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Higher placement standards increase course success but reduce program completions

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Abstract

A rigorous placement exam meant to increase the level of math preparation of entering students was introduced into a Developmental Mathematics program. The new exam increased course success rates, retention at the university and enrollment rates in math courses, but it *reduced* completion rates in Developmental Math and in math courses required for a degree. There may be an inverse relationship between course success rates and total program throughput.

Higher placement standards increase course success but reduce program completions

A common requirement for receipt of a Bachelor's degree is completion of a college algebra or statistics course, or some similar course within a group referred to here as standard courses (SC). Successful work in SC depends on a good high school preparation in algebra, a preparation that many matriculating freshmen do not have. This situation has led colleges to implement Developmental Mathematics (DM) courses which are meant to give under-prepared students skills and knowledge necessary to succeed in SC (Miller, 1996).

The University at which this research was done offers a typical sequence of DM courses, Pre-algebra, Beginning Algebra and Intermediate Algebra. At time of matriculation a student's math knowledge is assessed and he or she is either allowed to go into an SC course or is placed into the DM course appropriate for his or her level of ability. Upon succeeding in the first course, the student goes on to the next higher course, and so on until the last course is passed and the student is ready for college courses.

Pivotal in DM is the procedure for initial course placement (Akst & Hirsch, 1991; Matthews-Lopez, 1998; Perin & Charron, 2003). Such a procedure should place students into courses for which they are prepared and in which they are likely to succeed (Armstrong, 1995; Gillespie, 1993; Sawyer, 1997). In the Fall of 2001, the success rate at this university for all students in Beginning Algebra was .38 and in Intermediate Algebra was .43 and so it was decided that the placement procedure was not adequately meeting this criterion. A new placement exam was introduced in order to raise course entry standards and to prevent the

placement of students into courses for which they are not prepared.

Evaluation.

The obvious direct way to determine the value of the new placement procedure would be to examine the success rates in the target courses. Higher success rates would indicate that students were indeed better prepared and that the placement exam had done its job. The DM program, though, is more than separate courses and its success depends on more than particular high success rates. To address the broader question of whether the placement exam improves the whole DM program it is necessary to examine several aspects of student behavior. Proper evaluation of DM must be multifaceted (Akst & Hecht, 1980; Boylan, 2002; Grubb, 2001). Thus, in order to get an overall view of how the DM program had been effected, four outcome measures were selected for evaluation: 1) DM course success rates; 2) retention at the university, 3) rate of completion of SC, and 4) course enrollment rates.

DM success. Low course success rates were the immediate impetus for the new placement procedure and an increase in these rates would vindicate the change. Success rates have been used to measure effectiveness of DM program changes of several types (Best & Fung, 2001; Hector, 1983; Seon & King, 1997) and, in particular, modifications of placement procedures (Armstrong, 1995; Callahan, 1993). Course success rates, however, provide an incomplete evaluation of an entire DM program. They apply only to students who actually take a target course. Students who are not yet eligible for a course, or who do not enroll for other reasons, do not effect this statistic. If, for example, the first DM course filters out a large number of students, so that very few become eligible for the second, the success rate for these few in the second course could be very high. This number by itself would indicate a successful DM

program even though very few students get through it.

Retention. Students are in a DM program because of academic shortcomings in the past and they are at risk for the future. A successful DM program will help students adapt to the academic setting and stay in school. Thus, retention is a another measure of program success (e.g. Brittenham, Cook, Hall, Moore-Whitesell, Ruhl-Smith, Shafii-Mousavi, Showalter, Smith, White, 2003 ; Salter & Nablett, 1994). Retention, however, can be influenced by factors unrelated to the instructional effectiveness of DM. Students taking less demanding DM classes could be happier with their collegiate experience, and therefore have a higher tendency to remain in school even if they fail to reach the goal of passing the SC requirement.

SC completion. The third approach to evaluating a DM program change is through the number of starting students who do indeed meet the goal of passing a required SC course (e.g. Johnson, 1996; Waycaster, 1998). The more students passing SC, the better the program is preparing students for college mathematics. SC completion ratios are related to Boylan's criterion, "grades ... in post [DM] ... courses," (Boylan, 2002, p. 40), but distinct in one major respect. SC completion rates are measured against the total matriculating class, not just those enrolling in SC . It shows, of all students starting in DM, the percentage who meet the SC goal.

Enrollment. Although success in SC is required to graduate, and other incentives encourage enrollment, a student is not compelled to enroll in DM or SC courses in any particular semester. Clearly, course and program completion are dependent on the rate of these voluntary enrollments. Two conditions of enrollment can be distinguished: the initial enrollment, the course of which is determined by the initial placement procedure; and subsequent enrollments, the course of which is determined by the student's previous course success. That is, the first

course in which a student enrolls, Pre-algebra, Beginning Algebra, or Intermediate Algebra is specified by the rules for placing new students. The next and all further enrollments are determined by which course the student has just taken and whether or not he or she succeeded in it. With the introduction of the placement test it is expected that initial enrollments would change, with people not ready for the higher courses moving down into lower ones. The simple expectation for enrollments subsequent to this first, however, is that they would be unaffected by the initial placement.

Overall evaluation. Each of these four measures assesses an outcome that has independent value. If a DM program is not preparing students to succeed in SC, then it is not meeting a fundamental goal. SC completion must be considered in any comprehensive evaluation. A Baccalaureate education, however, is a gradual accumulation of knowledge and skill, each part of which has separate value. If course success rates go up (and enrollments do not decline) then more students are learning and that is to the good even if the total number finishing the program, succeeding in SC, and receiving a degree does not increase. Similarly, staying in school is in itself desirable, since, even if they are not succeeding in math courses or meeting SC requirements, resident students are succeeding in some courses and retain the possibility of succeeding in DM and SC in the future. These four evaluation measures may vary independently, so it must be recognized that a program change, such as the new placement exam, could produce improvements in some and not in others.

Research design.

In the Fall of 2002 a new diagnostic exam for placing Developmental Math students was introduced. In order to evaluate this change, freshmen entering in the Fall of 2001, the last year

of the old placement rules, and those entering in the Fall of 2002 were compared. The general evaluative question, “Did the new placement exam help students?” was analyzed into separate questions about changes in particular aspects of student behavior. Specifically, for each cohort, enrollment and success rates in DM courses, retention at the university, and completion rates in SC, were tracked for three years. The effect of more rigorous assessment and placement on all aspects of DM behavior could then be observed.

Method

Institutional setting.

This study was carried out in an open enrollment, state supported, four year university. Associate and Baccalaureate degrees are offered in standard academic fields as well as in applied areas of education, health professions, engineering technology and business. Fewer than 2% of students are enrolled in Master’s degree programs. Enrollment in Fall semester of 2001 was 16,871 (10,611 FTE). In Fall of 2002 it was 18,059 (11,111 FTE).

Students are primarily Caucasian, with 3.5% Hispanic, 1.6% Asian or Pacific Islander, and fewer than 1% in all other non-Caucasian ethnic groups. Women make up 50.6% of the student body. Most students commute from surrounding counties with only 3% living in on-campus dormitories.

Developmental Math curriculum.

All students with ACT Math scores below 23, or who have not taken the ACT exams because they are foreign, older or fall into some other special category, go into the Developmental Mathematics program. Developmental Math consists of three courses in

prerequisite order: Math 950, Pre-algebra; Math 960, Beginning Algebra; and Math 1010, Intermediate Algebra; plus a fourth course, Math 955, Integrated Arithmetic and Algebra. Math 955 covers the material of both Math 950 and Math 960 and thus is an alternative prerequisite course to Math 1010. Students in the Developmental Math program must successfully complete Math 1010 in order to take a standard course, College Algebra, Introduction to Statistics or Contemporary Mathematics, one of which is required for a Baccalaureate degree.

If a student receives a C or better he or she may advance to the next course, otherwise the course must be repeated. Enrollment is not required and in any semester students are free to enroll, or not enroll, in the next course in the DM program. It is not unusual for students to stop out from the university altogether for one or more semesters.

Math 950, Math 955 and Math 960 are completely standardized across the department. Common examinations and examination dates are used across all sections and a department rubric is used in scoring exams. 85% of the course grade is determined by scores on these exams according to explicit departmental rules. Throughout the period of this study a single textbook series was used for these courses, although new editions were adopted as they came out. New exams were constructed each semester, but all were based on the test generation system provided with the textbook. Math 1010 is also standardized in this way, but along two distinct textbook lines.

Students do not always follow curricular rules and sometimes enroll in the “wrong” course, one higher, or in some cases lower, than that permitted by prerequisite rules. This phenomenon has been reported at other universities (Gabe, 1989; Johnson, 1996), and is due to at least three sources at this institution: a) failures of the prerequisite checking routine in

computer registration; b) waivers granted by advisors and c) COMPASS retake scores which move a student to a higher course. Enrollments which do not follow the prerequisite rules are called “exceptions” or “exceptional enrollments.”

Placement testing.

Up until the Fall of 2002, and in particular for the freshmen starting in 2001, initial placement into math courses was determined by entering ACT Math scores. Students with scores below 15, and those with no ACT Math score, went into Math 950, those with 15 or 16 into 960 and from 17 to 22 into Math 1010. (Math 955 was introduced in 2002.) Under the new rules all students with ACT Math scores below 23, by default, start in Math 950, or Math 955. If they wish to start in a higher course they can take the placement exam, COMPASS, an adaptive, computer-based test from ACT (ACT, 2005). Compass results are reported as scores within content levels of mathematics which are then translated into particular course placements. It is possible to achieve a high enough COMPASS score to avoid the DM placement and go straight into SC. COMPASS tests are given on computers at the university Testing Center where students can take the test at any time, including evenings and weekends. Since it is an adaptive test, administration times can vary, but seldom exceed an hour.

Data analysis.

Records for all freshmen matriculating in the Fall of 2001 and the Fall of 2002 were examined. Transfer students were excluded from the study. Primary analyses were performed on those students who had ACT Math scores below 23, or who had no recorded ACT scores, and who therefore were required to enter the Developmental Mathematics program. Math course work was tracked for the first three years for each cohort separately, Fall 2001 through Spring

2004 for the first cohort, and Fall 2002 through Spring 2005 for the second.

First course enrollments and successes, those determined by the placement procedure, and subsequent enrollments and successes, those determined by course history, were examined separately. New students, in their first enrollment go into one of three categories of courses, Math 950-55, Math 960 and Math 1010. (Because the 2001 cohort was not offered Math 955, the Math 950 and Math 955 enrollment options were combined as equally available to any student in the lowest placement category.) Note that the first course enrollment need not occur in the first semester since students are free to put it off as long as they wish. The ratio of first-time enrollees to original matriculators was computed for each course choice, for each year.

After the initial course, students were categorized based on the course for which they were eligible. Students who had not succeeded in Math 950 or Math 955 were eligible to repeat Math 950 or Math 955. Students who had succeeded in Math 950, or who had failed to succeed in Math 960, were eligible to take Math 960, and so on. The most recent course taken and the result, success or non-success, determined, according to curricular prerequisite rules, a single next course for which the student was eligible. Students who were successful in Math 1010 became eligible for SC and those who succeeded in an SC became “completers.” The ratio of completers to matriculators is the SC completion rate.

Exceptional enrollments complicated these computations somewhat. Only enrollments which followed curricular rules are included in determining course enrollment rates. Students who enrolled in a course for which they were not eligible were counted as exceptional enrollees and moved into the state determined by the outcome of their exceptional enrollment. For example, a student eligible for Math 960 who enrolled in Math 1010 became eligible for Math

1010, or an SC, depending on whether or not they succeeded, but their enrollment was counted as exceptional and not Math 1010 or Math 960.

Retention.

Matriculation, here, is defined as initial attendance at the university after admittance, so for the first semester retention is, by definition, 100%. After this matriculation semester students are free to come back, or not, for an indefinite number of semesters. Retention is measured for each semester as the number of students who registered for any class that semester divided by the number of initial matriculators. Due to a retrieval error, retention information was lost for the Summer 2004 semester for the 2002 cohort. A comparison retention figure was also computed for non-DM students in each cohort, that is, those with ACT scores above 22.

For each cohort, data were grouped and analyzed separately by year. Specifically, years one and two included Fall, Spring and Summer semesters. The third year included Fall and Spring semesters.

Results

Of the 2636 new freshmen in 2001, 1954 went into DM. Comparable numbers for new freshmen in 2002 were 2791 and 2067.

Entering math abilities.

ACT scores were used to compare the entering abilities of the two freshmen cohorts. Score values at decile points were determined for the distributions of ACT scores for each. These values were the same for the two distributions at all deciles from 10 to 90. For each group of incoming freshmen 74% scored lower than 23 on ACT Math and therefore were required to go into Developmental Math. Of those who had ACT scores the mean score for the 2001 cohort

was 17.95 (SD = 2.43). For the 2002 cohort it was 17.93 (SD = 2.50). The two cohorts did not differ in entering math ability as measured by ACT Math.

COMPASS test results.

Only 246 or 12% of the cohort of 2067 in the 2002 DM cohort had taken the COMPASS exam before the end of registration in Fall of 2002. Two years later the total had risen to 436 or 21%. Thus, many students were accepting the default placement in Math 950 or 955, the lowest tier of courses. Table 1 shows the proportion of total exam placements in each course category at each point in time, as well as the proportion of actual enrollments in the first two years. A comparison of the first two columns in this table shows that COMPASS placement changes little over two years. Students who wait to take the exam have similar math skills as those who take it immediately. Actual enrollment proportions are higher than COMPASS placements for Math 950 and 955 and lower for Math 960, suggesting that some students are in the bottom courses by default and would have gone into Math 960, had they bothered to take COMPASS. Enrollments in Math 1010 higher than COMPASS would have placed, however, are not consistent with this interpretation.

Evaluation of new placement rules.

Statistics reported in the following are proportions, numbers of students meeting some criterion divided by the total number eligible. Specifically, they are the number of initial enrollments/number within the cohort, the number of subsequent enrollments/number eligible for enrollment, number succeeding/number enrolling, the number registering for semester/number in cohort and the number completing SC requirement/number in original cohort. Group sizes are sufficiently large that normal approximations to the binomial are used for making inferences.

Enrollments. Initial enrollments, determined by placement testing, are shown in Table 2. Subsequent enrollments, determined by past course success, and exceptional enrollments are shown in Table 3. For Table 2 enrollment rates are based on the entire cohort. So, for example, Table 2 shows that .16 of the 1954 students in the 2001 cohort enrolled in Math 960 during their first year. Rates in Table 3 are based on the number of students eligible for each course who actually enrolled. For example, 77 of the 2001 cohort had succeeded in Math 950 and 311 had failed Math 960 in the first year. Of these 59, or .15, enrolled in Math 960 as is shown in Table 3. Finally, the exceptional enrollments in Table 3 are computed by dividing the number of enrollments, after the first, which did not conform to prerequisite rules by the number of students who had completed their first course, but not yet completed SC.

If fewer students placed in higher courses means that placement rules are more rigorous, then the new placement testing is definitely more rigorous. From 2001 to 2002 there is a clear movement of students from Math 1010 and Math 960 down to Math 950. Enrollment differences were significant at the .001 level for all three courses. Total enrollments, however, did not change. The new placement exam changed the first course that students take, but not the probability that they would take that first course. Initial enrollments declined to near zero over the observation period, suggesting that few new enrollments will occur after 3 years.

Introduction of the placement exam increased the probability that students would take subsequent courses. Table 3 shows that enrollments after the first were higher in the 2002 cohort for Math 960, Math 1010, Math SC and for the total of all DM and SC courses. That is, once they got into the program, 2002 students stuck with it better than those under the old system. For both cohorts re-enrollment goes up with the course level, with the highest being for SC, and for

both cohorts re-enrollment rates for Math 950 and Math 955 are very low. Finally, it is noted that re-enrollments, even at their best, are below .50. The average student is not trying to meet DM and SC requirements quickly.

Exceptional enrollments increase slightly across the three years, but remain low for both cohorts. They do not appear to be a major influence on student progress.

Success rates. Success rates for each cohort for the first three years are presented in Table 4. Rates are shown for the three levels of DM courses, Math 950-955, Math 960 and Math 1010, for SC and for the total of all SC and DM courses. Students in the 2002 cohort, under the new placement system, succeed in Math 960 and Math 1010 at a distinctly higher rate than those in 2001 under the old placement system. In the bottom level courses and in SC success is identical for the two cohorts across the three year study period. The sum effect is a significant increase in total success rate after the implementation of the new placement procedure. The advantage for the 2002 group declines across the observation period as the effect of the placement exam wanes and that of previous course experience waxes.

Retention. The proportion of the originally matriculating students who registered for any class during non-summer semesters are shown in Table 5. A total registration rate was computed by adding all registrations for the five Fall and Spring semesters following the first Fall, and dividing this by the total possible registrations, that is, five times the number in the cohort. Similar rates for the non-DM students, those with ACT scores above 22 who were not required to take DM courses are also shown in Table 5.

The non-DM students were more likely to stay at school than the DM students. This supports the view that DM students are at risk and may need extra support to persevere.

Students under the new placement system did register at a small, but consistently and in totality significantly, higher rate than those under the old. The effect appears even stronger when an opposite trend is noted for the non-DM students, who in the 2002 cohort were significantly *less* likely to register in later semesters than those in the 2001 cohort. Under the new placement system DM students are retained at 88% of the level of the non-DM students, compared with 80% in the old.

SC completion. Figure 1 shows the proportion of the each cohort who had reached the goal state of succeeding in SC for each of the 8 semesters of the study. In the first semester a relatively high number of the 2002 cohort made an exceptional enrollment in a QL class, so the total yield is higher for this cohort in the first two semesters. This early advantage disappears and after 8 semesters the total yield is higher (difference = .0179, sd (diff) = .011, $p = .0571$) for the 2001 cohort. The new placement system reduced the number of students meeting the QL requirement.

It might be expected that the new placement rules would set more students back in the DM course sequence, so that fewer would get to SC in the first few semesters even though more of them would ultimately meet the requirement. If this were the case then a larger proportion of the 2002 cohort might be one step back, finished with the DM sequence, but not yet finished with SC. The proportion of students who had succeeded in Math 1010 but had not succeeded in SC for each cohort and each semester is shown in Figure 2. The 2001 cohort has the advantage here also. After 8 semesters a significantly greater proportion of students working under the old placement rules have completed DM, than those working under the new ($p < .05$).

Discussion

In certain clear ways the DM program was improved by the higher placement standards imposed by the new exam. Success rates in the two higher DM courses, Math 960 and Math 1010 went up a marked and significant degree. Success rates in the lowest level courses and in the ultimate SC courses have not increased, but that is to be expected. With the placement exam more math ability is required to get into Math 960 and Math 1010, only. Math 950 and Math 955 remain open to all students and so no increase in average entering ability would occur. Those going into SC have completed the DM course sequence and their success will depend on the way these courses are taught and not on the exam which determines initial entrance. Thus, success rates increased in the two courses where it would be expected.

Retention also increased. The 2002 cohort registered for at least one class in the eight semesters after matriculation 47% of the time, as opposed to 45% of the 2001 cohort. This 2% difference represents more than 190 additional students on campus over three years. This difference should be interpreted with caution, since different time periods are used in the comparison, Spring 2002 to Spring 2004 for the 2001 cohort and Spring 2003 to Spring 2005 for the 2002 cohort. Economic or other external factors could cause the groups to stay or leave school at different rates. The fact that the non DM students showed the opposite trend, the 2001 group were more likely to stay than the 2002 group, makes a confounding factor explanation less plausible. It appears that under the new system DM students are more likely to stay in school.

Finally, the new system improves student behavior in a way which was not anticipated. Once students have started to take courses, they re-enroll in the next course at a higher rate. This effect may be related to the higher success rates in the 2002 cohort. It would seem likely that

students who have succeeded in a course would be more willing to enroll in the next one, than would students who have failed a course and must retake it. Since the 2002 students are succeeding more, they enroll more.

All of these benefits, however, do not result in more students completing the required SC or even in completing DM. In fact, after 8 semesters the 2002 cohort is distinctly behind the 2001 cohort in the proportion of completing students. How higher success, higher retention and higher re-enrollment could result in lower completions can be understood entirely from the initial enrollment figures. On the average the 2002 cohort starts much farther back in the course sequence, primarily at the lowest course level. Although they are moving faster through the curriculum, succeeding and enrolling at higher rates, they have much farther to go than the 2001 cohort, that mostly started at a higher level, and it does not appear that they will catch up.

Two placement systems were compared, the lenient procedure of 2001 which allowed a large number of questionably prepared students into higher level courses and the more rigorous one of 2002 which put most students into the bottom level courses. The two appear to have benefitted different groups of students in different ways. The lenient 2001 rules allowed many more students to try their hand at the highest courses. They were, on the average, not as prepared as the 2002 students and did not succeed at as a high a rate, but those who were prepared, or who put in the effort to overcome their lack of preparation, were able to get through the program faster and thus benefitted from the lenient placement. Their fellows in the 2001 cohort who could not make it with the higher course placements, however, fared more poorly. They were less likely to enroll and less likely to succeed in successive courses and they were less likely to return to the university than students under the more rigorous placement procedure.

Under the 2002 rules students were more likely to be placed into courses in which they could succeed. Their higher success was related to greater satisfaction with the DM program as evidenced by the higher enrollments, and greater comfort in the academic setting, as evidenced by the higher retention. The more rigorous placement rules of 2002, in other words, kept more students within the high school curricular level where they were more comfortable and persistent. Unfortunately, they were also less likely to advance out of this level and succeed in SC than were the students of 2001.

Differences between the two cohorts are similar to differences noted between students in mandatory versus optional placement systems (Akst & Hirsch, 1991; Boylan, Bliss, & Bonham, 1997; Zeitlin & Markus, 1996). At some universities course placement prescriptions are advisory and need not be followed by the student. Boylan et al (1997) found that mandatory placements produce higher pass rates and higher retention than those that are optional. Presumably, when placements are optional a certain number of unprepared students take their chances at courses above their ability and fail at a high rate. Students who have no choice and are forced to go into the lower level courses do better on the average. Similarly, students in the 2002 cohort were forced to take lower level courses and showed advantages similar to those of mandatory placement students over optional placement. This comparison, however, suggests that the higher success and retention rates for mandatory placement might be associated with lower completion rates as they were in this study.

Mandating student behavior.

In general, systems which induce higher course success through high placement standards may have reduced completion rates and vice versa. The challenge is to engineer

systems which could optimize both course success and program completion. One option which is often discussed is to put more restraints on students to force them to take the correct path. At this university, for example, rules could require students to take the placement exam, so that more of them would start at a higher course level; and require them to enroll in DM or SC every semester, so that they would move more rapidly through the curriculum.

Requirements, such as these, may be beneficial, but there are potential dangers. Forced enrollment might bring in students who are not ready and thereby reduce success rates, and it might scare students away from the university and thereby reduce retention. Finally, before imposing extensive requirements, the ambitious, resourceful student should be considered. A person with weak credentials but high motivation and willingness to work may, through extra effort, be able to jump ahead and succeed in higher level courses than those prescribed. Gabe (1989) has identified such students and they were in evidence in the present study as exceptional enrollees who succeeded above their prerequisite level. A highly restrictive system may inhibit these go-getters.

Conclusion.

Imposition of a rigorous placement exam wrought clear improvements in some aspects of DM. It also, however, reduced the number of students who met college degree requirements. This study illustrates the value in multiple evaluation measures for a DM program. A single assessment would have obscured the complex effects of the new exam. Unfortunately, knowing the whole truth does not make future decisions easier. The results suggest an inverse relationship between DM success and retention on the one hand, and completion of SC on the other. Either the university can optimize student retention and mastery of the DM course

material, or it can optimize the number of students meeting Baccalaureate requirements for math.

This is not to suggest that further program changes might not be found which could optimize both outcomes. Requiring students to take the placement exam and then requiring them to enroll in DM and SC courses until requirements are met are candidates for such changes.

Until tested and validated against a battery of student behavioral measures, however, the effectiveness of added requirements cannot be known.

References

- ACT. (2005) COMPASS/ESL. May 23, 2005. <http://www.act.org/compass>.
- Akst, G. & Hecht, M. (1980) Program evaluation. In A. S. Trillin & Associates (Eds.). Teaching basic skills in college (pp. 261 - 310). San Francisco, CA: Jossey-Bass.
- Akst, G. & Hirsh, L. (1991) Selected studies in math placement. Research in Developmental Education, 8, (4), 3 - 6.
- Armstrong, W. B. (1995) Validating placement tests in the community college: the role of test scores, biographical data, and grading variation. Paper presented at the Annual Forum of the Association for Institutional Research, Boston, May 1995. (ERIC Document Reproduction Service No. ED 385 324)
- Best, L. & Fung, T. y. (2001) A report on student achievement in a pilot program for developmental students. Research and Teaching in Developmental Education, 18 (1), 15 - 23.
- Boylan, H. R. (2002) What works: research-based best practices in developmental education. Boone, NC: National Center for Developmental Education.
- Boylan, H. R., Bliss, L. B. & Bonham, B. S. (1997) Program components and their relationship to student performance. Journal of Developmental Education. 20 (3), 2 - 8.
- Brittenham, R., Cook, R., Hall, J. B., Moore-Whitesell, P., Ruhl-Smith, C., Shafii-Mousavi, M., Showalter, J., Smith, K., & White, K. (2003) Connections: An integrated community of learners. Journal of Developmental Education, 27 (1), 18 - 25.
- Callahan, S. (1993) Mathematics placement at Cottey College. Paper presented at annual conference of the American Mathematical Association of Two-Year colleges. Boston,

November 1993. (ERIC Document Reproduction Service No. ED 373 813)

Gabe, L. C. (1989) Relating college-level course performance in ASSET Placement scores. (Institutional Research Report Abstract RR89-22). Fort Lauderdale, FL; Broward Community College. (ERIC Document Reproduction Service No. ED 309 823)

Gillespie, M. (1993) Placement testing in community colleges: a response to Hughes and Nelson. Community College Review, 40 (4) , 59 - 69.

Grubb, W. N. (2001) From Black Box to Pandora's Box: Evaluating remedial/developmental education. Community College Research Center Brief, No. 11, February 2001. (ERIC Document Reproduction Service No. ED 455 865)

Hector, J. H. (1983) A base rate approach to evaluating developmental mathematics and English courses at a community college. (ERIC Document Reproduction Service No. ED 229 087)

Johnson, Laurence F. (1996) Developmental performance as a predictor of academic success in entry-level college mathematics. Community College Journal of Research and Practice, 20, 333-344.

Matthews-Lopez, J. L. (1998) Mathematics placement testing: Is it really necessary? (ERIC Document Reproduction Service, No. ED 457 165)

Miller, K. J. (1996) Developmental education at the college level. Phi Delta Kappa Fastback No. 404. Bloomington, IN: Phi Delta Kappa Foundation.

Perin, D. & Charron, K. (2003) Trends in community college assessment and placement approaches: implications for educational policy. Paper presented at annual meeting of the American Educational Research Association, Chicago, April 2003. (ERIC Document

Reproduction Service No. ED 478 367)

Salter, R. & Noblett, A. (1994) The role of institutional support in developmental studies student retention. Paper presented at the NADE Conference, Kansas City, March 1994.

Sawyer, R. (1997) Indicators of the effectiveness of developmental course placement systems in college. Paper presented at the annual meeting of the National Council on Measurement in Education, Chicago, March 1997. (ERIC Document Reproduction Service No. ED 413 359)

Seon, Y. & King, R. (1997) Study skills can make a major difference. Paper presented at 23rd annual conference of the American Mathematical Association of Two-Year Colleges, Atlanta, Georgia, November 1997 (ERIC Document Reproduction Service No. ED 417 791)

Waycaster, P. (1998) Student should spend sufficient time on developmental mathematics. Inquiry, 2 (1), 26 - 31.

Zeitlin, A. N. & Markus, T. C. (1996) Should remediation be mandatory in the community college? Community Review, 14, 27 - 33.

Table 1

COMPASS placements and actual enrollments, proportion of total.

	COMPASS placement before 1 st enroll	COMPASS placement after 2 years	actual enrollment in first 2 years
Math 950 or 955	.62	.66	.68
Math 960	.26	.25	.14
Math 1010	.06	.05	.12
above DM	.06	.04	.06
total n	246	436	1157

Table 2

Enrollment rates for initial course for 2001 and 2002 cohorts.

	year 1	year 2	year 3
Math 950 -955			
2001	.05	.04	.02
2002	.31	.06	.02
<i>sig of difference</i>	<i>.001</i>	<i>.01</i>	<i>no</i>
Math 960			
2001	.16	.01	.00
2002	.07	.01	.00
<i>sig of difference</i>	<i>.001</i>	<i>no</i>	<i>no</i>
Math 1010			
2001	.22	.04	.00
2002	.06	.01	.00
<i>sig of difference</i>	<i>.001</i>	<i>.001</i>	<i>no</i>
SC courses			
2001	.01	.01	.00
2002	.02	.01	.00
<i>sig of difference</i>	<i>.01</i>	<i>no</i>	<i>no</i>
all DM and SC			
2001	.44	.10	.03
2002	.46	.09	.03
<i>sig of difference</i>	<i>no</i>	<i>.no</i>	<i>no</i>

Table 3

Enrollment rates after initial course for 2001 and 2002 cohorts.

	year 1	year 2	year 3
Math 950 -955			
2001	.02	.06	.09
2002	.08	.07	.07
<i>sig of difference</i>	<i>no</i>	<i>no</i>	<i>no</i>
Math 960			
2001	.15	.10	.11
2002	.33	.17	.12
<i>sig of difference</i>	<i>.001</i>	<i>.001</i>	<i>no</i>
Math 1010			
2001	.17	.18	.15
2002	.20	.28	.22
<i>sig of difference</i>	<i>no</i>	<i>.001</i>	<i>.001</i>
SC courses			
2001	.31	.33	.30
2002	.32	.40	.44
<i>sig of difference</i>	<i>no</i>	<i>.05</i>	<i>.001</i>
all DM and SC			
2001	.19	.17	.15
2002	.22	.20	.18
<i>sig of difference</i>	<i>.01</i>	<i>.01</i>	<i>no</i>
Exceptional enrollments			
2001	.02	.04	.06
2002	.03	.03	.04
<i>sig of difference</i>	<i>.05</i>	<i>no</i>	<i>.01</i>

Table 4

Course success rates for 2001 and 2002 cohorts.

	year 1	year 2	year 3
Math 950 -955			
2001	.60	.50	.51
2002	.58	.48	.46
<i>sig of difference</i>	<i>no</i>	<i>no</i>	<i>no</i>
Math 960			
2001	.38	.61	.48
2002	.65	.61	.50
<i>sig of difference</i>	<i>.001</i>	<i>no</i>	<i>no</i>
Math 1010			
2001	.42	.39	.54
2002	.51	.58	.54
<i>sig of difference</i>	<i>.01</i>	<i>.001</i>	<i>no</i>
SC courses			
2001	.68	.72	.71
2002	.77	.73	.64
<i>sig of difference</i>	<i>no</i>	<i>no</i>	<i>no</i>
all DM and SC			
2001	.45	.52	.57
2002	.60	.59	.54
<i>sig of difference</i>	<i>.001</i>	<i>.01</i>	<i>no</i>

Figure Captions

Figure1. Proportion of students completing SC by semester for 2001 and 2002 cohorts.

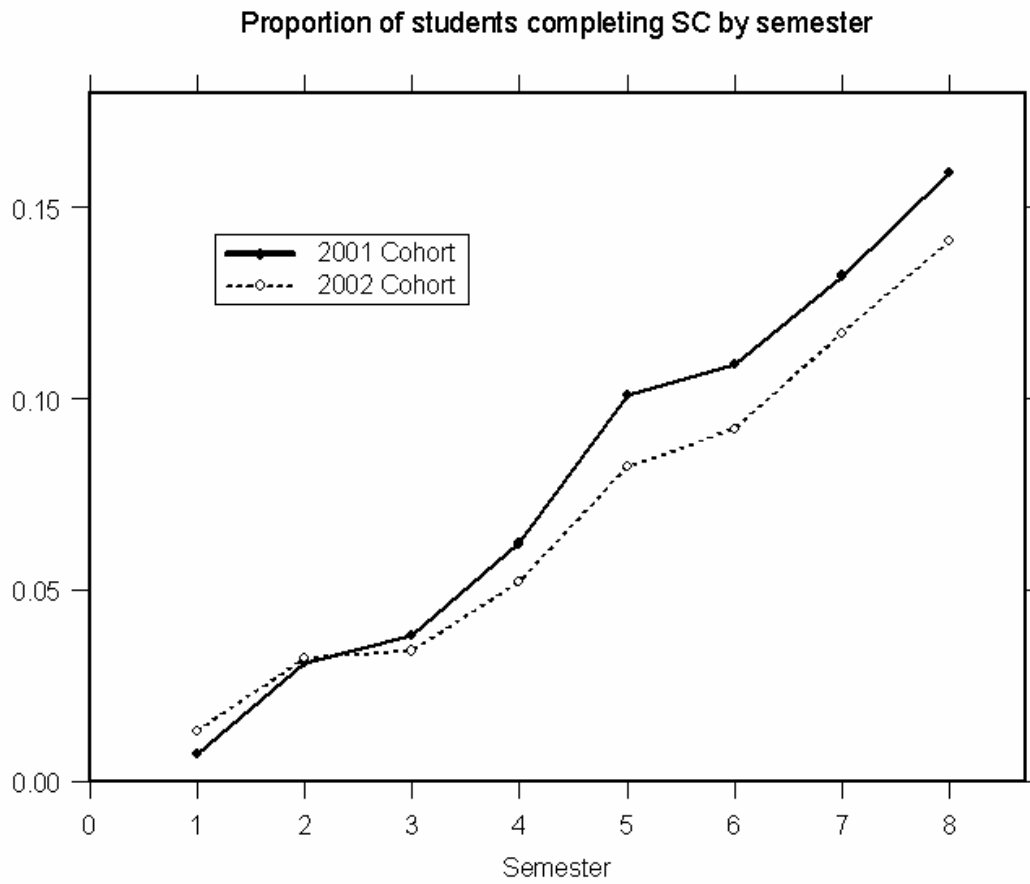


Figure 2. Proportion of students completing DM but not SC by semester for 2001 and 2002 cohorts.

