. The post-test would tell us how much they had progressed and where they would be placed in math at the opening of the Fall Semester 2006. The pre-test measured their proficiency on the two remedial math courses, 005 (Basic Math) and 015 (Introductory Algebra). The students were assured that the pre-test results would not pre-determine their placement into either of these remedial math courses. Only the post-test that would be taken after they have completed the project would determine their placement into either one of these courses, or hopefully, their exemption from both of them, and if exempted, the options open to them would be their

enrolment in freshman level math courses. They were free to leave after they finished the test. After the introductory parts, the students were escorted to the testing site and were administered the UDC placement test in math.

Snacks and drinks were provided before the testing, and thereafter for every day of the project, since many of the students came without breakfast. Lunch was provided every Friday. Serving food was important because it (1) showed we cared about their well-being and energy levels; and (2) gave an opportunity to relax and socialize with one another and the faculty. Serving food and drinks proved to be particularly important to several of the students because of working the graveyard shift in their jobs, and they came straight to the project at 10:00 AM. For several other female students with young children (three to six months), their nights were often interrupted by their children's needs. All of the students held some kind of job. Nobody came from an affluent background.

On day 2, the rules for classroom instruction and participation were initially discussed, most of which were elicited from the students themselves. The students were each given a three D-ring binder with tabs and paper. The agenda (see Appendix 1) for the first instructional unit was distributed. Instructions were given as to the placement of the agenda and paper in the appropriate tabs. Throughout the project, all instructional materials, including scratch paper and pencils were supplied by the project. The organization of the notebooks was monitored and checked by one of the faculty each week to make certain all of the students' materials were in a logical order for study as part of the preparation for college.

No calculators were allowed throughout the entire project in order to: (1) demonstrate to the students they could do the problems without a calculator, and (2) build confidence in their own problem solving ability

Fortunately, the results of the students' math placement tests were immediately available. It was clear that, with the exception of one student, we had a long road to travel. It was also clear that to bring changes in classroom behavior was going to be a long and bumpy road as well. A great deal of time had to be spent just maintaining an adequate instructional situation.

In general, the project maintained the following daily schedule of activities:

1. Review and reinforcement of the previous day's tasks and problems with students' active participation.
2. Presentation of new materials with much student participation.

3. Completion of handouts for practice and reinforcement, all of which were immediately checked by the professors. Also, with three professors present, assistance could be immediately given if a student was having difficulty. These activities usually took about an hour and 15 minutes.
4. Break (15 minutes)
5. Presentation of the new material at a more sophisticated level, or, if the students showed real problems with it, re-teaching of the same material with another practice exercise. Sometimes, a different topic was used altogether of about the same difficulty level in order to maintain their interest.
6. Completion of another practice exercise with prompt assistance and scoring available. The students provided answers, and usually came to the blackboard to show how they had worked the problem.
7. As an incentive, bonus points were given for solid problem-solving based on these exercises, which resulted in small cash prizes at the end of each week.
(Activities 5-7 usually took about an hour and 15 minutes)
8. Break (20 minutes)
9. Completion of “homework” assignments. The homework portion of the project was always completed and checked while students were still in the classroom. The requirement meant they would complete all their work for the day and would not have to be struggling with the problems at home, and more often than not, just giving up. (The activity usually took anywhere from 30 minutes to an hour and a half, depending upon the student.)

In total, the project ran about four hours per day. On three successive days, one female student brought her two children because of a problem with child care. One child was six-month old and the other, 18 months. Both were noisy and distracting. After an hour in the project, the disruption necessitated a change in procedure. One of us, Professor Brenda Brown, took the mother, her children, and one other student who had been helping out with the children, into another classroom for their instruction. (It must be noted that bringing very young children to the classes at UDC is not uncommon when day care arrangements fail.) After the completion of each

day's activities, the three professors met to discuss the day's activities and to plan for the following day.

At the end of the project, an exit interview was held with each student to report on the results of the post-testing and to advise them on registration and their first semester's class schedule. As a footnote, we point out that the "tough love" of the project resulted in most of them returning to one of us, Dr. Khatri, for registration a couple of weeks later.

FINDINGS

Two sets of findings are presented here. The first focuses on the mathematics findings. The second set is concerned with their personal growth and development as it relates to their readiness for general college work. Using UDC's placement test, the Accuplacer, Table 1 presents the pre-test and post-test summary statistics for the two below-college level math courses: 005, the basic mathematics, and 015, the introductory algebra course. Highlights of these findings are described as follows:

Mathematics Findings

Table 1: Summary Statistics: Pre-Post Assessment Data

	MATH 005: Basic Math ¹ (N =10)		MATH 015: Intro. Algebra ² (N=11)	
STATISTICS DESCRIPTION	Pre-Assessment	Post-Assessment	Pre-Assessment	Post-Assessment
Mean	35.6	63.4	34.45	49.1
Percent Improvement		78.09		42.48
Standard Deviation	11.95	22.44	10.42	24.48
Range	37.00	83.00	30.00	72.00
Median	30.50	60	32.00	44.00
One-tailed t-test for paired observations		5.82 (4.587) ³		2.26 (2.228) ³

¹ Passing score on UDC Placement Test is 70 for Basic Math

² Passing score on UDC Placement Test is 86 for Intro Algebra

³ The number in parentheses for the t-test are the critical values

1. On the pre-test for basic math (005), the mean score for the group (N=10) was 35.6, with the passing score being 70. The median was 30.5, indicating the mean was pulled up slightly. In this instance two students achieved a passing score and were not included in the analysis. The standard deviation was 11.50, which suggests a fairly homogeneous group to start with. On the post-test, the mean increased to 63.4 showing an improvement of 78 percent. In this instance, the median of 60 is double what it had been on the pre-test. The s.d. was 22.4 which suggest that the instruction profited some of the students more than others, but everyone gained (See Appendix 2 for the actual raw score).
2. Turning to the results for 015, Introductory Algebra, the pre-test mean for the group (N=11) was 34.45 close to the median of 32, and the s.d. of 10.42. The passing score for Introductory Algebra was 86 on the university's placement test. One student passed both the remedial math courses and no specific scores were available for 005, and therefore she was excluded from the analysis. On the post-test, the mean increased to 49.1, and the median improved to 44.0, again suggesting that the workshop profited some students more than others. While the difference between the means was not as great for the Introductory Algebra course as for the Basic Math course, the overall percent improvement was almost 43 percent.
3. Based on the UDC placement test, three students were able to skip the two remedial courses; three others were able to test out of the basic course, and the remaining six showed marked improvement in their readiness for the basic math course. Our own analysis and observations showed that two additional students could have been placed in math 015 (skip one course), but the team decided against it because the students themselves said they needed extra practice. One student, who had passed both the remedial courses placement tests, had many gaps in her math preparation and was grateful for the "refresher course".
4. Students t-ratio for paired observations, using a one-tailed test, was applied to the results of both the pre- and post-test results for 005 (Basic Math) and 015 (Introductory Algebra). The t of 5.82 was significant beyond the .0005 level for 005 math with a critical value of 4.587 at this level with $df = 9$. The t of 2.262 was

significant at the 0.025 level with a critical value of 2.228 with 10 df for the 015 math.

Readiness for College

The findings presented here are qualitative, except for the first one.

1. All of the 12 students who came to the project on the first day completed it, in spite of absences here and there on the part of some of them. For students from their backgrounds and life pressures and demands, this completion of the program was unusual. All too often, students from their backgrounds just tend to drop out.
2. Along the way, they began to feel some real confidence in their ability to solve math problems, and this confidence was reflected in both the time they spent on the math post-test (almost double what they had spent on the pre-test), and of course, their scores. In short, they had lost their fear of math.
3. By the last week of the project, their classroom behavior was attentive and focused. Anybody who disrupted the instruction was viewed as wasting everyone else's time. Peer pressure from the group was now exerting itself in a positive way. Also, most of the students began to comment on what a great opportunity the project had been. All of them individually expressed their appreciation to the three professors during their exit interviews.
4. The dress of the four males and the disco outfits for the five of the six females changed to attire more suitable for a college campus.

CONCLUSIONS AND RECOMMENDATIONS

- We are convinced more than ever before that the students from the District Public High Schools can skip the below-college remedial math courses but more time is needed. We theorize that a period of eight-weeks will be sufficient.
- Instruction and extensive practice in math alone is insufficient. Ongoing attention must be given to study habits, individual responsibility, attitudes toward authority, organization, and classroom behavior. Most of these students came to us with only the barest minimum of all of these aspects. They were street-wise, not college-wise. However, with our persistence and their growing awareness of a college education's

benefits, their readiness for the individual responsibilities and obligations of a college student markedly increased.

As a final note, tracking these students and their academic performances in the first year of their college experience is planned in order to determine their retention rate. Also, they are free to contact any one of us if they care to do so.

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