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ABSTRACT

This paper describes a Developmental Education Outcomes Study being conducted for 21 Minnesota state community colleges. The goals of the study were to examine the academic performance of students placed into developmental reading, writing, and mathematics courses and to identify areas where improvement was needed. Subjects were all 20,543 post-high school students who were assessed and enrolled in any of Minnesota's 21 community colleges during Fiscal Year 1992-93. Students were categorized as either college-prepared students, successful developmental course completers, or developmental course non-takers. The outcomes of developmental courses were examined by analyzing differences in three career academic performance measures--the ratio of credits earned to credits attempted, cumulative grade point average, and persistence rate. Students who successfully completed the developmental reading, writing or mathematics course sequence achieved significantly higher on all career performance measures than students who did not take the recommended course sequence. Developmental Course Completers performed as well as or better than the students originally classified as college-prepared. Implications of the high levels of non-compliance with developmental placements, especially in reading, are discussed. (Contains 29 references.)(DB)

DEVELOPMENTAL EDUCATION OUTCOMES

AT

MINNESOTA COMMUNITY COLLEGES

A Paper
Presented at the
Annual Forum of the
Association for Institutional Research
May, 1996

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Jean Endo
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AIR Forum Publications

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ABSTRACT

This paper describes a Developmental Education Outcomes Study conducted for twenty-one State Community Colleges. The goals of the study were to examine the academic performance of students placed into developmental reading, writing and mathematics courses and to identify areas where improvement was needed. The outcomes of developmental courses were examined by analyzing differences in three career academic performance measures, the ratio of credits earned to credits attempted, cumulative grade point average, and retention and a course pass rate. Students who successfully completed the developmental reading, writing or mathematics course sequence achieved significantly higher career performance measures than students who did not take the recommended course sequence.

INTRODUCTION

In 1988, the State Board for Community Colleges adopted an educational mission statement that identified developmental education as the program which enables students "to improve basic learning skills which thereby furthers the achievement of personal educational objectives." Thus, the Board challenged developmental educators at the twenty-one Minnesota Community Colleges to improve student success rates and to define student success as achievement of educational objectives within college-level academic work.

The Minnesota Community Colleges responded to this by developing comprehensive and integrated developmental education programs. The programs included assessment and placement, developmental courses, and academic and student support. In addition, the Community College System undertook a Student Success Initiative in 1991 which provided additional funding and staff support to colleges for program and curricular improvements intended to increase the numbers and proportion of students who are retained and succeed in the college-level program and for research on student success. One of the major curricular improvement efforts was a two-year initiative to define college readiness skills in reading, writing, and mathematics in explicit and concrete terms. (See Community of Classrooms: A Handbook for Preparing Students for Reading and Writing in College, 1994; and Foundations for College Mathematics, 1995, for more detail.)

The State Board for Community Colleges revisited its policy in 1993 and added a provision that required students who score below minimum standards to complete developmental coursework before enrolling in the college-level courses, beginning Fall 1995. The policy became known as Placement for Success and was understood to be a mandatory placement policy. Minimum standards for college-level work were established by statewide faculty committees. Two studies translated the minimum standards into a range of assessment test scores. (See Reading and Writing Standards Setting Study, 1994 and Mathematics Standards Setting Study, 1994.)

A program of developmental education for underprepared students represents a significant investment for Minnesota Community Colleges. Costs for developmental direct instruction were $6,248,000, or 8.9 % of the total community college direct instructional budget in 1992-93. An additional $2,300,000 were spent on personnel and non-personnel costs for support programs including program coordination, assessment, and tutoring/learning centers. (These support programs serve both developmental and college-ready students.) The 3,137 Full Year

Equivalent (FYE) in developmental courses represented 8.9 % of the total 35,150 FYE in Minnesota Community Colleges during 1992-93.

THE CONTROVERSY

Underprepared students long have been a concern of American colleges and universities. In 1849, the University of Wisconsin implemented the first "preparatory department" and a similar program developed shortly thereafter at Vassar College (Brier, 1984). Today, over 90 percent of all public colleges and universities offer at least one developmental course (National Center for Education Statistics, 1991). Despite that long tradition and the worthiness of such a philosophical and resource commitment, developmental education remains a controversial component of Minnesota community colleges and of American higher education (Boylan, 1988; Clowes and Levin, 1989; Abraham, 1992; Seybert, 1992).

Proponents point to developmental education as an example of how colleges and universities have embraced the challenge to democratize higher education, affording students not only access to higher education but also a reasonable chance of success and an opportunity to overcome the barrier of lack of adequate preparation (Ellifson, Pounds, and Stone, 1995). Expanding higher education opportunities to previously underserved populations was the impetus for the community college movement. The community colleges' open admissions policies have resulted in student populations with diverse demographic characteristics, socio-economic backgrounds, educational objectives, and academic preparation and skills (Clowes and Levin, 1989).

However, developmental education is at the center of conflicting objectives regarding higher education:

- Open access policies as the embodiment of democratic principles versus the tradition of higher education as a tool to stratify the population;
- The commitment to the success of all students versus the presumption that rigorous academic standards separate the more able from the less able;
- The value of what the college can do for the student versus the value of what the student brings to the college as a measure of institutional quality.

Developmental education has become the institutional fulcrum that balances the commitment to access and student success with the commitment to program quality and high academic standards. As a result, when appropriate questions are asked about the effectiveness of developmental education programs, it is often difficult to separate the

questions of will and purpose (i.e., should such programs exist?), from questions of utility and effectiveness (i.e., are these programs achieving their goals?).

Developmental education programs, in justifying their existence, must do more than acknowledge their role in providing educational access and opportunity. They also must demonstrate their utility in preparing students for rigorous academic experiences (Tomlinson, 1989; Ellifson, Pound, Stone, 1995). As policy makers explore new ways of funding higher education, including outcomes for student learning and performance-based funding (Ewell, 1987, 1991; Seybert, 1992), demonstrating the effectiveness of developmental programs will become a requirement.

LITERATURE REVIEW

Although it is well-documented (Cross, 1971; Roueche and Kirk, 1973; Astin, 1975; Zwerling, 1976) that underprepared students have the highest attrition rate of any group, at the same time, numerous studies also have documented the positive effects of developmental education for this group. Developmental education has positive effects on underprepared students' persistence, grade point average, and the average grade in the first college-level course. Examples of such state or systemwide studies have been done in New Jersey, Tennessee, Colorado, and Texas. Notable examples of institutional studies with similar findings were done at Sinclair, Mercer, and Grayson community colleges.

A recent national study of developmental education at 116 two- and four-year institutions, conducted by the National Center for Developmental Education, found a clear relationship between participation in developmental programs and retention for underprepared students (Boylan and Bonham, 1992). Kulik, Kulik, and Shwalb (1983) in a meta-analysis of 300 programs found that a substantial majority of the studies report positive effects for developmental education programs, including improved GPA and short term persistence. Boylan's (1983) review of over 60 evaluation studies and Burley's (1994) meta-analysis of thirteen studies report improved retention rates and improved GPA.

Models for Research Design

Research on developmental education is often criticized for its limitations in terms of generalizability, quantity, and quality (Boylan, 1983; Alfred and Lum, 1988; Seybert, 1992, Burley, 1994). A most basic dilemma is how colleges define the minimum standard of readiness for college-level work Underpreparedness is, by

definition, relative to an expected norm, but that norm varies from college to college, and from discipline to discipline within a single college.

The variability of students, standards, and programs has resulted in no generally accepted model for assessing developmental education outcomes (Budig, 1986). Several meta-analyses of research studies (Smith, 1983, Cantler, 1993; Kulik, Kulik, and Shwalb, 1983) found that a single group pretest/posttest is the most commonly used design for assessing developmental education programs. Although this design has the advantage of simplicity and readily available measures, it has been criticized for addressing the skill deficient population only and for using two forms of the same test as its only indicator of effectiveness (Budig, 1986).

The best models for research design, according to Akst and Hecht (1980), used multiple indicators, compared developmental students to other student groups and monitored student academic progress over time. Specifically, developmental education student performance was compared to that of college-prepared students and/or to developmental students who did not complete the recommended coursework. Alfred and Lum (1988) identified research on multiple institutions as a necessary contribution to the literature on the outcomes of developmental education. Akst and Hecht (1980) recommend a comprehensive assessment that includes pre-program measures such as test scores, short-range post-program measures such as final grades and developmental course completion, and long-range post-program measures such as grade point average (GPA), persistence, and credits earned (p. 56).

THE MINNESOTA STUDY

The Minnesota study examines outcomes of developmental education programs at all 21 Minnesota Community Colleges. It reports the characteristics of new entering students, including their levels of basic skills preparedness and their participation and performance in developmental education programs. It monitors over a two-year period and compares the academic performance and persistence of students who completed developmental reading, writing, and/or mathematics courses with that of college-prepared students and students who did not complete the recommended developmental coursework. (At this time, the Placement for Success Policy was not in effect.) Outcomes are reported for persistence, GPA, the ratio of credits earned to credits attempted, and pass rates in college composition and several mathematics courses.

This study is consistent with the state of the art analysis of developmental education programs. It uses multiple group comparisons and multiple indicators of performance and tracks students' progress over time at several institutions. The comparison of those who needed developmental courses and took them with those who needed developmental courses and did not take them is, in fact, an improvement on many of the analyses reported in the research literature. Few other studies of this size have successfully monitored the progress of noncomplying developmental students.

The primary purpose of this study is to examine the extent to which developmental education programs increase student success. As such, it responds to the following research questions:

(1) Do students take the recommended developmental coursework?;

(2) Are students who complete developmental coursework succeeding and persisting in college?; and

(3) Are there differences in success rates and persistence among the student classifications?

Study Cohort

The subjects of this study were the entire population of 20,543 post-high school students who were assessed and enrolled in one of Minnesota's 21 community colleges during Fiscal Year 1992-93. Fifty-seven percent of these students were females, 11 % were members of a non-white ethnic group, and 65 % were under 25 years of age. These students participated in the community colleges' incoming student assessment program, which administers The College Board's Descriptive Tests of Language and Mathematics Skills for course placement and advising.

Student Classifications

Students in the cohort were classified within three content areas (reading, writing, and mathematics) according to their placements, their subsequent course enrollment, and their performance in one or more developmental courses. Each placement scheme included one or more "gray areas" for which placements were assigned according to the student's choice between two adjacent placement levels.

Students with placements in each of the content areas generally were classified into one of the following categories:

- College-prepared Students,
- Successful Developmental Course Completers, or
- Developmental Course Non-takers

College-prepared Students were those placed into college-level courses. Successful Developmental Course Completers included those students who obtained a developmental placement in a given content area and who completed the recommended developmental course(s) with a grade of C or better or a grade of P (Pass). Developmental course non-takers included students who obtained a developmental placement in a given content area and who did not complete the recommended developmental course(s).

The performance of partial and unsuccessful developmental completers was not analyzed. Students who completed only a portion of the developmental course sequence and not the last course in the sequence were considered partial completers. Some of these students were advised not to take the last developmental course either by faculty or by a counselor. In other instances, the expectations regarding the course sequence were not clear to the students Still other students chose not to take the last course despite recommendations that they do so. Since there was no way to distinguish partial completers' reasons for not completing the sequence nor their readiness for the college curriculum, the performance of this group was not analyzed.

Students who earned a grade of D or who failed the developmental course(s) were excluded from the analyses. It was assumed that developmental courses represent a treatment designed to reduce performance differences between prepared and underprepared students. Since these students did not pass the developmental course, it was assumed that the treatment had not been administered. If unsuccessful students were included with successful students, it would be difficult to determine the effect of treatment.

Performance Measures

Three student academic career measures were used in each of three content areas, reading, writing, and mathematics, to compare the academic performance of the students. The measures included:

- ratio of credits earned to credits attempted,
- cumulative grade point average, and
- persistence rate.

The ratio of credits earned to credits attempted (credit ratio) was calculated by dividing the sum of the student's earned credits for all terms by the sum of the student's attempted credits for all terms. The cumulative grade point average (GPA) was calculated by dividing the sum of the student's grade points for all terms by the sum of the student's grade point credits for all terms. The persistence rate was calculated by dividing the number

of students in a group who were still enrolled at a given college during the fourth quarter (excluding summer sessions) after entry by the number first enrolled

In both the writing and mathematics content areas, a course specific measure, the pass rate in a single higher level course, also was analyzed. The pass rate was defined as the proportion of students taking the course that earned a passing grade (A, B, C, D or P) and consequently earned credit for the course. Writing pass rates were calculated for college composition. Mathematics pass rates were calculated for the next logical course in the mathematics sequence.

Performance measures for each student classification at a given college were calculated by taking the simple average of all students' measures. Systemwide performance measures for each student classification were calculated by weighting the college average by the number of students at the college in that group.

Analytical Approach

Developmental education programs at Minnesota Community Colleges, including placement standards and course sequences, are campus-specific and, as a result, quite varied. College size also varies from 420 FYE to 5,049 FYE. As a result outcomes were analyzed separately by college in order to moderate the effect of size.

Table 1 illustrates the variability of minimum standards for placement in the content areas of reading, writing, and mathematics at Minnesota's 21 community colleges. The information about reading indicates the minimum standards of readiness for college-prepared students, the writing cut scores are related to readiness for college composition, and the mathematics cut scores are reported for several different mathematics courses.

TABLE 1

MINIMUM STANDARDS FOR PLACEMENT

1992-93

	Reading	Writing	Elemen. Algebra	Intermed. Algebra	College Algebra
Total Possible Points	45	40	35	35	30
Range of Min Standards	24 to 36	24 to 31	19 to 35	17 to 32	0 to 22
Cut Score Mean	29	29	23	21	18
Cut Score Median	29	30	21	21	19
Cut Score Mode	31	30	21	19	21

Although there were a few colleges whose standards were at the extremes in each content area, as the range of cut scores reveals, in most cases, a central tendency to cut score standards is apparent.

Hypotheses And Methods

The null hypotheses tested in the present study were:

- Null Hypothesis One - There are no significant differences between Successful Developmental Course Completers and Developmental Course Non-takers on the three student academic career measures: credit ratio, cumulative GPA, and persistence rate.
- Null Hypothesis Two - There are no significant differences between Successful Developmental Course Completers and College-prepared Students as measured by the same three student academic career measures.
- Null Hypothesis Three - There are no significant differences between Developmental Course Non-takers and College-prepared Students as measured by the same three academic career measures.

An analysis of variance was used to examine differences in the credit ratio and the cumulative GPA between the student classifications within each content area. A Chi-square analysis was used to examine differences in the persistence rate. An analysis of covariance also was used to examine differences in the credit ratio and cumulative GPA, controlling for assessment test scores, in the reading and writing content areas. Statistical analyses of differences between student classifications were conducted only for groups with at least 25 students in them.

RESULTS

The study cohort closely resembled the total population of community college students on most characteristics. The one exception was that students in the cohort were more likely to be members of a non-white ethnic group (11%) than were Minnesota Community College students (6%). Students in the cohort were better prepared in English than in mathematics. Eighty-four percent had taken three or four years of high school English, but only 43% had taken Intermediate Algebra or a higher-level mathematics course in high school.

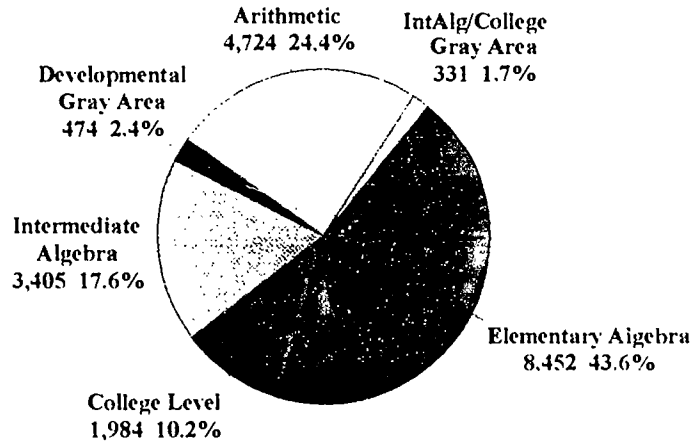
Placement

The majority of students in the cohort were deemed to be college-prepared in reading. Fifty-eight percent (n=10,724) of the 18,495 students with placements in reading were college-prepared. More than 22% (n=4,000), however, received a developmental reading placement, and 17.4% (n=3,200) were placed into a college reading course at the 13 colleges that offered such a course. An additional 2.7% (n=501) received a gray area placement which allowed them to choose between a developmental and a college reading course.

The majority of students in the cohort also received a college composition placement in writing. Fifty-three percent (n=9,491) of the 17,986 students who received a writing placement were placed into college composition. Almost 39% of students (n=7,000), however, received a developmental writing placement. An additional 8% (n=1,500) received a gray area placement which allowed them to choose between a developmental course and college composition.

The majority of students in the cohort received a developmental placement in mathematics. Eighty-eight percent (n=17, 055) of the 19, 370 students who received a mathematics placement were placed into arithmetic, elementary algebra, intermediate algebra or a developmental gray area, as shown in Figure 1.

FIGURE 1
STUDENT MATHEMATICS PLACEMENTS



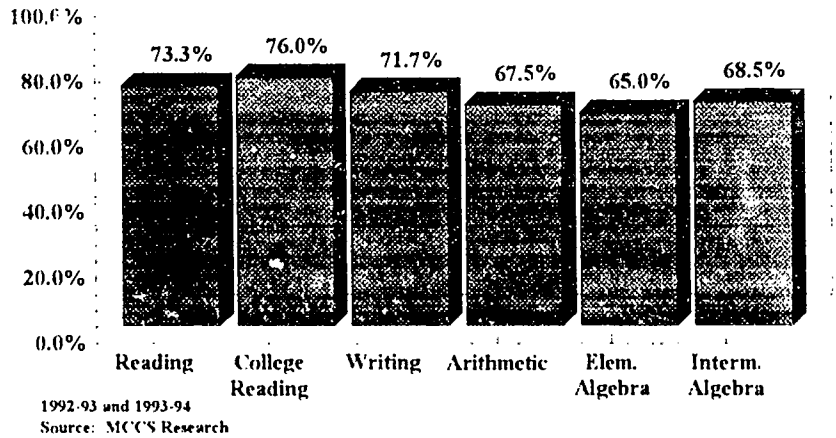
Developmental Course-Taking Patterns and Success

Substantial numbers of students did not take the recommended developmental courses during the two-year tracking period. Of 4,061 students recommended to take a developmental reading course, only 24% (n=983) completed the last course in the developmental reading sequence. Thus, success in developmental courses was analyzed for only 983 students in developmental reading. Compliance with the developmental writing recommendations was higher, with 53% (n=3,853) of the 7,310 students completing the last course in the developmental writing sequence.

The proportion of students completing the mathematics sequence needs to be understood in light of the fact that many colleges do not have a college-level mathematics course requirement. Thus, students may fulfill general education requirements without addressing their underpreparedness in mathematics. As a result, of 4,724 students recommended into an arithmetic course(s), 39% (n=1,847) completed the final course in the arithmetic sequence Forty-seven percent (n=3,958) of the 8,509 students with elementary algebra placements completed the course. Fifty-eight percent (n=2,120) of the 3,682 students with intermediate algebra placements completed the course as recommended.

The majority of students who completed the last developmental course in a content area were successful (See Figure 2). Seventy-three percent of the 983 completers were successful in developmental reading, leaving 721 students for the analysis of academic career measures. Seventy-two percent of the 3,853 completers were successful in developmental writing, thus the academic career measures of 2,761 students were analyzed. Sixty-seven percent of the 1,847 arithmetic completers were successful, leaving 1,246 students for the analysis of academic career measures. Sixty-five percent of the 3,958 completers were successful in elementary algebra, thus the academic career measures of 2,573 students were analyzed. Sixty-nine percent of the 2,120 intermediate algebra completers

FIGURE 2
STUDENT SUCCESS
IN DEVELOPMENTAL COURSES



were successful, leaving 1,452 students for the analysis of academic career measures. The proportions are consistent with findings in other studies.

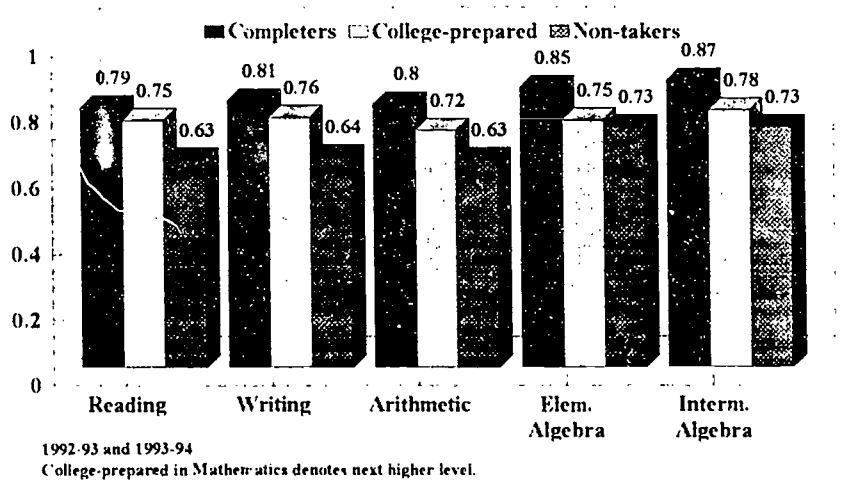
Student Performance on Academic Career Measures

The student performance on the three academic career measures was analyzed for three pairs of student classifications at each college and systemwide. The college results were reported as an average for the students in each group and statistical analysis was done to test the hypotheses in instances where both groups contained at least 25 students. The results of the statistical analyses on each measure were reported as the number of colleges where the hypothesized outcome was found compared to the total number of colleges with at least 25 students in each group. The systemwide results were reported as a weighted average for the students in each group across all colleges and statistical analysis was done to test the hypotheses.

Credit Ratio.

Successful Developmental Course Completers outperformed the Developmental Course Non-takers and the College-prepared Students in the proportion of credits earned to credits attempted across all three content areas as shown in Figure 3. Statistical analyses indicate that at a majority of colleges (from 67% to 91%),

FIGURE 3
CREDIT COMPLETION RATIO
BY STUDENT CLASSIFICATION



1992-93 and 1993-94
College-prepared in Mathematics denotes next higher level.

Developmental Completers' credit ratios were significantly higher than those of Developmental Non-takers. In no instances were Developmental Non-takers' credit ratios significantly higher than those of Successful Completers. Successful Developmental Completers had credit ratios that were either significantly higher than or not significantly different from those of College-prepared Students at 100% of the colleges with sufficient numbers of students. When analyses of covariance were performed in the reading and writing content areas, controlling for

assessment test scores, the pattern of these results was even more pronounced. When weighted averages for all students in each group across all colleges were compared, Developmental Completers' credit ratios were significantly higher than those of Developmental Non-takers. See Table 2 for results of statistical analysis on credit ratios.

TABLE 2

CREDIT RATIO BY STUDENT CLASSIFICATION

	Systemwide Results All Colleges Combined			Statistically Significant Results		
Credit Ratio	Successful Develop-mental Completers	College-Prepared Students	Develop-mental Non-takers	Completers performed significantly better than Non-takers: No. of Colleges	Completers performed as well as or better than College-prepared Sts No. of Colleges	College-prepared performed significantly better than Non-takers: No. of Colleges
Developmental Reading	0.79	0.75	0.63	8/11 * 73%	11/11 * 100%	12/17 * 71%
College Reading	0.81	0.76	0.70	4/6 * 67%	6/6 * 100%	7/11 * 64%
Developmental Writing	0.81	0.76	0.64	14/20 * 70%	21/21 * 100%	14/20 * 70%
Arithmetic	0.80	0.72	0.63	8/11 * 73%	11/11 * 100%	10/17 * 59%
Elementary Algebra	0.85	0.75	0.73	14/19 * 74%	19/19 * 100%	7/17 * 41%
Intermediate Algebra	0.87	0.78	0.73	10/11 * 91%	13/13 * 100%	5/12 * 42%

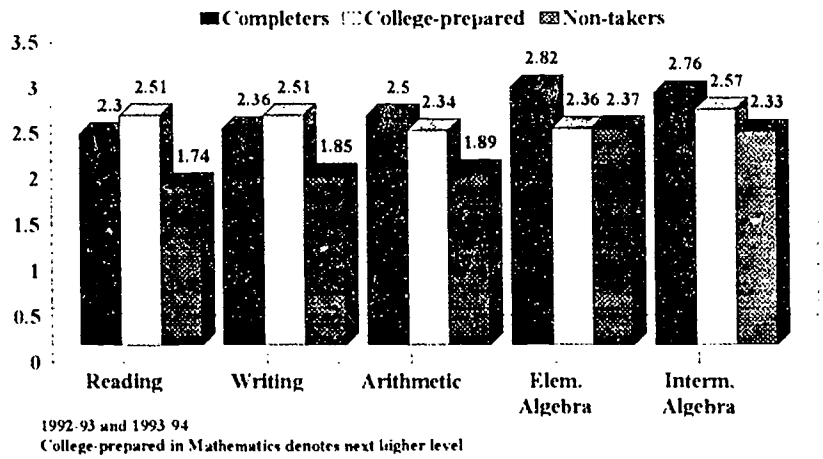
* Indicates statistically significant systemwide results at $p < .05$ level.

Cumulative GPA.

Successful Developmental Completers outperformed Developmental Non-takers in cumulative GPAs in all three content areas. In mathematics, Successful Developmental Completers also outperformed students who were prepared for the next highest mathematics course as shown in Figure 4. Statistical analyses indicate that at a majority of colleges (from 55% to 82%), Developmental Completers' cumulative GPAs were significantly higher than those of Developmental Non-takers. In no instances were Developmental Non-takers' cumulative GPAs significantly higher than those of Successful Completers. Successful Developmental Completers had cumulative

GPAs that were either significantly higher than or not significantly different from those of College-prepared Students at a majority of the colleges (67% to 100%) with sufficient numbers of students. When analyses of covariance were performed in the reading and writing content areas, controlling for assessment test scores the pattern of these results was even more pronounced. When weighted averages for all students in each group across all colleges were compared, Developmental Completers' cumulative GPAs were significantly higher than those of Developmental Non-takers. Using the Minnesota Community College standard for satisfactory academic progress of a 2.0 cumulative GPA, it is apparent that Developmental Non-takers in reading, writing, and arithmetic are, as a group, in academic difficulty. See Table 3 for results of statistical analysis on GPAs.

FIGURE 4
CUMULATIVE GPA
BY STUDENT CLASSIFICATION



1992-93 and 1993 94
College-prepared in Mathematics denotes next higher level

TABLE 3

GRADE POINT AVERAGE BY STUDENT CLASSIFICATION

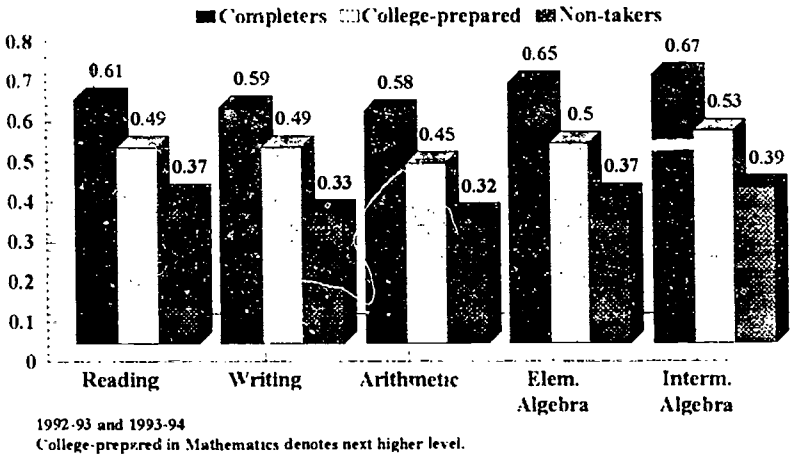
	Systemwide Results All Colleges Combined			Statistically Significant Results		
Cumulative Grade Point Average	Successful Developmental Completers	College-Prepared Students	Developmental Non-takers	Completers performed significantly better than Non-takers: No. of Colleges	Completers performed as well as or better than College-prepared Sts No. of Colleges	College-prepared performed significantly better than Non-takers: No. of Colleges
Developmental Reading	2.30	2.51	1.74	9/11 * 82%	8/11 * 73%	14/17 * 82%
College Reading	2.44	2.54	2.06	4/6 * 67%	6/6 100%	11/11 * 100%
Developmental Writing	2.36	2.51	1.85	13/20 * 65%	14/21 * 67	16/20 * 80%
Arithmetic	2.50	2.34	1.89	6/11 * 55%	11/11 * 100%	12/17 * 71%
Elementary Algebra	2.82	2.36	2.37	13/19 * 68%	19/19 * 100%	2/17 12%
Intermediate Algebra	2.76	2.57	2.33	8/11 * 73%	12/13 * 92%	7/12 * 58%

* Indicates statistically significant systemwide results at $p < .05$ level.

Persistence Rates.

Successful Developmental Completers had substantially higher persistence rates than Developmental Non-Takers and College-prepared Students in all three content areas as shown in Figure 5. Statistical analyses indicate that at a majority of colleges (from 50% to 95%), Developmental Completers' persistence rates were significantly higher than those of Developmental Non-takers. In no instances were Developmental Non-takers' persistence rates significantly higher than those of Successful Completers. Successful Developmental Completers had persistence rates that were either significantly higher than or not significantly different from those of College-prepared Students at 100% of the colleges with sufficient numbers of students. When weighted averages for all students in each group across all colleges were compared, Developmental Completers' persistence rates were significantly higher than those of Developmental Non-takers. See Table 4 for results of statistical analysis on persistence rate

FIGURE 5
PERSISTENCE RATE
BY STUDENT CLASSIFICATION



1992-93 and 1993-94
College-prepared in Mathematics denotes next higher level.

TABLE 4

PERSISTENCE RATE BY STUDENT CLASSIFICATION

	Systemwide Results All Colleges Combined			Statistically Significant Results		
Retention Rate	Successful Developmental Completers	College-Prepared Students	Developmental Non-takers	Completers performed significantly better than Non-takers: No. of Colleges	Completers performed as well as or better than College-prepared Sts No. of Colleges	College-prepared performed significantly better than Non-takers: No. of Colleges
Developmental Reading	0.61	0.49	0.37	7/11 * 64%	11/11 * 100%	10/17 * 59%
College Reading	0.60	0.49	0.42	3/6 * 50%	6/6 * 100%	7/11 * 64%
Developmental Writing	0.59	0.49	0.33	14/20 * 70%	21/21 * 100%	13/20 * 65%
Arithmetic	0.58	0.45	0.32	10/11 * 91%	11/11 * 100%	9/17 * 53%
Elementary Algebra	0.65	0.50	0.37	18/19 * 95%	19/19 * 100%	12/17 * 71%
Intermediate Algebra	0.67	0.53	0.39	10/11 * 91%	13/13 * 100%	9/12 * 75%

* Indicates statistically significant systemwide results at $p < .05$ level.

Single Course Pass Rates.

There were virtually no significant differences among any of the three groups when the course specific measures, the pass rates in the college composition course and the next higher mathematics courses, were analyzed. The average composition pass rates for the three groups were uniformly high with Successful Developmental Completers at .84, College Composition Placements at .84, and Developmental Non-takers at .79. Although the mathematics course pass rates were not as high as those for college composition, again there were no significant differences among the Successful Completers, Non-takers, or Course-prepared Students. The lack of significant differences in single course pass rates may be the result of defining success as a grade of D or higher. Use of a more rigorous standard for success may have revealed significant differences.

DISCUSSION

The finding that Successful Developmental Completers achieved higher career academic performance measures than the Developmental Non-takers supports the relationship between successful completion of recommended developmental coursework and overall success in a Minnesota community college. The finding that Successful Developmental Completers performed as well as or better than the College-prepared Students suggests that developmental education improved the success of underprepared students such that their performance was indistinguishable from that of College-prepared Students. Several possibilities may explain this result. Lower class size in many developmental courses allows for greater interaction with faculty. Developmental courses generally address content and learning how to learn which supports students in their academic career success. Finally, developmental students generally have spend more time directly addressing the broad base of attributes associated with college success. These findings provide support for the continuation of developmental education programs and for the "Placement for Success" policy at Minnesota community colleges.

Substantial numbers of students are not ready for the academic requirements of college and need developmental education. The majority of students in the study cohort were recent high school graduates. Minnesota State Colleges and Universities (MnSCU), which now includes Minnesota community colleges, are in a unique position to work with high schools and the MN Department of Children, Families and Learning to increase the number of traditional-age students who are prepared for the college-level curriculum. MnSCU and its institutions can work to inform elementary and secondary students about expectations for college readiness. In

addition, use of the System recommended cut scores by all community colleges would help clarify what these expectations for college readiness are. MnSCU also can support the MN Department of Children, Families and Learning as it implements new high school graduation standards. The finding that nearly 90% of new students need developmental mathematics coursework calls for a targeted strategy in collaboration with high schools to reduce that need.

High levels of non-compliance with developmental placements put both students and the quality of the college curriculum at risk. Students entering the college curriculum without the requisite academic skills are at high risk of failure. The findings of poor performance by Developmental Course Non-takers, with low credit ratios, GPAs and retention rates, illustrate the level of risk. Substantial numbers of students without the requisite skills also place the quality of the college curriculum at risk and they create a dilemma for instructors who must choose between failing the students or compromising the standards for the course.

The high rate of non-compliance in reading is especially alarming since reading is an essential skill for college-level work. There appears to be a reluctance on the part of students to take reading courses and on the part of institutions to require them to do so. This pattern of low compliance in reading also has been found in other studies. Given that the strongest effects in this study were in the reading content area, efforts to increase compliance in reading must be undertaken.

In addition, the substantial number of students who had taken no writing or mathematics courses during the two-year tracking period is of concern. Establishing a timeframe for the early completion of developmental education requirements also should be undertaken to ensure that students have the requisite academic basic skills as they enroll in the college curriculum.

While a substantial majority of students who complete developmental courses are successful, from one-quarter to one-third do not succeed. Although this study excluded unsuccessful participants from the examination of developmental outcomes, students' lack of success in developmental courses may be a cause for concern about curriculum and/or instruction in those courses. Is the lack of success the result an appropriate level of rigor in the developmental curriculum or are the methods of instruction not reaching certain kinds of students? Such issues can be addressed best by campus level study.

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