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Program Components and Their Relationship to Student Performance

By Hunter R. Boylan, Leonard B. Bliss, and Barbara S. Bonham

ABSTRACT: Much has been written in the past 20 years regarding the impact of various program components on the success of developmental students. Among these components, centralized program organization, mandatory assessment, mandatory placement, tutoring, advising, and program evaluation have been mentioned most frequently. As part of the National Study of Developmental Education several of these components were explored to determine their relationship to such measures as first-term GPA, cumulative GPA, retention, and performance in developmental courses. All of these components were found to have some relationship to the success measures being studied. Centralized program organization, tutoring with tutor training and systematic program evaluation were found to be related to the highest number of success measures.

In November of 1988, the Exxon Education Foundation awarded a major research grant to the National Center for Developmental Education. The purpose of this grant was to conduct a national study designed to assess the efficacy of developmental education. The project studied developmental programs and students to determine the impact of developmental education, to identify successful developmental education techniques and components, and to determine what is known and not known about developmental education.

The Exxon Education Foundation provided over \$750,000 for this project from 1988 to 1994 and it eventually became known as the National Study of Developmental Education. The project is ongoing and, since 1994, has been supported by additional funds from the Exxon Education Foundation, the Alfred P. Sloan Foundation, the National Association for Developmental Education, and the National Center for Developmental Education.

The National Study of Developmental Education has explored a wide variety of issues discussed in the literature of the field. One of the most important of these is the study of those service components most commonly found in developmental programs. This article will examine which of these components are most closely associated with the success of students participating in developmental education.

Methodology

The population from which the sample of institutions was drawn included over 3,000 colleges and universities in the United States identified by *Peterson's College Data Base (1989)*. Proprietary and military institutions were deleted from this population and a representative sample was selected from the remaining institutions. Using a circular, systematic sampling procedure, 160 institutions were selected through a series of replicated subsamples. The subsamples were stratified by institutional type and geographical region to insure representativeness.

At each institution selected for inclusion in the study, a random sample of developmental students was identified. Students were identified as developmental according to local criteria. Whoever was placed, as a result of institutional assessment and/or advising in developmental courses or programs, was considered to be a developmental student for the purposes of the study. A random sample of just under

6,000 students was eventually selected for inclusion in the study.

A review of the literature was then conducted to identify program components considered to be associated with student success. Based on this review, the following components were identified:

- presence of centralized program organizational structure,
- presence of mandatory assessment of students,
- presence of mandatory placement of students,
- availability of tutor training,
- availability of advising/counseling services, and
- presence of program evaluation.

A 44-page questionnaire was used to collect information about the developmental education programs at participating institutions and to identify whether or not a given component was present or absent. This information was then entered into the program database. The data about student performance, including retention, first-semester GPA, cumulative GPA, and success in developmental courses, was obtained from individual student transcripts and entered in the student database.

The analysis for this study involved combining data from the student and the program databases. The statistical analysis generating findings about program components involved several different tests which were conducted using the *Statistical Package for the Social Sciences (SPSS)* (1991) software program. The observed significance level for all findings reported as statistically significant was less than .05 ($p < 0.05$).

The causal-comparative method was used to explore the relationships among variables used in the study. This method focuses on revealing possible relationships between variables. This method is sometimes referred to as "ex post facto research, since causes are studied after they have presumably exerted their effect on another variable" (Borg & Gall, 1983, p. 533). The major advantage of this method is that it enables the study of relationships between many variables. The statistical tests used most frequently in causal comparative research are the *t* test, analysis of variance (ANOVA), or one of the nonparametric tests such as chi square.

The independent variables, that is, each of the program components, were measured according to whether or not they were present. The dependent variables, first-semester GPA, cumulative GPA, retention, and success in developmental courses, differed in their levels of measurement because they represented different types of data. Because the way in which data is analyzed depends upon the way it is measured, various statistical tests were used depending on the type of variable.

Retention and success in developmental courses are nominal variables, also referred to as categorical or dichotomous variables. The categories used for retention were: (a) students who have graduated or are still retained at the institution and, (b) students who have withdrawn from the institution. Graduation and retention was measured after 5 1/2 years at 4-year institutions and 3 1/2 years at 2-year institutions. The categories used to identify success in developmental courses are either pass or fail. The category pass includes all students who earned a D or better (or a Pass or Satisfactory for nongraded courses). The category fail includes all students who either failed or did not complete the course.

To determine if there is a degree of association or correlation; between each of the program components and retention or success in developmental courses, cross tabulations and chi-square tests were used. The Phi- coefficient and Cramer's V were used to measure the strength or magnitude of the

association in the contingency tables. The chi-square test was used to evaluate the statistical significance of this measure of association (Glass & Hopkins, 1984).

Students' first-semester GPA and cumulative GPA are ratio variables with the value of these variables having an indefinite number of points along a continuum. To analyze the differences between the groups of students at institutions which did or did not have a particular program component, a comparison of means for first-semester GPA or cumulative GPA was conducted for each group. The statistical tests used to determine if there was a statistically significant difference between the group means ($p < 0.05$) were ANOVA and t-tests (Borg & Gall, 1983).

Findings

Centralized Developmental Programs

There are two organizational models prevailing for developmental education courses and services. One is a centralized program in which all courses and services are provided under a single administrative unit with its own director or coordinator. The other is a decentralized program in which remedial courses and laboratories are offered through individual academic departments. In such arrangements support services are either provided by academic departments or through a learning assistance center separate from academic departments. Centralized programs were found at 52% of the institutions participating in the study (Boylan, Bonham, & Bliss, 1994).

Several authors, most notably John Roueche and his colleagues, have argued that centralized developmental programs are more effective than decentralized programs (Roueche & Baker, 1986; Roueche & Snow, 1977). The data indicate that this argument is, indeed, valid.

Students participating in centralized developmental programs were more likely to be successful than students participating in decentralized programs (see Table 1). Students at 2-year institutions, participating in centralized developmental programs had higher rates of retention than those participating in decentralized programs. There was no difference in either first-term GPA or cumulative GPA for those students participating in centralized or decentralized programs at 2-year institutions.

Table 1 Centralized Program Structure and Student Success					
	First-Term GPA	Cumulative GPA	Retention	Success in developmental courses	
				Math	English
2-year Institutions			X		X
4-year Institutions	X	X		X	

Note: X indicates statistical significance at $p < 0.05$.

Students at 4-year institutions participating in centralized developmental programs had higher first-term GPAs and higher cumulative GPAs than those participating in decentralized programs. Students participating in centralized programs were also more likely to pass developmental courses in English at 2-year institutions and in mathematics at 4-year institutions. There was no difference in rates

of retention for those students participating in centralized or decentralized programs at 4-year institutions.

Mandatory Assessment

A substantial majority of developmental programs make assessment mandatory. Boylan, Bonham, and Bliss (1994) found that 76% of the nation's developmental programs require that incoming students be assessed. The remaining programs provide assessment on a voluntary basis.

Roueche and Snow (1977), Morante (1987; 1989), and Hays (1994) have argued forcefully for mandatory assessment of incoming students. For developmental students, however, this component appears to have little impact on student grades or retention. No statistically significant differences were found in the first-term GPA, cumulative GPA, or retention rates of students participating in programs with voluntary or mandatory assessment (see Table 2).

Table 2					
Mandatory Assessment and Student Success					
	First-Term GPA	Cumulative GPA	Retention	Success in developmental courses	
				Math	English
2-year Institutions					
4-year Institutions				X	X

Note: X indicates statistical significance at $p < 0.05$.

Mandatory assessment was, however, related to student success in developmental courses. Students participating in programs featuring mandatory assessment were significantly more likely to pass their first developmental English or mathematics courses than students in programs where assessment was voluntary. This was true for all institutions.

Mandatory Placement

Roueche and Snow (1977), Morante (1989), Hays (1994) and others have advocated mandatory placement of students based on assessment results. According to Boylan, Bonham, and Bliss (1994), placement in developmental courses is mandatory for students who demonstrate deficiencies as a result of assessment at 69% of 4-year institutions and 35% of 2-year institutions.

Mandatory placement in developmental education was only found to be positively related to retention at 4-year institutions. Mandatory placement was found to be negatively related to retention at 2-year institutions (see Table 3).

Table 3	
Mandatory Placement and Student Success	

	First-Term GPA	Cumulative GPA	Retention	Success in developmental courses	
				Math	English
2-year Institutions			X-	X	X
4-year Institutions			X	X	

Note: X and X- indicate statistical significance at $p < 0.05$.

Mandatory placement was, however, related to success in developmental courses. Students participating in developmental courses at 2-year institutions were more likely to pass developmental English or mathematics courses in programs where placement was mandatory than in programs where placement was voluntary. This was also true for developmental mathematics students at 4-year institutions.

This is an important finding in support of both mandatory assessment and placement. According to Boylan, Bonham, and Bliss, (1992), passing developmental courses has been positively correlated with success in college as measured by cumulative GPA and retention. Any component which contributes to success in developmental courses, therefore, is related to increased retention.

Tutoring Services with Tutor Training

Maxwell (1985) and Casazza and Silverman (1996) have suggested that tutor training is essential for successful tutoring programs. The findings from this study indicate that they are undoubtedly correct in their position.

An initial review of the data on tutoring programs indicated that they had no relationship to student GPA or retention. When only those tutoring programs with a training component were considered, however, such a relationship was found (see Table 4). According to Boylan, Bonham, and Bliss (1994), 70% of the nation's tutorial programs have a training component.

	First-Term GPA	Cumulative GPA	Retention	Success in developmental courses	
				Math	English
2-year Institutions	X				X
4-year Institutions	X	X	X		X

Note: X indicates statistical significance at $p < 0.05$.

Students participating in tutoring programs featuring a training component were more likely to have

higher first-term GPAs at both 2-year and 4-year institutions. They were also more likely to have higher cumulative GPAs and to be retained at 4-year institutions. Tutoring programs featuring training components were associated with higher pass rates in developmental English courses at both 2-year and 4-year institutions.

Advising/Counseling

Advising and counseling services have regularly been cited in the literature as essential components of successful developmental programs (Boylan, 1980; Maxwell, 1985; Miller, 1996; Roueche & Baker, 1986; Roueche & Snow, 1977). Boylan, Bonham, and Bliss (1994) found that the vast majority (71%) of developmental programs offer advising and counseling services.

Although these services have little relationship to retention and cumulative GPA, they are related to first-term GPA and success in initial developmental courses at 4-year institutions (see Table 5). They are related to success in developmental mathematics courses at all institutions. In general, students participating in developmental programs including an advising and counseling component were more likely than students in programs without these components to have higher pass rates in developmental mathematics courses. They were also more likely to have higher pass rates in English at 4-year institutions.

Table 5					
Advising/Counseling and Student Success					
	First-Term GPA	Cumulative GPA	Retention	Success in developmental courses	
				Math	English
2-year Institutions				X	
4-year Institutions	X			X	X

Note: X indicates statistical significance at $p < 0.05$.

Program Evaluation

Program evaluation has long been advocated as an important feature of successful developmental programs (Casazza & Silverman, 1996; Maxwell, 1985; Maxwell, 1991; Roueche & Snow, 1977). Unfortunately, only a relatively small percentage of developmental programs engage in ongoing, systematic evaluation. Only 14% of developmental programs at 2-year institutions and 25% of programs at 4-year institutions evaluate their activities in a regular and systematic manner (Boylan, Bonham, & Bliss, 1994).

This is unfortunate because program evaluation does appear to be linked to student success (see Table 6). It should be noted that, in order to be considered as having an ongoing, systematic evaluation, programs had to have an established evaluation plan using systematic criteria to investigate all components on a regular basis.

Table 6

Program Evaluation and Student Success					
	First-Term GPA	Cumulative GPA	Retention	Success in developmental courses	
				Math	English
2-year Institutions			X-	X	X
4-year Institutions		X	X	X	X

Note: X and X- indicate statistical significance at $p < 0.05$.

Program evaluation is positively related to student retention at 2-year and 4-year institutions as well as success in developmental mathematics and English courses at both 2-year and 4-year institutions. Those students participating in developmental programs which engage in regular and systematic evaluation are more likely to be successful than students who participate in programs without such an evaluation component.

Discussion

It should be noted at the outset of this discussion that the methods employed in the study do not permit us to imply that the presence of a particular program component *causes* student success. We can only say that a relationship exists between these components and the success of students. Nevertheless, the fact that such a relationship exists coupled with observations from 20 years of research suggesting the importance of these components indicates, at least, that they contribute in some way to the success of developmental students.

It should also be noted that the study went to substantial lengths to insure that participating institutions and students were randomly selected and representative of all institutions and students. Consequently, the findings here could be generalized to all developmental programs.

Of all the components studied, centralization, tutor training, and evaluation demonstrated the strongest relationship to student success. The presence of these components was not only positively associated with firstterm and cumulative GPA, it was also linked to success in initial developmental courses.

Developmental programs which are not already centralized may not be able to change their administrative structure. However, the key to the success of centralized programs appears to be their level of coordination. This is supported by the fact that many decentralized programs with coordination of developmental courses and services also had higher student first- term and cumulative GPAs than programs which were not coordinated (Boylan, Bonham, & Bliss, 1992). It is possible, therefore, that the study is measuring the level of coordination of developmental courses and services rather than their centralization. Insuring that all those working with developmental students meet on a regular basis, having common goals and objectives for all courses and services, and having someone clearly in charge of all developmental courses and services certainly appears to represent sound practice. Improving program coordination, therefore, should contribute to student success even in decentralized programs.

The finding that tutoring without tutor training has little impact on student success may help to

explain some of the conflicting findings regarding the outcomes of tutoring programs (Maxwell, 1990). Studies of the impact of tutoring rarely take into account the one factor that appears to be most important in successful tutoring programs, that of tutor training. Consequently, it is easy to see why some studies find that tutoring makes little difference. They have failed to control for the positive effects of tutor training.

Although the presence of a tutoring program coupled with a tutor training component was strongly related to student success, training in all areas was also related to student success. The study also found that the association of advising and counseling as well as the association of remedial courses to student success was strengthened whenever training was added to the component. Although the relationship was most pronounced for tutor training programs, those students participating in programs where faculty and staff development was a general priority tended to be more successful than those participating in programs where it was not a priority. The provision of training for faculty and staff, therefore, appears to be a critical component of successful developmental education programs.

Evaluation differs from other program components in that it does not involve direct service to students. Nevertheless, students in those programs which engaged in ongoing and systematic evaluation were generally more successful than those in programs which were not evaluated in this manner. The act of engaging in evaluation may enable program staff to monitor and improve performance in those components which do provide direct services to students. Without such evaluation, it is impossible to determine how successful various courses or activities may be. Unless developmental educators are aware of the impact of their services, they cannot improve them. Consequently, the presence of a regular and systematic evaluation component characterizes the more successful developmental programs.

The fact that there was a negative relationship between mandatory placement and student success on some measures also bears explanation. Again, it is important to note that although mandatory placement was negatively correlated with some aspects of student performance it did not cause that performance. This negative correlation can probably be explained in the following way. When placement is mandatory as a result of assessment, those students most in need of remediation are required to participate in it. When placement is voluntary, many of the students in greatest need of remediation "slip through the cracks." Mandatory placement, therefore, insures that larger numbers of weaker students participate in developmental programs. This makes the developmental program accountable for the performance of larger numbers of the weakest students, thus driving down cumulative GPA and retention rates.

Obviously, this is not an argument against mandatory assessment and placement. In fact, it strengthens the arguments favoring it. As Morante points out, "Testing should be mandatory because too many students, especially those who most need assistance, will avoid assessment whenever possible" (1989, p. 34). Developmental educators and administrators should be aware, however, that moving from a voluntary to a mandatory assessment and placement system may have a somewhat negative impact on the developmental program's grade point average and retention data.

Conclusion

In many respects, the findings of this study simply reinforce what 20 years of literature in the field has already suggested. Thirteen years ago, Kulik, Kulik, and Schwalb (1983) found that the more comprehensive a program's services, the more likely the program was to be successful. Many of the services they considered to contribute to comprehensiveness were explored in this study. Scholars before and since have suggested that centralization of services, mandatory assessment and placement, tutoring and tutor training, faculty and staff development, advising and counseling, and program evaluation all

contribute to successful programs.

This particular study and the ongoing National Study of Developmental Education has, however, taken previous research a further step. It has systematically attempted, through large-scale research, to identify those components which appear to be most strongly associated with the success of developmental programs. It has identified those components which ought to be considered a minimum for a fully effective developmental program.

There are, no doubt, other components which contribute to program success. For instance, this study did not find enough developmental programs providing occupational counseling, peer mentoring, paired courses, or advanced technological applications to explore these techniques in a scientific manner. They may or may not contribute to the success of developmental programs.

Given our current knowledge, however, we can say that there appear to be definite relationships between the presence of certain program components and various measures of academic success among developmental students. These components include centralized or well coordinated administrative structures, mandatory assessment and placement, tutoring with tutor training, commitment to faculty and staff development, advising and counseling, and ongoing and systematic evaluation. Of these, centralized structure, tutoring with tutor training, and ongoing and systematic program evaluation are related to more success variables than others. Professionals making decisions would do well to examine these variables within their programs.

Furthermore, researchers should consider experimental and quasi-experimental studies to investigate the effects of these variables on student outcomes in general and in specific programs.

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Hunter R Boylan, Director, National Center for Developmental Education

Leonard B. Bliss, Professor of Educational Foundations, Department of Leadership and Educational Studies

Barbara S. Bonham, Associate Professor of Higher Education, Department of Leadership and Educational Studies

Appalachian State University, Boone, NC 28608