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When No Relationship is a Good Relationship

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Abstract

This paper presents a multi-method assessment of the effectiveness of a developmental college that serves underqualified students who would not normally be admitted to a major research University. The relationship between precollege predictors and college academic outcomes was assessed. All correlations were weak with none of the precollege predictors accounting for more than 10% of the variance in any of the college outcome measures. Comparisons of retention, transfer, academic standing, and graduation rates with national estimates and University statistics are presented to argue for an overall positive effect on students regardless of their prior academic preparation.

INTRODUCTION

This paper presents a multi-method assessment of the effectiveness of a college that serves underqualified (including non-traditional, underprepared and economically disadvantaged), first and second year students who would not normally be admitted to a major research University. The college's curriculum is based on developmental education theories and philosophies and will be referred to as the developmental college. Since underqualified students are also served in the State's community college system, questions about the effectiveness of the developmental college are being asked by State public officials, University administrators, and the local press.

The developmental college offers a general education curriculum across several disciplines (mathematics, composition, humanities, biological science, and physical science) that helps students meet general graduation requirements at the University. Students admitted to the developmental education college must eventually transfer to a degree granting program at the University to graduate. Transfer requires that students maintain acceptable college grade point averages (GPA) in order to be retained and progress to the point where they can apply for transfer. There has been a steady increase in the transfer rate of entering freshmen cohorts since 1992. One question of interest to the college is whether larger percentages of incoming freshmen with better academic preparation is the primary reason for the increased transfer rates. The developmental college has instituted many changes to the curriculum and support programs aimed to increase academic progress, retention, and transfer. If the college is effective in serving all developmental education students, the relationship between the precollege predictors and college academic outcomes should be very weak. Otherwise, prior academic success should be predictive of academic outcomes in college.

Traditional measures of precollege academic performance such as high school GPA and standardized test scores such as the ACT and SAT have not always been found to be reliable predictors of college outcomes for nontraditional students. Several studies provide evidence that standardized test scores are not predictive of college GPA for this population. Sedlacek and Adams-Gaston (1989) found that SAT scores had essentially no correlation with college GPA for a group of 105 student athletes. Arbona and Novy (1990) looked at a mixed population of Black, Mexican American, and White students and found that SAT scores predictive of neither college GPA nor persistence. However, this is not always the case. Fuertes, Sedlacek, and Liu (1994) did find SAT mathematics scores to have the highest correlation with college GPA among predictor variables used with a group of 431 Asian Americans. The correlations were low, however, ranging between .31 and .38 depending on the semester in which the cumulative GPA was calculated. In another study of "high risk" college students, Nisbet, Ruble, and Schurr (1982) found high school rank and SAT scores to make statistically significant contributions to the prediction of college GPA, but scores on the Effective Study Test had the highest correlation and made the largest contribution.

In general, measures of academic success based on high school courses have been the best predictors of academic success for nontraditional populations of college students. House (1996), in a study of 9,589 freshmen that consisted of Black, Asian American, Hispanic, Native American, and White students found high school rank to have the highest correlation with college GPA ($r = .476$). This finding was consistent regardless of a student's ethnic group. Several studies have found high school GPA to be the best predictor of college GPA for Black college students, while SAT scores were typically found to not be predictive (Allen, 1986; Nettles, 1984; Young & Sowa, 1992; Walter, Smith, Hoey, & Wilhelm, 1987). In contrast to these findings, Nettles, Thoeny, and Gosman (1986), in a study which compared the college achievement of Black and White college students, found that low but significant correlations between high school GPA and SAT scores ($r = .299$ and $r = .233$, respectively) with college GPA. Two other noncognitive factors, students' feelings of racial discrimination and reported number of interfering problems, had higher correlations ($r = -.533$ and $r = -.344$, respectively) than either high school GPA or SAT scores.

PRECOLLEGE MEASURES AND STUDENT OUTCOMES

To look at the relationship between prior academic preparation and college outcomes, three measures of precollege

academic performance were used as independent variables: high school grade point average (HS GPA), high school percentile rank (HS PR), and ACT composite score. Records were available on high school percentile rank and ACT scores for freshmen who entered the college from fall 1989 through fall 1996. Records for high school GPA were available only from fall 1992 to 1996. All together, information on 7046 students who entered the college between fall 1989 and fall 1996 were used in the study. [Table 1](#) presents statistics on precollege measures of academic performance for the seven cohorts of freshmen.

Table 1. Averages for three measures of precollege academic performance and four measures of first year college outcomes.

| Cohort | HS GPA | HS PR | ACT | First Year College GPA | Percent Good Standing | Percent Retained | Percent Transferred |
|--------|----------|-------|------|------------------------|-----------------------|------------------|---------------------|
| 1989 | a | 34.5 | 18.3 | 2.34 | 68.5 | 62.4 | 4.7 |
| 1990 | a | 35.5 | 18.2 | 2.35 | 68.3 | 57.4 | 4.1 |
| 1991 | a | 42.1 | 19.0 | 2.45 | 72.0 | 58.9 | 5.8 |
| 1992 | 2.26 | 41.1 | 19.1 | 2.51 | 75.1 | 60.2 | 9.7 |
| 1993 | 2.23 | 39.0 | 18.7 | 2.47 | 73.6 | 60.7 | 10.8 |
| 1994 | 2.44 | 44.5 | 19.5 | 2.51 | 75.4 | 63.1 | 14.4 |
| 1995 | 2.48 | 43.5 | 19.5 | 2.60 | 77.8 | 68.3 | 28.8 |
| 1996 | 2.56 | 46.1 | 20.2 | 2.62 | 80.4 | 68.6 | 25.9 |

a High school GPA was available for less than one-third of the students in the cohort.

The academic outcomes of interest were college academic performance, retention, and transfer to a degree granting program. Three dichotomous variables and one continuous variable were used as measures of academic outcomes. The first dichotomous variable measured retention and was coded 1 if a student registered for course work at the University during the fall of their second year of college and 0 otherwise. Transfer was defined as having transferred to a degree granting program within the University by the fall of the second year of college. The first measure of academic performance was a student's academic standing at the end of the first year in college. Students who met the academic performance standards of the college (cumulative GPA ³ 2.00) at the end of their first year in college were coded as 1 (0 otherwise). The second measure of academic performance was the student's cumulative GPA at the completion of the first year of college. Bivariate correlations and stepwise multiple regression were used to assess the relationships given that the results of logistic regression are typically similar to the results of ordinary least-squares (OLS) multiple regression and the OLS results are usually easier to interpret (Terenzini, Springer, Yaeger, Pascarella & Nora, 1996). Averages for each of the dependent measures are presented in [Table 1](#).

[Table 2](#) presents samples sizes for the various analyses while [Table 3](#) presents results from the multiple regression analyses. While all of the correlations are statistically significant (primarily due to the large samples sizes; sample sizes ranged from around 3400 to 5800), the correlations were all quite weak. None of the precollege predictors, either individually or in combination, accounted for more than 10% of the variance in any of the outcome measures. The findings are consistent with the conclusion that the developmental college's program has a similar effect on all students regardless of their prior academic performance.

Table 2. Sample sizes for multivariate analyses.

| Cohort Year | Cohort Size | HS GPA | HS PR | ACT | HS GPA and ACT | HS PR and ACT |
|-------------|-------------|--------|-------|------|----------------|---------------|
| 1989 | 1026 | a | 779 | 505 | a | 484 |
| 1990 | 966 | a | 732 | 539 | a | 520 |
| 1991 | 969 | a | 775 | 662 | a | 637 |
| 1992 | 807 | 725 | 689 | 603 | 591 | 573 |
| 1993 | 815 | 706 | 676 | 693 | 657 | 636 |
| 1994 | 780 | 660 | 617 | 648 | 617 | 586 |
| 1995 | 830 | 770 | 742 | 780 | 738 | 718 |
| 1996 | 853 | 799 | 777 | 805 | 779 | 760 |
| Total | 7046 | 3660 | 5787 | 5235 | 3382 | 4914 |

a High school GPA was available for less than one-third of the students in the cohort.

Expanding on the findings presented in [Table 3](#), a logistic regression approach (Noble & Sawyer, 1997) was used to see if admissions cutoff scores could be established for high school GPA and ACT scores. A sample of 2072 students from the developmental college's fall 1994, fall 1995, and fall 1996 entering freshmen cohorts served as a reference group. Noble and Sawyer (1997) presented three validity indices that are used to determine the cutoff score for a measurement. The three indices are computed for each level of the measurement. The estimated accuracy rate is the proportion of students from the reference group who were predicted to succeed and did succeed (true positives) plus the proportion who were predicted to not succeed and did not (true negatives). The second index, estimated success rate, is the ratio of true positives to the sum of true positives and false positives (students predicted to succeed but who did not). The final index, the percentage not admitted, is the sum of the percentages of true negatives and false negatives (students who succeeded when they were predicted not to succeed). The optimal cutoff score is that cutoff score with the highest accuracy rate (i.e., the cutoff score which maximizes the percentage of true positives and true negatives).

Table 3. Bivariate and multiple correlation coefficients for relationships between precollege predictors and academic outcomes.

| | HS GPA | HS PR | ACT | ACT & HS GPA | ACT & HS PR |
|----------------|--------|-------|-------|--------------|-------------|
| Retention | 0.184 | 0.132 | 0.025 | a | 0.121 |
| Transfer | 0.252 | 0.173 | 0.13 | 0.27 | 0.218 |
| Good Standing | 0.221 | 0.187 | 0.08 | a | 0.194 |
| Cumulative GPA | 0.309 | 0.245 | 0.117 | 0.317 | 0.277 |

a Only high school GPA accounted for a significant amount of variance in the outcome measure

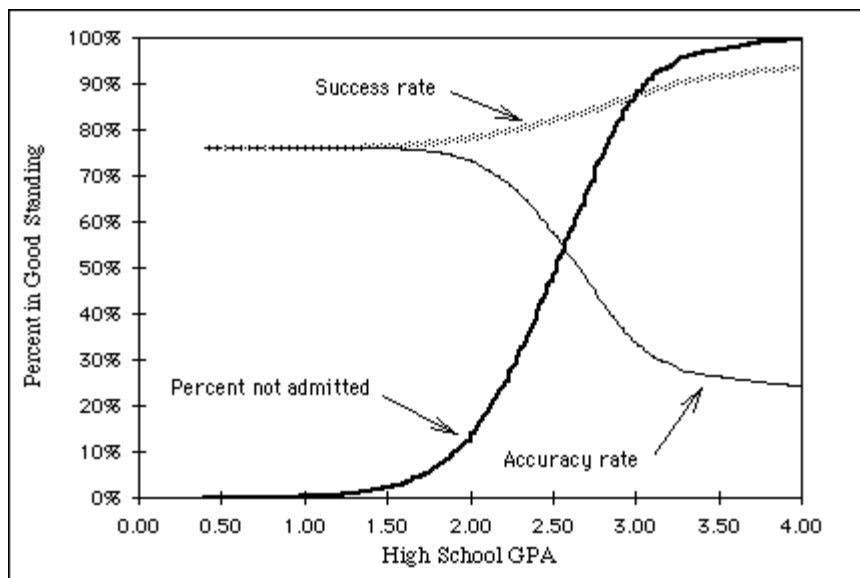
Consistent with earlier results, only high school GPA was found to have a significant relationship with first year academic standing. Validity indices for first year academic standing were computed only for cutoff scores based on high school GPA. [Table 4](#) and [Figure 1](#) present the validity indices for cutoff scores based on high school GPA. Estimates for the success rate and percentage of students who would not be admitted increase as high school GPA increases. The estimated accuracy rate, however, reaches a maximum at about 1.40 and then shows a marked decline. Setting the optimal cutoff for high school GPA at 1.40 would result in an estimated 98.6% of all applicants being admitted. The results indicate that it is difficult to discriminate among applicants on the basis of precollege academic performance measures are consistent with the previous conclusion that the developmental college has similar effects on students regardless of their prior academic preparation.

Table 4. Validity indices for first year academic standing based on high school GPA.

| HS GPA | Accuracy Rate | Success Rate | Percent Not Admitted |
|-------------|---------------|--------------|----------------------|
| 0.40 - 0.60 | 75.92% | 75.92% | 0.00% |
| 0.61 - 0.80 | 75.92% | 75.92% | 0.00% |
| 0.81 - 1.00 | 75.97% | 76.01% | 0.24% |
| 1.01 - 1.20 | 76.00% | 76.08% | 0.47% |
| 1.21 - 1.40 | 76.00% | 76.32% | 1.37% |
| 1.41 - 1.60 | 75.82% | 76.68% | 3.02% |
| 1.61 - 1.80 | 75.08% | 77.31% | 6.65% |
| 1.81 - 2.00 | 73.51% | 78.11% | 12.08% |
| 2.01 - 2.20 | 69.06% | 79.56% | 23.92% |
| 2.21 - 2.40 | 62.22% | 81.15% | 38.77% |
| 2.41 - 2.60 | 52.71% | 83.02% | 56.65% |
| 2.61 - 2.80 | 42.37% | 85.05% | 73.92% |
| 2.81 - 3.00 | 34.06% | 87.26% | 86.60% |
| 3.01 - 3.20 | 29.22% | 89.45% | 93.49% |

| | | | |
|----------------|--------|--------|--------|
| 3.21 - 3.40 | 27.02% | 91.08% | 96.42% |
| 3.41 - 3.60 | 25.87% | 92.14% | 97.88% |
| 3.61 - 3.80 | 25.01% | 92.96% | 98.92% |
| 3.81 - 4.00 | 24.45% | 93.49% | 99.58% |

Figure 1. Validity indices for first year academic standing based on high school GPA.



PRECOLLEGE MEASURES AND INSTITUTIONAL OUTCOMES

While the results indicate that the precollege measures of academic performance are not good predictors of individual students' college performance for the population under study, there is a relationship between precollege and college outcomes at the institutional level. An approach was used similar to that of Zajonc and Mullally (1997) where average scores on the precollege and college measures were calculated for each entering freshman cohort from fall 1989 to fall 1996. Averaging across individuals is expected to have the effect of eliminating variance due to variables not included in the analysis. The unit of analysis in this investigation was the institution which reduced the sample size the number of cohorts. The sample size was eight when ACT and high school percentile rank were the only precollege variables used while the sample size was reduced to five when high school GPA was involved. [Table 5](#) presents the results. While several of the correlations are not statistically significant due to the small sample sizes, the majority of the correlations are above .90 with only four below .80. These findings are consistent with the cutoff score validity measures presented in [Table 4](#) which establish that the predicted success rate increases with higher cutoff scores. [Figures 2](#) through 5 further demonstrate the close mapping between average high school GPA and averages for each of the four dependent variables.

While these results do suggest a strong relationship between precollege and college outcomes for the population of underqualified students, they do not contradict the earlier conclusion that the developmental college effectively meets the individual differences found among its students. As pointed out earlier, while the probability of success increases, it does so with a reduction in accuracy. Establishing a high cutoff score based on high school GPA would increase the success rate at the cost of not serving large numbers of students with lower academic preparation who had the potential to be successful.

Table 5. Bivariate and multiple correlation coefficients for relationships between mean precollege predictors and mean measures of academic outcomes.

| | HS GPA | HS PR | ACT | ACT & HS GPA | ACT & HS PR |
|----------------|---------|---------|---------|--------------|-------------|
| Retention | .958*** | .441 | .613 | .950* | .554 |
| Transfer | .874* | .780** | .846*** | .940 | .874** |
| Good Standing | .932** | .947*** | .874*** | .871 | .875** |
| Cumulative GPA | .936** | .958*** | .930*** | .896 | .944*** |

* p < .10

** p < .05

*** p < .01

**** p < .001

Figure 2. Relationship between mean high school GPA and mean first year college GPA.

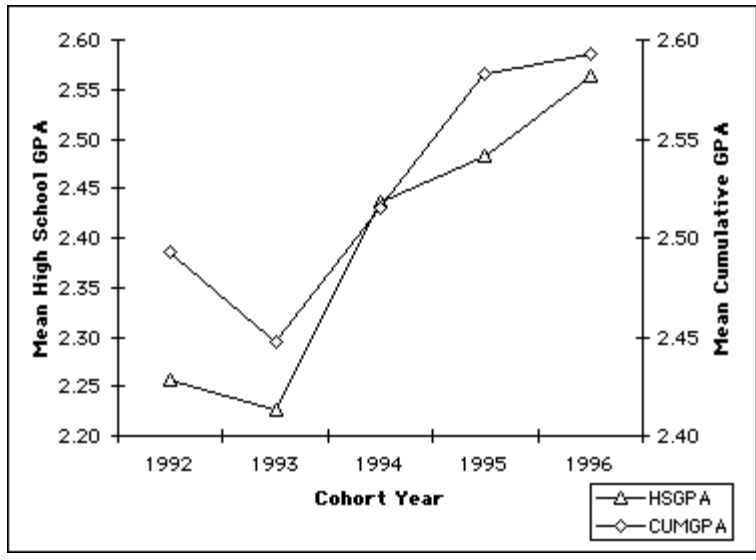


Figure 3. Relationship between mean high school GPA and mean percent in academic good standing at the end of the first year.

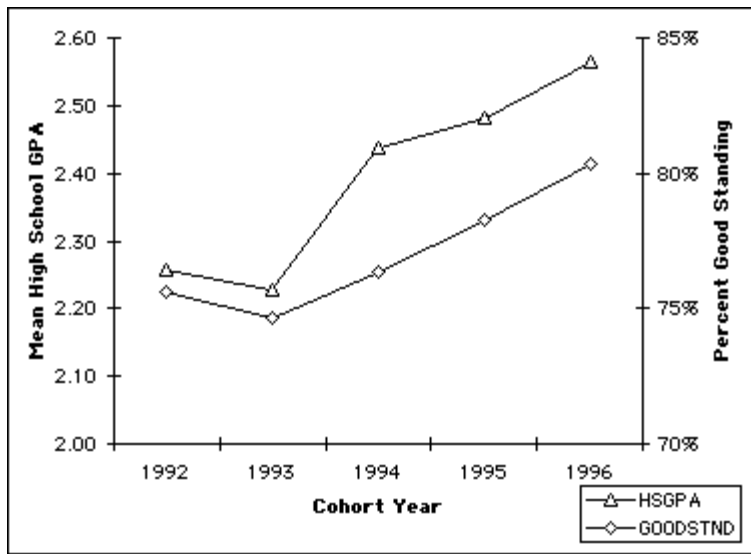


Figure 4. Relationship between mean high school GPA and mean percent retained in the fall of the second year.

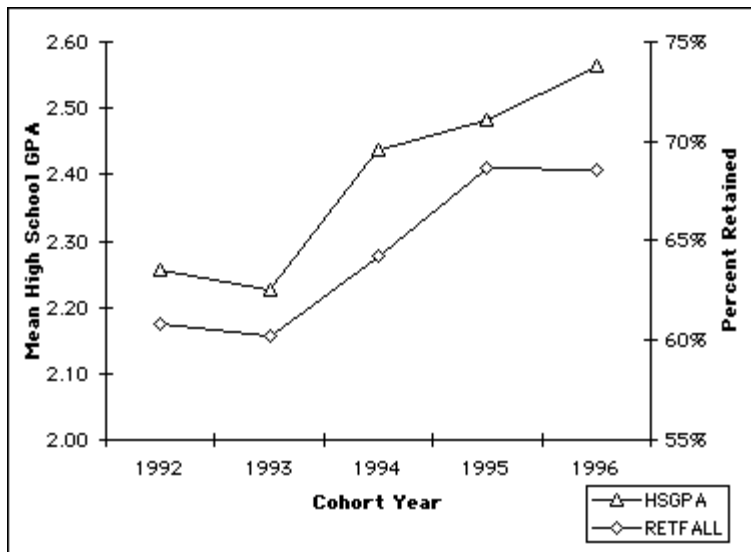
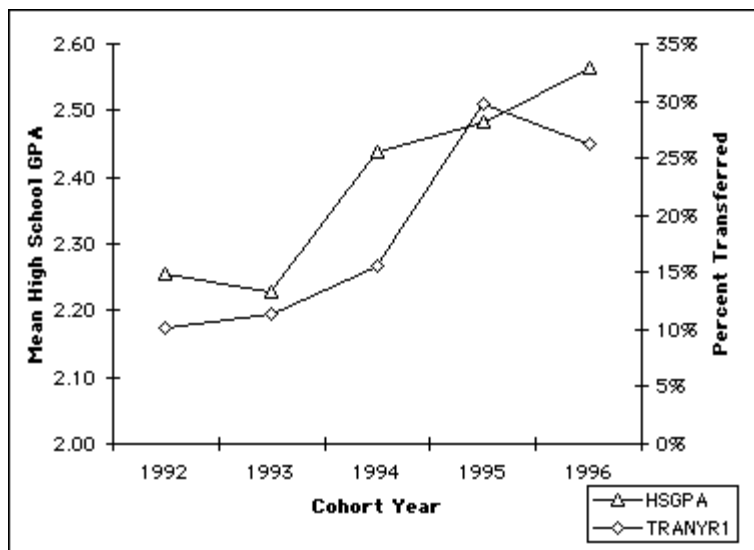


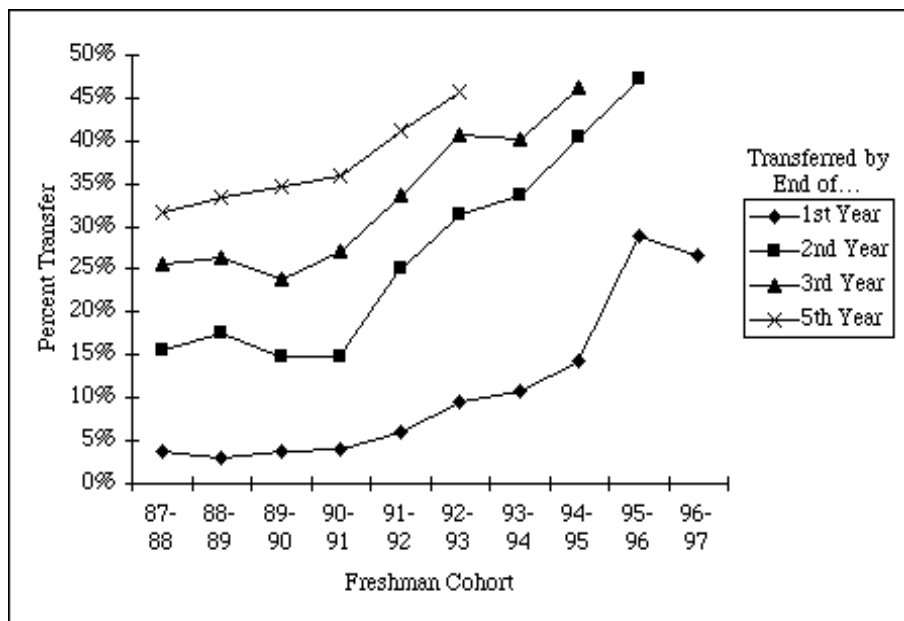
Figure 5. Relationship between mean high school GPA and mean percent transferred by the fall of the second year.



STUDENT OUTCOMES AND INSTITUTIONAL EFFECTIVENESS

The lack of a relationship between precollege indicators of academic success and college outcomes does not by itself demonstrate that the developmental college has been effective. There are other indicators that do support the conclusion that the developmental college has been effective in serving students. The retention rates presented in [Figure 4](#) for the 1995 and 1996 freshman cohorts are 10% to 15% higher than those of students who start at two-year institutions and institutions with open admissions, are comparable to rates for public four-year institutions, and are only about 7% lower than estimates for public Ph.D. granting institutions (Mortenson & Miller, 1997). As illustrated in [Figure 5](#), transfer rates have shown a steady increase since 1990 with three-year transfer rates of recent cohorts matching or exceeding the five-year transfer rates of previous cohorts (see [Figure 6](#)).

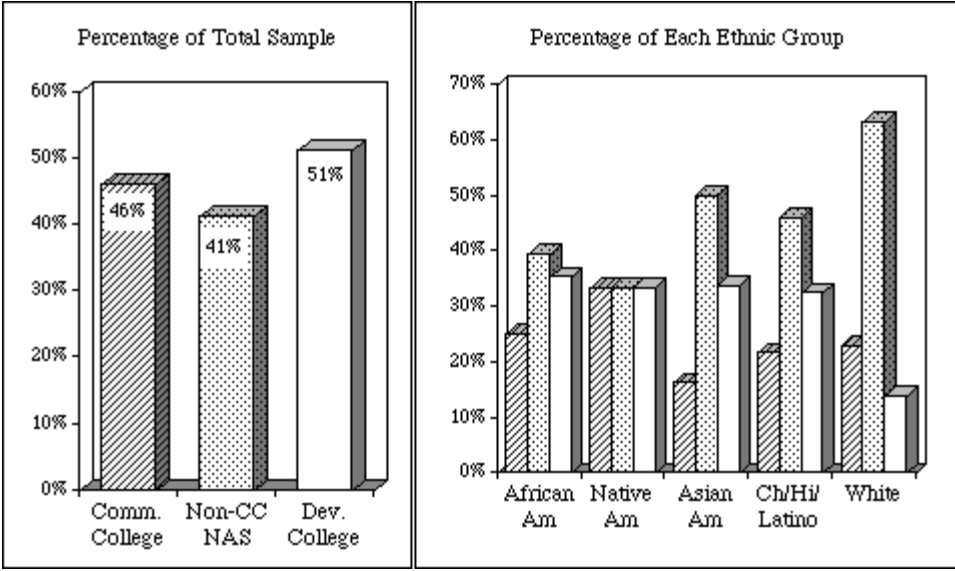
Figure 6. First-, second-, third-, and fifth-year transfer rates for ten freshmen cohorts.



Students also compete well after transfer to a degree-granting program. [Figure 7](#) compares five-year graduation rates among students who transferred to the University's liberal arts college from state community colleges (N = 1164),

other institutions outside of the University (N = 3618), and the developmental college (N = 710) between 1988 and 1992. Graduation rates for the developmental education college are slightly higher than those of students from the other institutional types. In addition, while the developmental college accounted for only 13% of the transfers, the college represented nearly a third of all graduates in ethnic groups other than White. This demonstrates that the college effectively provides access to baccalaureate degrees for students from underrepresented ethnic groups.

Figure 7. Five-year graduation rates compared among New Advanced Standing (NAS) students and developmental college students who transferred to the University's liberal arts college.



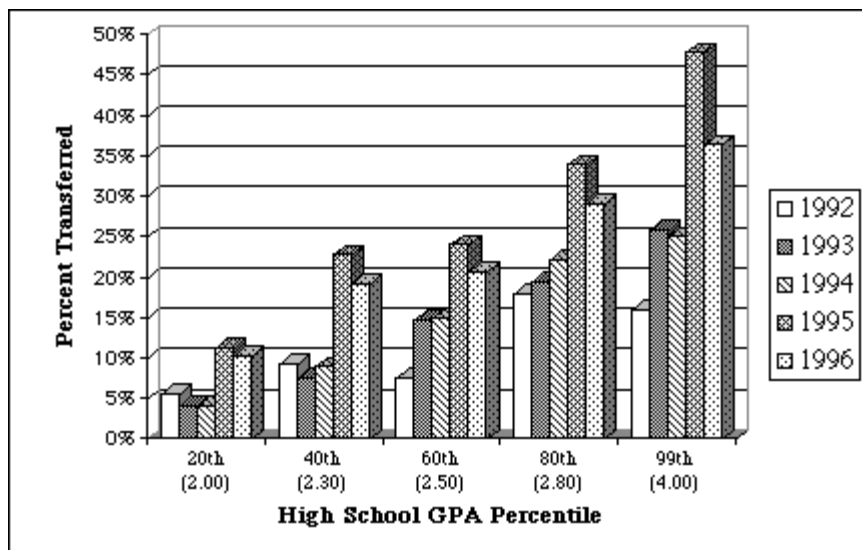
Comm. College = Community colleges

Non-CC NAS = new advanced standing students from institutions other than community colleges

Dev. College = students who transferred from the developmental college

The initial question that prompted this study was whether observed increases in transfer rates can be attributed to increases in academic preparation. Figure 5 appears to support this conclusion. Figure 8, however, illustrates that increased transfer rates were not restricted to only those students with higher academic preparation. Figure 8 divides incoming freshmen into five quintile ranges based on high school GPA. The values in parentheses below the horizontal axis labels give the upper limits of each quintile. A noticeable increase in first year transfer rates occurs for all five high school GPA ranges. In all five groups, the first-year transfer rates nearly double when the fall 1995 and 1996 freshmen cohorts are compared to the fall 1992 through 1993 cohorts. The freshmen cohorts were regrouped into two groups (1992 through 1994 and 1995 through 1995) and separate chi-square analyses performed for each high school GPA quintile. All chi-square statistics were statistically significant at $p < .01$.

Figure 8. Percent of students who transferred to a degree granting program by the end of their first year.



CONCLUSION

The research presented in this paper supports the conclusion that the developmental college has been effective in assisting students to develop the academic skills they need to transfer and eventually graduate from the University. This conclusion is supported by the weak relationship between measures of precollege academic preparation and college outcome measures as well as demonstrated increases in transfer rates and competitive graduation rates. Increased transfer rates that are independent of high school GPA provide evidence that the college is effective across the wide spectrum of precollege preparation represented by developmental education students. While the maximum percentage of transfers may be limited by students' level of high school performance, all high school GPA groups saw increases in transfer rates among recent freshman cohorts. This study demonstrates that assessing the effectiveness of developmental education, and perhaps any educational system, requires a multi-method approach that addresses relationships among variables throughout the span of students' college careers.

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