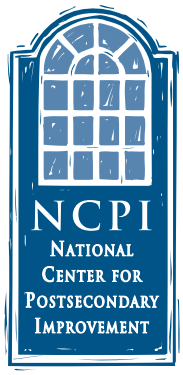

Replacing Remediation with Acceleration in Higher Education: Preliminary Report on Literature Review and Initial Interviews

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I. Introduction and Description of the Task

The Accelerating the Education of Remedial Students in Higher Education Project ("the Project") is a five-year research project which will attempt to design and implement a program that provides enrichment and accelerated education for students who are not adequately prepared to benefit from higher educational experiences and moves them quickly into the academic mainstream. In the first phase of the Project, we have three objectives: (1) examining the goals, content, extent, and effects of remedial courses at the postsecondary level, (2) exploring the applicability of the Accelerated Schools concept to higher education, and (3) setting out a framework for designing accelerated experiences to replace remedial experiences.

Thus far, we have reviewed literature that addresses the first of those goals and have contacted and interviewed researchers and educators who have been active in the field of postsecondary remedial education to obtain their impressions as to the goals and content of both "ordinary" and "exemplary" remedial programs. This report discusses the information obtained from the literature review and interviews and summarizes that information into three main areas of inquiry: (1) The extent and demographics of remediation in higher education; (2) the consequences of remediation in terms of academic achievement and persistence; and (3) the delivery and content of remedial education, both traditional methods and exemplary alternatives.

We conclude the report by summarizing our findings regarding the three primary areas of inquiry and by providing several additional and relevant avenues for further inquiry. By way of preview, our research and literature review suggests that although remedial coursework is offered at most two-year and four-year institutions, and although some 30 percent of all first-year college students take some type of remedial course, there is very little reliable and comprehensive research regarding the efficacy of such coursework in terms of student achievement and persistence. Moreover, the methods by which remedial coursework is delivered are myriad. Based on our review of the literature and discussions with experts in the field, we believe, however, that "successful" remedial programs exhibit certain characteristics, including a tie to content coursework and instruction, as well as an emphasis on problem-solving and critical thinking.

II. Method and Procedure

As noted, our research thus far has consisted of two distinct methods: a comprehensive review of the literature dealing with remedial education in postsecondary institutions and interviews with researchers and practitioners in the field. Regarding the literature review, our literature search initially cast a very broad net as we first identified research and practitioner articles discussing "remedial" courses in postsecondary institutions. Because there is no uniform definition of "remedial education," however, we used a broad construction of the term and included literature dealing with not only what is explicitly labeled "remedial" education, but also that which is labeled "compensatory," "developmental," or "basic skills" education in postsecondary institutions.[1] Our search was conducted in the educational literature database, ERIC; the on-line service, NEXIS; and certain publications dedicated to remedial education (particularly the *Journal of Developmental Education*). After identifying articles dealing with remedial education, we then selected for review those articles that in some way addressed the three areas of inquiry set forth above. From the outset, however, it should be noted that there was no comprehensive or nationwide data for certain of our areas of inquiry. Nevertheless, to be as complete as possible, we have included certain regional or institution-specific data provided in the literature.

After gathering and reviewing the literature in the field, we then contacted and interviewed researchers and practitioners who have had significant experience with remedial education in postsecondary institutions. We identified those researchers and practitioners from the literature review and from the principal investigator's professional contacts. We then interviewed them to glean further information regarding our three main areas of inquiry. It should be noted that our interviews confirmed our suspicion that there is little or no comprehensive and reliable research regarding the efficacy of remedial education, but there are several examples of what are perceived to be "successful" remedial programs.

III. The Extent and Contours of Remediation in Higher Education

This section of the report discusses the criteria used by postsecondary institutions for placing students in remedial courses; the extent of remediation in postsecondary institutions, i.e., the percentage of students in remedial education; and the demographic makeup of those taking remedial coursework.

The Criteria for Assigning Students to Remedial Education

The difficulty in determining the appropriate criteria for assigning students to remedial courses is perhaps best reflected in one author's observation that:

> The academic abilities of [remedial] students are broad: They may exhibit deficiencies in the basic skills of reading, writing or mathematics; or they may be competent in content areas, but lack the necessary study and learning skills to succeed in a collegiate setting. The students may also have poor self-esteem, high anxiety associated with learning or testing, and score low on standardized tests. Such students need development of the skills which were never learned or which were mislearned, and should not be confused with the incapable or uneducable student (Van, 1992, p.27).

Given this difficulty, one might expect a myriad of criteria by which students are selected for remedial courses. Although the literature does not provide a comprehensive picture of the criteria used for assigning students to remedial courses, it does suggest that there are at least four general selection criteria for remedial courses: (1) inadequate coursework and/or performance in secondary school; (2) poor performance on college entrance examinations, such as the ACT and SAT; (3) poor performance on subject matter placement tests; and (4) self selection for remedial courses. Our research revealed that the use of placement tests appears to be the most widely used mechanism by which students are selected for remedial courses.

Compulsory Remediation vs. Recommended Remediation

As a threshold matter, it should be noted that, even where a student is deemed in need of remediation, many institutions do not require the student to take remedial classes. This was one of the issues for which data was obtained in two nationwide surveys conducted by the National Center for Educational Statistics (NCES) regarding the extent of remediation in American higher education. NCES conducted the first survey in 1989 and reported its results in 1991 (1991 NCES Report), and it conducted the second survey in 1995, reporting its results in 1996 (1996 NCES Report).[2] This report will discuss the findings of both NCES reports and will specify the NCES report from which the findings were obtained.

The 1991 NCES Report found that among the responding postsecondary institutions that offered remedial courses, approximately 50 percent required students needing remediation to take remedial courses. Such courses were voluntary at 2 to 3 percent of the institutions, while

at the remainder of the institutions, remedial courses were recommended, but not required. The report showed, however, that four-year institutions were much more likely to require remedial courses, while two-year institutions were more likely to recommend, but not require such courses (NCES, 1991). The data presented in the 1996 NCES Report showed a substantial increase in the percentage of institutions requiring remedial courses, as 71 percent of institutions required remedial reading for those who needed it, 79 percent for remedial writing, and 75 percent for remedial math (NCES, 1996).

The policy question is whether mandating remedial courses for those deemed in need of such courses makes a difference. A study by Alfred and Lum (1988) specifically addressed the issue of the effect of an institution's remedial placement policy (i.e., compulsory vs. voluntary) on student academic achievement. The study population was all students (N = 6,117) enrolled in a remedial writing course during the fall 1978, 1979, and 1980 semesters at ten large metropolitan community colleges in the midwest. Four of the institutions had a compulsory placement policy, while six institutions had a voluntary placement policy.

The authors found that "[s]tudents enrolled in institutions with a voluntary placement policy achieved higher grades in both the remedial writing and the college-level composition course than students attending institutions with a compulsory placement policy" (Alfred and Lum, p. 115). Moreover, remedial students enrolled in institutions with a voluntary placement policy "were more likely to persist (complete up to ten courses) in the early phase of college study than [remedial] students enrolled in institutions with a compulsory placement policy" (Ibid.). These results may be explained by the fact that those voluntarily taking remedial courses may well be more motivated or conscientious and therefore perform better and persist longer than those who are compelled to take remedial courses. Thus, one should be wary of concluding that a voluntary placement policy positively affects student persistence and achievement. Interestingly and somewhat paradoxically, the authors also found that remedial students who completed one year of study or 30 credit hours and were enrolled in institutions with a compulsory placement policy were more likely to remain in college and complete an associates degree than the voluntary group. Thus, according to this study, compulsory placement is related to higher graduation rates (as opposed to short-term persistence rates).

Another study, by Boylan, Bliss, and Bonham (1997), looked at the relationship between mandatory placement policies and retention/graduation rates.[3] In that study, the authors considered whether mandatory placement is related to a remedial student's first-term GPA, cumulative GPA, retention, and/or success in the remedial course. The authors concluded that mandatory placement was significantly and *positively* related to retention at four-year institutions (defined as graduation or persistence after 5 1/2 years), while it was significantly and *negatively* related to retention at two-year institutions (defined as graduation or persistence after 3 1/2 years). This finding regarding two-year institutions appears to contradict Alfred and Lum's findings set forth above. Boylan, Bliss, and Bonham explain the negative correlation as follows:

> 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 develop-

> mental programs. This makes the developmental program accountable for the performance of large numbers of the weakest students, thus driving down cumulative GPA and retention rates (p. 8).

Although this explanation provides a plausible reason for the negative relationship between mandatory placement and retention at two-year institutions, it says nothing about the difference in findings between two-year and four-year institutions. One way to explain the difference may be that those attending two-year institutions do not want to commit the additional time or money to remedial coursework, while those in four-year institutions may be more willing to make the commitment for the longer term gains. Regardless of the effect of mandatory placement policies, the growth in the number of institutions adopting such policies suggests that policy makers are leaning towards the adoption of such policies.

The Selection Criteria for Remedial Programs

Regarding the selection criteria for remedial courses, the 1991 NCES Report found that among those institutions offering remedial courses, 94 percent of the institutions used placement tests for remedial writing, 93 percent for mathematics, and 88 percent for reading (NCES, 1991). The 1996 NCES Report provided slightly different statistics based upon slightly different information that was gathered. Approximately 60 percent of the institutions surveyed required all students to take a placement test to determine the need for remediation (NCES, 1996). Between 22 and 25 percent (depending upon the subject matter) required students who failed to meet certain criteria (e.g., insufficient ACT/SAT scores) to take placement tests for remedial courses, while approximately 10 percent of the institutions required students who failed to meet certain criteria (again, insufficient ACT/SAT scores) to take remedial courses. Another study conducted by the Southern Regional Education Board, which examined remedial education in 15 southern states, found that nearly 125 combinations of 75 different tests (including the SAT and ACT) in the areas of reading, writing, and math are used to place students in either degree credit or remedial courses (Abraham, 1992).

Apart from specific institutional policies regarding placement testing, several states have implemented statewide placement tests for postsecondary institutions. For instance, according to the State of California Legislative Analyst's Office, which obtained its data from the National Postsecondary Student Aid Study in November 1995, the criteria for placing students in remedial courses in California's postsecondary public schools differed depending upon which of the California postsecondary institutions the student attended (State of California Legislative Analyst's Office, 1995). In the University of California (UC) system, students must demonstrate competence in writing by passing the "Subject A" exam, a two-hour essay exam. Those failing the Subject A exam were placed in remedial writing courses. At the time of the report, UC did not administer a statewide placement test in math. In the California State University (CSU) system, students must demonstrate competence in English reading and writing and in math by successfully taking the English Placement Test, a one-hour reading and composition test with a forty-five minute essay, and the Entry Level Mathematics Test, a seventy-five minute multiple choice test covering elementary and intermediate algebra and geometry.[4]

Finally, remediation determinations for the community college system are made at the local level. In other words, no statewide exams are given.

In Texas, students who fail to pass the Texas Academic Skills Program Test, which is designed to ensure that all students attending public colleges and universities within the state have the reading, writing, and math skills necessary to perform effectively college-level work, are placed in remedial courses (Olson, 1995). Finally, both New Jersey and Tennessee have implemented and evaluated mandatory placement testing programs. (Morante, Faskow, & Menditto, 1984a, 1984b; Van Allen, 1992).

Although most widely used, placement tests are not the only method used for selecting students for remedial courses. Students in need of remedial assistance are also identified by their SAT or ACT scores, high school rank, and high school grades (Abraham, 1992; Van, 1992; Lavin, Alba and Silberstein, 1981). One author argued, however, that ACT and SAT scores are poor predictors of college success among minorities, returning adults, and underprepared students. Rather, "[r]esearch suggests the use of criterion reference diagnostic tests to more effectively evaluate the diversity that exists within the developmental education population" (Van, 1992, p. 33). Another group of authors noted that, in a study of the City University of New York in 1970 and 1971, placement in remedial math was determined primarily by high school preparation, while placement in remedial reading and writing was determined by placement testing (Lavin, et al., 1981). Finally, many students who identify themselves as needing academic assistance voluntarily take remedial or linked courses (linked courses are described below).

Some institutions may use combinations of the above-mentioned criteria and other criteria to select remedial students. For instance, the University of Wisconsin (Eau Claire) uses five different criteria to assign students to remedial courses: (1) repetition of the class after failing or dropping it in a previous semester; (2) readmission to the university after suspension for a low grade point average; (3) admission to the university on probation due to insufficient units, low high school grades, or substitution of G.E.D. for high school diploma; (4) return to college after an extended absence from schooling; and (5) learning disabilities or skill deficiencies identified by advisors or tests administered in the academic skills center or during freshman orientation (Harding, 1981). Thus, although the placement test is the most widely used method for assigning students to remedial courses, other methods and combinations of methods have been used.

The Extent of Remediation in Higher Education

The extent of remediation in higher education, *i.e.,* how widespread is remediation, may be gauged in several ways. The first measure of the extent of remediation is the percentage of higher education institutions offering remedial services. This measure varies by institution type and type of control over the institution, but is higher for public than for private institutions. In 1995, 78 percent of higher education institutions offered at least one remedial reading writing, or mathematics course (NCES, 1996). Notably, virtually *all* public two-year institutions and 81 percent of public four-year institutions offered remedial courses, while 63 percent of both private two-year and private four-year institutions offered such courses (NCES, 1996).[5]

A more appropriate measure of the extent of remediation is, however, the percentage of students taking remedial courses in college. This figure is quite substantial and also differs depending upon the type of postsecondary institution. Generally, the articles reviewed indicate that the percentage of students enrolled in any remedial course is higher in two-year than in four-year institutions and higher in public than in private institutions.

In an analysis of data from the 1992-93 National Postsecondary Student Aid Study conducted by the NCES, Linda Knopp for the American Council on Education (ACE) reported that 13 percent (about 1.6 million) of all students attending college took a remedial course (be it a course in math, reading, writing, or study skills) (Knopp, 1995).[6] This same study (hereinafter referred to as the ACE Brief) found that the percentage of students enrolled in remedial courses differed depending upon the type of institution as follows: public two-year (17 percent); public four-year (11 percent); independent less-than-four-year (11 percent); independent four-year (8 percent); and proprietary (7 percent). These results may be misleading, however, insofar as certain types of institutions may tend to offer fewer—or no—remedial courses (as was noted above).

The percentage of students enrolled in remedial courses also differs among the year levels of postsecondary education. Naturally, there are significantly greater numbers of first-year students in remedial courses than in later years. Based on 1992-93 statistics, the ACE Brief found that 56 percent of all students enrolled in remedial courses were first-years, 24 percent sophomores, 9 percent juniors, and 9 percent seniors (Knopp, 1995). More to the point, according to the 1996 NCES Report, 29 percent of first-time first-year students enrolled in at least one remedial reading, writing, or mathematics course in fall 1995. First-year enrollments differed depending upon the institution type, as 41 percent of such first-years at public two-year institutions enrolled in a remedial course, while those figures were 26 percent at private two-year institutions, 22 percent at public four-year institutions, and 13 percent at private four-year institutions (NCES, 1996). The aggregate number of first-years in remedial courses differed little in 1989, as 30 percent of all first-year students took a remedial course in 1989 (NCES, 1991). Finally, in California, the number of first-year students taking remedial courses is broken down as follows: 34 percent of first-years in the UC system take remedial courses, while 49 percent in the CSU system take remedial courses (Legislative Analysts' Office, 1995).

The 1996 NCES Report also found that there has been an increase in the number of students enrolled in remedial courses in the previous five years. About half (47 percent) of the institutions indicated that remedial enrollments stayed about the same, 39 percent said enrollments had increased, and 14 percent said they had decreased (NCES, 1996).

Finally, it is interesting to note that 19 percent of all postsecondary institutions offer remedial education services/courses to local business and industry. Among those postsecondary institutions, 50 percent of the public two-year and 6 percent of public four-year institutions offered such services/courses; while 5 percent of private two-year and 4 percent of private four-year institutions offered such services/courses.

Demographics of Remediation in Higher Education

This section of the report summarizes the contours of remediation, i.e., the demographic makeup of those enrolled in remedial courses.

Race and Ethnicity

The most comprehensive data we have regarding the demographics of the students in remedial courses is contained in the ACE Research Brief (Knopp, 1995). As was noted, the brief reports that in the 1992-93 academic year, 13 percent of all undergraduates were enrolled in a remedial course. The racial composition of those students enrolled in remedial courses was reported as follows: 65 percent of all students enrolled in remedial courses were white, 15 percent African-American, 13 percent Hispanic, 7 percent Asian-American, and 1 percent American Indian. In terms of the incidence of enrolling in remedial courses among different racial groups, the report found that 11 percent of all white students took such a course; 19 percent of all African-American students; 19 percent of Hispanic students; 19 percent of Asian-American students; and 15 percent of American Indian students.

It should be noted that the most comprehensive studies on remedial education, those performed by the NCES, did not provide statistics regarding the racial makeup of students in remedial courses. According to the 1991 NCES Report, such data could not be provided because the too few of the responding institutions were able to provide such data. Specifically, the 1991 NCES Report states that some 30 percent of the responding institutions were unable to provide such breakdowns in 1989. Nevertheless, both reports provided data regarding remediation at schools with a majority population of students of color and majority white schools. The 1991 NCES Report showed that there was no difference in remedial course offerings between those colleges that were predominantly students of color and those that were predominantly white (NCES, 1991). The study also showed that at institutions with a predominantly minority student body, 55 percent of first-year students enrolled in at least one remedial course, while at institutions with a predominantly nonminority student body, 27 percent of first-years did so. In 1995, those statistics differed a great deal as 94 percent of institutions with high minority enrollment compared with 76 percent of institutions with low minority enrollment offered at least one remedial course (NCES, 1996). Part of the difference between high and low minority enrollment institutions may be explained, however, by the fact that a third of the high minority enrollment institutions had an open-admissions policy, while only 15 percent of the low minority enrollment institutions had such a policy.

Gender

According to the ACE Brief, in 1992-93, 13 percent of all male students and 14 percent of all female students took at least one remedial course (Knopp, 1995). In terms of the gender breakdown among those taking remedial courses, 43 percent of all students taking remedial courses were male, while 57 percent were female (Ibid.).

Socioeconomic Status

There are two measures of socioeconomic status that surface from the literature reviewed: receipt of financial aid and household income levels. The most comprehensive information pertaining to these measures of the socioeconomic status of those in remedial courses is contained in the ACE Brief (Knopp, 1995). The brief reported that in 1992-93, 39 percent of all students enrolled in remedial classes received financial aid, while 36 percent of all students who took no remedial courses received financial aid.

Regarding the income/wealth of students enrolled in remedial courses, a distinction must be drawn between those students that are financially independent and those that are dependent upon parents or guardians. Fifty-one percent of the students taking remedial classes and 52 percent of those not taking remedial classes were financially independent. Among independent students, those enrolled in remedial courses were more likely than those not in remedial courses to report annual family incomes of less than $20,000 (54 percent vs. 43 percent) (Knopp, 1995).

Among the dependent students, nearly one quarter (22 percent) of those taking remedial courses reported an annual family income of less than $20,000, while only 14 percent of those not enrolled in remedial courses reported annual family income of less than $20,000. On the other end of the spectrum, 43 percent of those not enrolled in remedial courses reported an annual family income of $50,000 or more, while only 31 percent of those enrolled in remedial courses reported annual family income of $50,000 or more (Knopp, 1995). In short, "[r]egardless of their dependence status, students taking developmental classes are more likely than their peers who do not receive remedial help to come from families with annual incomes below $20,000" (Knopp, 1995, p. 4).

Native Country/Primary Language

According to the ACE Brief, in 1992-93, "[s]tudents taking developmental classes are more likely than those not receiving remedial help to come from another country and to speak a language other than English at home, although the differences are not as large as might be expected. . . . Approximately one fifth (18 percent) of the students taking developmental courses were not U.S. natives" (Knopp, 1995, pp. 6-7). Twenty-one percent of the undergraduates receiving remedial help spoke a language other than English at home. More telling, however, was that 35 percent of those in remedial writing and 33 percent of those in remedial reading spoke a language other than English at home, but those not speaking English at home made up only 15 percent of those taking remedial math courses.

In a related vein, the 1996 NCES Report found that 47 percent of higher education institutions offer English as a second language (ESL) for their students. Of those, 38 percent deemed all such ESL courses "remedial," 38 percent deemed none of the ESL courses remedial, and 24 percent deemed some of their ESL courses remedial.

IV. The Consequences of Remediation in Higher Education

Perhaps the area of inquiry most central to the Project is an analysis of the current consequences of remediation in higher education. In particular, we are interested in determining the academic success of those in remedial courses in terms of their performance in later content courses and in terms of their persistence in and graduation from college. Unfortunately, the research we have compiled yields very little comprehensive and systematic information regarding such consequences. At the national level, there is little data concerning the performance and persistence of students in remedial courses (there is, however, data concerning the rate at which such students pass the remedial courses and the rate at which first-year remedial students persist to the second year). So limited is the data regarding the effects of remediation, two authors concluded in 1988 that there has been insufficient research to determine whether remedial programs are successfully meeting student needs (Alfred and Lum, 1988). Additionally, much of the research regarding the effects of remediation has been flawed. O'Hear and MacDonald (1995), who reviewed all articles and research reports which appeared between 1985 and 1995 in the publications dedicated to remedial education (*Journal of Developmental Education, Journal of College Reading and Learning, Research in Developmental Education, Forum for Reading, Research and Teaching in Developmental Education*) or were presented at certain conferences dedicated to remedial education, concluded that "most research (76.9 percent) in developmental education is quantitative, and that most of those quantitative studies are seriously flawed [70 percent of the quantitative studies were deemed unacceptable]."[7]

Having noted the general lack of data and the unreliability of many of the studies in remedial education, in this part we first discuss one large-scale and ongoing study in the field of remedial education and then address specific questions regarding the impact of remedial education on (a) performance in remedial courses, (b) performance in later college courses, and (c) persistence in and graduation from college. Please note that much of the data provided in response to those questions is region and institution-specific. Necessarily, one must be cautious in drawing any conclusions and extrapolating from such limited data.

The National Study of Developmental Education

Notwithstanding the general lack of data, we have unearthed one large-scale and ongoing study of the impact of remedial education—the "National Study of Developmental Education" that is being conducted by Dr. Hunter Boylan of the National Center for Developmental Education at Appalachian State University in Boone, North Carolina. The researchers on the study describe it as follows:

> 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 (Boylan, Bliss, & Bonham, 1991, p. 2).

The Center selected 160 institutions stratified by institution type and region to participate in the study. From those institutions, some 6,000 students were selected for inclusion in the study. Extensive questionnaires were given to the institutions and the students. Moreover, the institutions provided extensive achievement and longitudinal data for the students participating in the study. To date, the results of the study are three published articles—Boylan & Bonham (1992); Boylan, Bonham, & Bliss (1994); and Boylan, Bliss, & Bonham (1997)—and an extensive database of information that the Center is currently analyzing.

One of the published papers, Boylan, Bliss, & Bonham (1997), looked at whether the following seven components of a developmental education program had any impact on remedial students' first-term GPA, cumulative GPA, retention, and/or success in the remedial course: (1) presence of a centralized program organizational structure; (2) presence of mandatory assessment of students; (3) presence of mandatory placement of students; (4) availability of tutorial services; (5) availability of tutor training; (6) availability of advising/counseling services; and (7) presence of program evaluation. The authors reported those relationships that were significant at the p=.05 level.

The authors findings can be summarized as follows:

1. *Centralized Developmental Program*. The authors found that first-term GPAs and cumulative GPAs in centralized programs in four-year schools were significantly higher than in decentralized programs in four-year schools, but the effect size was small. The same pattern held true in terms of retention in two-year institutions.

2. *Mandatory Assessment*. The authors looked at whether the mandatory assessment (not placement) of students has an impact on remedial student success. They found that mandatory assessment has little or no impact on grades and retention, but is related to success in remedial courses at four-year institutions.

3. *Mandatory Placement*. As noted above, the authors found a negative relationship between mandatory placement and retention in two-year institutions, and a positive relationship between mandatory placement and retention in four-year institutions.

4 and 5.*Tutoring Services and Tutor Training*. The authors found no relationship between mere tutoring and GPA or retention. But there is a significant relationship between tutoring and GPA/retention in four-year institutions where the tutors have been trained.

6. *Advising/Counseling*. "Although advising and counseling services have little relationship to retention and GPA," the authors found, "they are related to first-term GPA and success in initial developmental courses at four-year institutions" (p. 4).

7. *Program Evaluation*. The authors first noted that only 14 percent of developmental programs at two-year institutions and 25 percent at four-year institutions evaluate their activities in a regular and systematic manner (a fact we have found painfully true). Program evaluation is positively related to retention at both two- and four-year institutions and cumulative GPA at four-year institutions.

øAs discussed above, the findings regarding program centralization, mandatory placement, and tutoring are useful to the design of any remedial program. Moreover, the positive relationship between program evaluation and student retention suggests that such ongoing evaluation is helpful in monitoring a remedial program and facilitating ongoing improvement of the program. As the authors note, however, there are many more components that may contribute to the success of a remedial program including occupational counseling, peer mentoring, paired courses, or advanced technological applications. Unfortunately, insufficient numbers of the surveyed institutions provided such techniques.

Beyond this national study, there is almost no comprehensive information regarding the impact of remedial education. What follows, however, is a summary of the limited national, regional, and institutional information we possess regarding the "success" of certain remedial programs. Although many of the studies provide excellent information for individual institutions, the reader should take care in generalizing from those studies.

Performance in Remedial Courses

The percentage of students who pass and advance from remedial courses is one possible indicator of "success" for a remedial program. The 1996 NCES Report found the following passing rates, by subject, for those enrolled in remedial courses in fall 1995: 77 percent for reading, 79 percent for writing, and 74 percent for mathematics. Those figures were much the same in 1989, as the 1991 NCES Report found the following passing rates, by subject, for those enrolled in remedial courses: 77 percent for reading, 73 percent for writing, and 67 percent for math (NCES, 1991). These figures should be viewed in light of the finding that 92.7 percent of students enrolled in regular college courses passed such a course. Unfortunately, neither report provided information regarding students who were deemed in need of remedial courses, but never enrolled in them; nor did the report provide any information concerning the relative pass rates of first-time remedial course takers vs. those who have taken the course more than once. Put simply, reporting mere pass rates for remedial courses provides limited information because there is no matched control group against which such rates can be compared.

Nonetheless, performance in remedial courses may have an impact on later academic achievement. One study discussed above, Alfred and Lum (1988), analyzed the effect of several variables, especially institutional remedial placement policy and demographic characteristics, on the performance of remedial students. Without directly focusing on the issue, the authors found that performance in the remedial course was of vital importance to student achievement and retention:

> Of the findings discussed above, probably none were as educationally meaningful as the findings which disclosed the significance of institutionally-related factors in determining academic achievement. In all of the multivariate analyses, remedial course performance in the community college had a greater overall impact on academic achievement than either student demographic characteristics or remedial placement policy. Student learning and motivation, especially during the first semester of enrollment, can have a direct and profound effect on student achievement and retention. (p. 117)

Thus, there is a potential tension between assuring that students do not leave remedial classes without first acquiring basic skills and the empirical finding that poor performance in such courses is related to attrition.

When measuring performance in remedial courses, it is also useful to determine what percentage of students identified as needing remedial assistance either never take a remedial course (because such a course is not required) or drop out of the program before beginning the remedial coursework. In the first instance, one might argue that the most "motivated" and "conscientious" students who are identified as needing remedial assistance will actually take remedial courses when recommended, thus suggesting that any measure of completion or performance in remedial courses is skewed favorably due to the higher incidence of such motivated and conscientious students. In the other instance, to the extent students identified as needing remedial assistance simply leave school, there will be a similar skewing of results. Unfortunately, the few studies that looked at student performance in remedial courses generally did not account for the effect of student motivation.

Academic Performance

Another indicator of the "success" of a remedial program is the academic performance of remedial students in regular college courses. Although the 1991 NCES Report found that among the institutions offering remedial education, 65 percent conducted "follow up studies of grades," the report provides no information regarding the results of those follow up studies (NCES, 1991). There is, however, limited information on remedial student performance in specific institutions and states. Here, we present by way of example the results of several non-randomly sampled institutional studies and one statewide study.

Johnson County Community College Study

For instance, a small-scale (but relatively in-depth) study of the remedial program at Johnson County Community College in Overland Park, Kansas was conducted in 1990 (Seybert and Stoltz, 1992). Noting that the college's open-enrollment policy resulted in large numbers of unprepared students at the college and that a full 11.7 percent of all course offerings at the college were remedial courses, the authors concluded that a study of the effectiveness of the remedial courses was necessary. (The authors did not state the criteria for remedial-course enrollment, however. Thus, it cannot be determined whether self-selection and self-motivation affected the results of the study. The authors also did not discuss the content of remedial courses.) The study specifically examined, for the subjects of reading, writing, and math, remedial students' course grades and completion rates, grades in related college-level courses, overall academic progress, and scores on standardized assessment tests given before and after the remedial course.

In examining the remedial reading courses, the authors explored the relationship between students' performance in two developmental reading courses (LC 125 [Fundamentals of Reading] and LC 126 [Reading Skills Improvement]), scores on the comprehension and vocabulary subtests of the Stanford Diagnostic Reading test, performance in other college-level courses,

and the persistence and graduation rates of remedial reading students.[8] The authors found that 91.7 percent of those in LC 125 (n = 244) and 90.8 percent of those in LC 126 completed the course (n = 714). Significant improvements on the Stanford Diagnostic scores also were reported. In LC 125 comprehension scores improved from an average 9.5 (pretest) to an average 16.2 (posttest), while vocabulary scores improved from 20.7 to 33.6. In LC 126, comprehension scores improved from an average of 20.0 to 32.3, while vocabulary scores improved from 35.2 to 48.1. The authors then found that remedial reading students' concurrent grades in humanities, sociology, and history courses showed a moderate and statistically significant correlation with the students' grades in LC 126 (the same analysis was not conducted for LC 125 students due to the low number of such students). Such students' grades in history and sociology were well below the course average, however.

With regard to developmental English courses, the authors studied the relationship between students' performance in remedial English courses, their concurrent and subsequent performance in college-level courses in which English was important, and the persistence and their graduation rates. The authors selected ENGL 106, Introduction to Writing, as the subject course. That course reviewed sentence skills, moved into paragraph-writing with an emphasis on topic selection, organization, development, and editing. Using the ASSET (English subtest) as a measuring tool, the authors found significant improvements in mean scores from 37.3 on the pretest to 40.1 on the posttest.

The authors also studied the successful completion rate and mean grades earned by the fall 1986 "developmental English cohort" in college-level courses related to remedial English. The authors found that, compared to college-wide grades in English-related courses, the English cohort achieved somewhat lower mean grades and completed such courses at a somewhat lower rate. (Because the specific grade comparisons are lengthy and differ for each "English-related course," they will not be repeated here.) However, the authors also found a strong and significant correlation between remedial English and related course grades ($r = .62$, $p < .001$). This finding corroborates the Alfred and Lum (1988) conclusion that performance in remedial courses is related to academic achievement in future content courses. The authors also found that the developmental English cohort's average GPA dropped in the semester following the remedial course, but rose slowly after that point (this could be due to the fact that fewer of those students persisted as time wore-on and those who persisted tended to have better GPAs). Finally, the authors found that the developmental English cohort earned lower GPAs than the average college-wide GPA.

The authors studied finally the relationship between performance in remedial math courses, their concurrent and subsequent performance in other college-level courses requiring math, and the persistence and graduation rates of those taking remedial math courses. The authors concluded that students who earned relatively high grades in the fall 1986 remedial math course continued to earn relatively high grades in subsequent courses. Moreover, students who took a remedial math course in fall 1986 and continued to enroll achieved passing grades, on average, during the subsequent five semesters. Those students taking a remedial math course achieved passing grades, on average, in subsequent math-related courses, but achieved lower average grades than the college-wide average grade in such courses.

Sinclair County Community College

The Sinclair County Community College, Ohio, designed a study to examine the effects of remedial course participation on student retention and academic performance over a three-year period (Office of Institutional Planning & Research [OIPR], 1994). The study selected all degree or certificate-seeking students (N=1,798) enrolled for the first time at Sinclair in the fall 1990. All such students were required to take a battery of placement tests to determine the need for remedial coursework. Of the students in the sample, 82 percent had at least one remedial course recommended, while the remaining 18 percent had no remedial courses recommended. Notably, Sinclair did not require that students take remedial courses. The quasi-experimental study then divided students into four groups: those who chose to take all of the recommended remedial courses (N=533), those who chose to take some of the recommended remedial courses (N=451), those who chose to take none of the recommended remedial courses (N=486), and those for whom no remedial courses were recommended (N=328). Not surprisingly, of the four groups, those who tested out of the remedial courses had the highest mean scores on the placement tests. Interestingly, however, those who chose to take none of the remedial courses had the next highest mean score on the placement test.

The study then reported several findings. First, with regard to persistence, the study found that, overall, 40.4 percent of the students persisted for three years. The study also found that "[s]tudents who took all recommended developmental courses tended to stay in school longer than those who took some or no recommended courses and thus had a higher retention rate than those students who did not have any developmental courses recommended" (OIPR, 1994, p. 5). This finding is suspect, however, because (1) the study did not determine whether the students who did not persist for three years either graduated or transferred out of Sinclair and (2) the study did not account for the effect of student motivation which may be correlated with those who persisted and those who took all recommended remedial courses. Thus, the effect of the remedial courses on persistence may be exaggerated. The study also found that academic success as measured by GPA could not be predicted in a straightforward manner by remedial course participation because other variables, including incoming ability level and background experiences, confounded this measurement.

City University of New York

Lavin, Alba, and Silberstein (1981) (hereinafter Lavin) conducted an extensive study of students who entered the City University of New York (CUNY) in 1970 and 1971 under the newly instituted "open enrollment" policy. The study and resulting book describe in detail the effect of the open enrollment policy on those students' academic careers and life chances. Among the data compiled in the study, an entire chapter was devoted to an analysis of the outcome of remedial efforts directed at the "open-enrollment" students.

Lavin first provided an overview of the remedial effort at CUNY. Notably, because CUNY is a federated system, that remedial effort was decentralized and differed at the various CUNY campuses. Nonetheless, Lavin found that compensatory education was provided for writing, reading and study skills, and mathematics at nearly all the campuses. Students were selected for remedial work through a variety of means, including writing samples, standardized En-

glish tests, math placement tests, high school record, and standardized reading tests (the standardized tests often were from the Stanford achievement test battery). The instruction in the remedial courses apparently was traditional because the authors specifically noted that "innovative" techniques including self-paced courses, computer-assisted instruction, and audiovisual learning were "sometimes" used. Finally, like the placement criteria, the exit criteria differed among the campuses.

Next, Lavin provided an excellent discussion of the need for remedial coursework broken down by various demographic and other pertinent variables, including senior college vs. community college, race and ethnicity, "open-admissions" student vs. "regular-admissions" student, rank in high school class, and preparatory courses taken. Though interesting, those findings are not directly relevant to this discussion and will not be repeated here.

Lastly, Lavin provided conclusions on the impact of remediation on CUNY students. At the outset, Lavin reviewed the then-existing literature on the effectiveness of compensatory education and concluded that

> although such programs were quite common in community colleges by the late 1960s, there was not much research evaluating them, and what little there was generally showed disastrous results. . . . In the 1970s evaluation studies were more common, but their findings were inconsistent, largely as a result of variation in success criteria and in study designs. . . . In short, even though there is considerable prescriptive wisdom about the desirable features of a remedial program, there is not consensus in the research literature on the most effective components (Lavin, 1981, p. 248).

Lavin then compares the academic performance of those who took remedial courses and those who did not, controlling for differences in high school background and the level of need for remediation. One analysis conducted by Lavin capitalized on the fact that CUNY's decentralized and variable placement process created an approximation to a natural experiment in that students who took remedial courses had peers of comparable academic skills and background who took none. Lavin warned, however, that the practice of placing, after the beginning of a term, unexpectedly unsuccessful students into remedial classes and unexpectedly successful students out of remedial classes may result in an overly negative assessment of remediation. Lavin then analyzed outcomes on four indices: grade point average, credit accumulation, dropout and persistence, and graduation.

With regard to senior (four-year) colleges, Lavin found that, in general, "exposure to remediation did almost nothing to facilitate academic achievement" (Lavin, 1981, pp. 249-50). Remedial students were no more likely to stay in college than were comparable nonremedial students and overall they were slightly less likely to graduate. Moreover, those taking remedial courses did not have improved subsequent academic work as measured by grade point average. Those taking remedial courses in fact had slightly lower grades than did comparable nontakers—often equal to a tenth of a letter grade. One finding that bears mentioning however, is that success or failure in remedial courses did make a difference in academic achievement. (Recall that Alfred and Lum (1988) made a similar finding.) In particular, each course that a remedial student passed made her about 4 percent more likely than a comparable

nonremedial student to return for a second year of college. More important, "successful remedial students showed a greater likelihood of graduating after five years . . . than did comparable nonremedial students. . . . [E]ach course passed added about 1 percent to the probability of graduating" (Lavin, 1981, p. 252). Remedial coursework, however, was also an indicator of delayed graduation. In stark contrast to the successful remedial students, those unsuccessful in remedial coursework, relative to comparable nontakers, had sharply lower grade point averages, were much more likely to drop out, earned far fewer credits, and were much less likely to graduate.

Lavin found similar results with regard to the community colleges. Notably and mirroring the findings in the senior colleges, Lavin found that success in remedial courses made a difference: "Each remedial course they passed increased the probability that they would return for a second year by about 7-8 percent relative to similar nontakers . . . . Though these successful remedial students were slightly less likely than were their nonremedial peers to graduate from community college after two years, they were more likely to persist in school after the second year and ultimately they were a bit more likely to graduate or transfer to a senior college—each remedial course passed made them 2-3 percent more likely to graduate or to transfer than comparable nontakers" (Lavin, 1981, p. 256). In sum, sheer exposure to remedial courses did not enhance academic achievement, but success or failure in remedial courses impacted achievement and persistence in college. Note, however, that although the performance in remedial courses produces important results, the overall size of the differences is not overwhelming.

It should be noted that Lavin and Hyllegard (1996) conducted a follow-up study to the 1981 study on the 1970 and 1971 CUNY open-admissions cohorts. That follow-up study focused on the life chances of those who took advantage of open admissions in general as opposed to a paired study of those who took remedial coursework vs. those of comparable academic makeup who did not. Thus, although the 1996 report provides interesting conclusions regarding the open-admissions policy, it does not provide any further assessment of remedial outcomes at CUNY.

Still, it is interesting to note that in 1976, CUNY adopted a standardized policy that requires all incoming first-years to take skills assessment tests in reading, writing, and mathematics. Those who do not meet university-wide competency standards are required to take remedial courses. Moreover, all three tests must be "passed" to enter into the junior year of college (Lavin, 1996). Under the skills-testing policy, the percentage of first-years taking remedial courses grew dramatically: in senior colleges almost two-thirds of the first-years in 1980 were placed in remedial courses, compared with one-third in 1970; and in two-year schools, the proportion increased from one-half in 1970 to well over 80 percent in 1980. Unfortunately, due to the change in testing, it is impossible to determine whether this increased "need" for remediation is due to a decline in entering students' academic skills or heightened expectations. Lavin and Hyllegard conclude that because the 1980 cohort accumulated fewer credits than the 1970 cohort (especially in the first year), remedial courses retarded credit accumulation (regardless of whatever effect of remediation on other measures of academic achievement). This slow progress also may be attributed in part to the 1980 cohort's juggling of work and school in light of CUNY's much higher tuition and costs in 1980 (indeed, no tuition was charged in 1970).

Basic Skills Assessment and Evaluation in New Jersey and Texas

Studies conducted in both New Jersey (Morante, Faskow et al., 1984; Morante, Faskow et al., 1984) and Texas (Texas Higher Education Coordinating Board, 1995, August) attempted to look at the performance of remedial course-takers on a statewide basis. In a two-part article published in 1984, Morante, Faskow, and Menditto (hereinafter Morante) reported the results of a study of the New Jersey Basic Skills Assessment Program and the efficacy of remedial courses in the State of New Jersey. The first part of the article reported on New Jersey's decision to convene a task force to address the issue of remediation in New Jersey's colleges and the consequent development of the New Jersey College Basic Skills Placement Test (NJCBSPT), a test designed to help place entering students in appropriate college courses and to provide a statewide measure of the basic skills proficiencies of New Jersey's college first-years. That first part of the article also discussed the basic skills proficiency rates of New Jersey's students as measured by the NJCBSPT.

The second part of the article then reported the results of an evaluation "of the character and effectiveness of colleges' remedial programs" (Morante, 1984b, p. 6). Guidelines promulgated by the New Jersey Board of Higher Education requested that each of New Jersey's public colleges provide information on each of six outcome variables: (1) passing rates in remedial courses; (2) attrition rates; (3) grade point averages; (4) ratio of credits earned versus credits attempted; (5) pre- and post-testing; and (6) performance in subsequent nonremedial college level courses. The authors only reported, however, certain mean GPAs and attrition rates from such colleges. In this section, we discuss the findings regarding mean GPAs among students taking the reading portion of the NJCBST; attrition rates are discussed below.

In analyzing the data, the authors divided all full-time students entering in the fall of 1982 into four mutually exclusive groups for each basic skills area: (1) students who did not need remediation in the specific basic skill area (*i.e.*, those who did not place into a remedial course pursuant to the NJCBSPT); (2) students who needed remediation in the specific basic skill area and who completed it by the end of the fall semester; (3) students needing remediation in the specific basic skill area who enrolled in the remedial/developmental course, but who did not complete remediation by the end of the fall semester; and (4) students who needed remediation in the specific basic skill area but who did not enroll in the specified remedial course by the fall semester (Morante, 1984b, p. 8).

Reporting the results of the study of the spring, 1983 GPAs of students entering college in the fall of 1982, the authors stated that "students who complete a remedial course in reading achieve consistently higher grades than student who need remediation but do not complete it" (Ibid.). (No description of the remedial reading courses is provided and one could assume that the substance of such courses differed from institution to institution). For county colleges the mean GPA for those who completed remediation (n=2,635) was 1.83, while those who did not complete remediation (n=844) earned a mean GPA of 1.22. In the state college sector, those who completed remediation (n=1,416) earned a 2.09 mean GPA, while those who did not complete remediation (n=221) earned a 1.46 mean GPA. Notably, however, those who passed remedial courses earned lower GPAs than those who did not need remediation—the mean GPA for those in county colleges who did not need remediation (n=6,374) is 2.19, while the mean GPA for those in state colleges who did not need remediation (n=4,645) is 2.47. Finally, in the state

college sector, those who passed remedial courses earned a *lower* mean GPA than those who needed reading remediation, but did not enroll in a remedial course (n=250, mean GPA=2.20). The authors explain this finding with the observation that "many of the students who needed remediation and did not take it (presumably the weakest students) are no longer enrolled in the college" and thus were not included in the "need, but did not take" group (Ibid.). No evidence is provided to support this observation, however. Nor is it clear that a similar argument could not be made for the group that completed a remedial course— the weakest students could have completed the remedial course in fall 1982, but were no longer enrolled in spring, 1983.

The Texas study, which is similar to the New Jersey study and will not be discussed in detail, compared those completing required remediation to those not requiring remediation and found that the remediation completers performed at levels comparable to their non-remedial peers. That is, remedial course completers: (a) obtained a GPA of 2.0 or higher at a rate within 10 percentage points of the rate of students not requiring remediation; (b) passed the first college-level English course at a rate within 10 percentage points of non-remedial students; and (c) passed the first college-level math course at a rate within 20 percentage points of non-remedial students. But even this finding is qualified because the comparison between remedial course *completers* and those who did not need remediation ignores the great number of students who drop out of the remedial courses (44-47 percent in Texas) and possibly college.

The findings from the New Jersey and Texas studies may indicate that some remediation is better than no remediation, but one cannot conclude that some remediation will enable underprepared students to perform at the level of those who do not need remediation. Indeed, the authors of the New Jersey study make the debatable claim that the "the goal of successful remediation is to help students perform satisfactorily and not necessarily at the same level as students not needing remediation" (Ibid.).

In sum, the effect of remedial coursework on academic achievement is uncertain. Though some studies found a relationship between such courses and achievement, others found no such relationship. Moreover, even those finding such a relationship are suspect insofar as confounding variables such as student motivation were not controlled. Finally, none of the studies provided evidence that traditional remedial courses provide students with the skills to perform at the level of those who do not need remediation.

Persistence

Another important indicator of the "success" of a remedial program is the students' persistence in and graduation from college. At the national level, the 1996 NCES Report provided some data regarding the persistence of remedial students. Particularly, the report found that first-year students in remedial courses are somewhat less likely to persist to the second year than college students in general:

> Full-time entering freshmen who enrolled in remedial courses continued at their institution to the start of their second year at a somewhat lower rate than all full-time entering freshmen at institutions offering remedial courses. High retention (i.e., 75-100 percent

> continuing) of all freshmen was reported by 32 percent of institutions offering remedial courses; high retention of freshmen enrolled in remedial courses was reported by 23 percent of the institutions . . . . Conversely, low retention (i.e., 1-49 percent continuing) of all freshmen was reported by 15 percent of institutions offering remedial courses; low retention of freshmen enrolled in remedial courses was reported by 24 percent of the institutions (NCES, 1996, p. 14).

Moreover, some regional and institution-specific information was provided concerning persistence. The Southern Regional Education Board (SREB), for instance, found that among institutions within the 15 SREB states, "institutions do a better job of retaining students who do not need remediation than students who take remedial courses. For example, twice as many of the responding institutions reported retention rates of 25 percent or less for remedial students as reported such rates for non-remedial students" (Abraham, 1992, p. 17). The study also reported that the median percentage of students retained to start a second year is 55 percent for remedial students and 65 percent for non-remedial (Abraham, 1992). Data from certain institution-specific studies and one statewide study are presented below.

Johnson County Community College Study

In the study at Johnson County Community College mentioned above, the authors also addressed the issue of persistence. They reported that remedial reading students graduated (i.e., received a degree or certificate) at a rate (4.1 percent) slightly more than one-half that of the student body as a whole (Seybert and Stoltz, 1992). Further, students in the 1986 remedial English "cohort" graduated at a rate (8.21 percent) that approximated those of students college-wide, while remedial math students graduated at a rate (14.39 percent) nearly twice the college-wide average. While these findings appear important at first blush, the authors caution not to over-interpret the findings because many (if not most) students who enter a community or two-year college do not intend to graduate from them. In fact, reported the authors, less than 15 percent of those enrolling in community colleges graduate historically.

Prince George's Community College Study

A 1990 study at Prince George's Community College (PGCC), Maryland also analyzed the persistence and graduation rates (i.e., achievement of an associate's degree) of remedial students. The study, which looked at students entering PGCC the fall of 1984, found that students who had taken at least one remedial course were just as likely to have graduated from PGCC by 1988 as those who did not take any such course, although they were less likely to transfer to another institution, as 34 percent of those who did not take a remedial course transferred to another institution, compared to 22 percent of those who took at least one remedial (McCoy, 1991).

A couple points of caution should be heeded, however. First, the study reported that all students entering PGCC must take a placement test upon applying to the school, but does not specify whether remedial courses are required (as opposed to voluntary) for those failing to

achieve a high enough score on the tests. Thus, it is unclear whether the problem of motivated and conscientious student self-selection affected the study's results. Second, the study, like the Johnson County Community College Study above, did not control for those who entered PGCC without the intention of graduating from PGCC. Thus, the graduation rates of those taking remedial courses may be too favorably skewed. (Finally, it should be noted that the bulk of this study focused on the demographic makeup of students requiring remedial assistance and the remedial needs of such students).

The New Jersey and Texas Studies

Data from the New Jersey and Texas studies both indicate that those who *complete* remedial courses persist as long or longer in college than their non-remedial peers. Recall, however, that these findings are qualified by the fact that those who enrolled in but did not complete remedial courses are not counted among the non-persisters. In other words, the remedial courses themselves were unable to retain many students.

For instance, the New Jersey study (Morante, 1984b) reported the rates of attrition between the first and second semesters of college among those who took the reading portion of the NJBCST. The authors found the following attrition rates in county colleges: those who passed remedial courses (n=3,223, attrition rate = 13 percent), those who had no need for remediation (n=9,005, attrition rate=21 percent), those who did not complete remediation (n=1,774, attrition rate=42 percent), and those who needed but did not enroll in remediation (n=1,201, attrition rate=27 percent). The authors also found the following attrition rates in state colleges: those who passed remedial courses (n=1,530, attrition rate = 7 percent), those who had no need for remediation (n=5,192, attrition rate=11 percent), those who did not complete remediation (n=315, attrition rate=30 percent), and those who needed but did not enroll in remediation (n=329, attrition rate=14 percent). Thus, this study indicates that those who complete remedial courses enjoy relatively low attrition rates. This finding is of course tempered by the facts that: (1) it is not surprising that those who complete a remedial course in the first semester re-enroll in the second semester at relatively high rates; and (2) the authors did not control for student motivation.

Other Information on Persistence

In California, although there is "almost no" information on the college graduation rates of students who enroll in remedial courses, the California Legislative Analyst's Office reported that "students who are involved in remedial education tend to take longer to graduate than those who are not" (Legislative Analyst's Office, 1995). To support this conclusion, the authors state that at CSU Hayward, 23 percent of the students graduating in four years needed remedial education, compared to 63 percent of those who graduated in five years. The only other evidence cited by the Legislative Analyst's Office was that students in the Los Rios Community College District who take remedial courses take up to a year longer to transfer to a four-year institution than those who do not take such courses. Although the report provides no information as to why remedial students take longer to graduate, one might suspect that because many remedial students come from lower income families and may need to work at

least part time, it takes longer for them to graduate. Another explanation could simply be that remedial students may not receive credit towards graduation for their remedial work and therefore spend more time accumulating enough credit hours to graduate.

Moreover, as described above, the study of remediation at the Sinclair County Community College, Ohio (OIPR, 1994) found that students who took remedial courses tended to persist longer than those who were advised to do so, but did not. This finding is suspect, however, due to its failure to control for student motivation and student graduation/transfers. Further, Lavin's 1981 study of CUNY found that remedial students were no more likely to persist in college than non-remedial students of similar capabilities.

All told, the effect of remedial coursework on persistence is ambiguous as some studies have found a positive relationship between the two (but have been methodologically flawed), while other studies found that such a relationship did not exist. Two findings appear uncontradicted, however: (1) students who take remedial courses tend to take longer to graduate than those who do not take such courses; and (2) performance in remedial courses is positively related to persistence in college.

V. The Delivery and Content of Remediation in Higher Education: The Locus of Basic Skills Delivery, The Content of Traditional Remedial Coursework, and Exemplary Alternatives to Traditional Approaches

This section considers the delivery and content of remediation in higher education. Specifically, we first look at how the postsecondary institution organizes its basic skills instructional programs—whether centralized in one department or spread among the various general academic departments. Then we consider how remedial services are delivered, including traditional repetition and drills with low level skills, and its alternatives and supplements, including linked/paired courses, student-centered instruction, learning assistance centers, and critical thinking programs. It should be noted, however, that most of the information reviewed concerning the delivery and content of remedial coursework focused on "successful" and/or "innovative" interventions. Very little information was provided concerning the content of most remedial courses.

The Delivery of Remedial Education: Centralized vs. Decentralized

We have found that remediation is generally delivered in one of two models: centralized and decentralized. In the centralized model all remedial courses and services are provided under a single administrative unit and coordinator. In the decentralized model, remediation is dispersed among the general academic departments—mathematics and English, most often—in the institution. Support services for remedial students in a decentralized system are provided through the academic departments, divisions, or a learning assistance center separate from the academic departments. Both models are widespread, and empirical, practical, and philosophical arguments can be made in favor of and against each of them.

A study conducted by the Southern Regional Education Board (SREB) in 15 southern states found that the decentralized model is the most frequent delivery model: "[t]he traditional academic department is the most frequent means of delivering remedial education in the region, with 41 percent of the institutions using this approach in reading, 57 percent in writing, and 58 percent in mathematics" (Abraham, 1992, p. 3). One could argue that this decentralized model provides coherence between the remedial courses in a department and the department's regular courses. The decentralized model also facilitates the involvement of departmental faculty in the preparation of remedial students (though we have received much anecdotal evidence that the general academic departments often assign teaching assistants and adjunct or junior faculty to the remedial and basic skills courses). Despite these virtues of the decentralized model, however, there is some evidence that the centralized model may provide greater benefits to remedial students.

Some have argued that centralized remedial programs are more effective in meeting the needs of underprepared students than decentralized programs (Boylan, Bliss, & Bonham, 1997; Boylan, 1984; Maxwell, 1985; Rouche & Snow, 1977; Spann, 1977). Proponents of the centralized system posit that these programs are more likely to have comprehensive coordination of remedial courses and services. Such coordination ensures that those working in remedial education meet on a regular basis, share common goals, and possess a clear line of leadership and accountability. From a practical and political standpoint, departmental/divisional status

also provides administrative control over program curriculum, funding, and services, as well as a visible and unitary faculty.

There is some evidence to support the position that centralized programs enhance the performance and persistence of remedial students. Boylan, Bliss, and Bonham (1997) found:

> Students participating in centralized developmental programs were more likely to be successful than students participating in decentralized programs. . . . Students at two-year institutions participating in centralized developmental programs had higher rates of retention than those participating in decentralized programs. . . . Students at four-year institutions participating in centralized developmental programs had higher first-term GPAs and higher cumulative GPAs than those participating in decentralized programs (p. 3).

Notwithstanding these findings, however, arguments can be made against the centralized model. For instance, centralization is not necessarily the factor that results in better performance. Rather, coordination among remedial programs and services may be the necessary key to success. Such coordination could conceivably be achieved through orchestration by the learning assistance center and/or greater cooperation among the various academic departments. Others have noted that, under the centralized model, remedial coursework, instructors, and students are segregated from the academic departments at many institutions (Eaton, 1994; Shaw, 1996). The SREB study reflects the substantial number of schools that segregate their remedial programs: "About a third of the institutions use separate divisions to offer remedial reading, writing and mathematics" (Abraham, 1992, p. 3). This segregation may pose an additional obstacle to entering the academic mainstream at college.

The Traditional Remedial Approach: Repetition and Drills with Low-level Skills

Although there are many strategies for delivering basic skills to underprepared college students, we know very little about the "typical" or most common methods for delivering basic skills. Some authors claim, however, that the traditional and typical approach is to provide non-degree credit courses which attempt to inculcate the necessary skills that are considered preparatory to doing college level work (Grubb, 1998; Keimig, 1983). This approach "tends to focus on sub-skills—on arithmetic procedures like multiplication and percentages, on grammar and punctuation and vocabulary, on math 'problems' of the most contrived sort and reading passages from texts that have been simplified for low reading levels" (Grubb, 1998, p. 8). Unfortunately, this drills-and-skills approach has a number of drawbacks, not the least being that much of this type of instruction simply replicates the unsuccessful conditions which the student previously experienced and which led, in part, to earlier failure.

The little comprehensive data available about traditional basic skills remedial courses were gleaned from the 1991 NCES Report. Although the report provided no information on the content of most remedial courses, it did provide information on whether the institutions based remedial-course exit skills on regular academic-course entry skills. In the fall of 1989, approximately 80 percent of the institutions reported that they based exit skills on regular academic-

course entry skills—86 percent in remedial mathematics, 81 percent in remedial writing, and 70 percent in remedial reading (NCES, 1991). (The 1996 NCES Report did not provide these statistics.) Such a skills orientation, while properly focusing on the preparedness of students for higher level coursework, may have the unfortunate effect of also focusing on the acquisition of such skills in isolation, using instructional strategies with a drill-and-practice emphasis. Indeed, scholars of community colleges have criticized remedial classes for this very practice of emphasizing the acquisition of "basic skills" over the development of critical thinking (McGrath & Spear, 1991).

The Learning Assistance Center and Academic Support Services

In addition to the remedial courses themselves, many postsecondary institutions offer support services for students desiring academic assistance. Among the institutions surveyed by the NCES in 1989, 85 percent offered peer tutoring as a support service, 82 percent offered counseling, 70 percent offered faculty tutoring, 69 percent offered a learning center, 64 percent offered an assistance lab, and 61 percent offered additional diagnostic testing (NCES, 1991). Although not designed solely to meet the needs of remedial students, these services often benefit such students. Because they are designed to meet the needs of all students who desire some extra assistance, however, the impact of such support services on remedial students is unclear. What follows is a description of two of the more widespread support services—tutoring and the more comprehensive learning assistance centers—that remedial students may utilize.

Peer tutoring at the college level is often an inexpensive and ostensibly effective way to supplement the learning of students in need of support. Maxwell (1990) surveyed a large and varied body of literature on peer tutoring and specifically discussed the question of whether peer tutoring helps students. Initially, however, she stated that:

> Experts do agree about what constitutes a successful tutoring program. At a minimum, tutors are recommended by a faculty member, carefully screened and selected on the basis of performance criteria and knowledge of the subject, trained how to work with underprepared students before they start tutoring them, and evaluated regularly by their coordinators, instructors and their students (Maxwell, 1990, p. 1).

Maxwell then went on to review the literature to determine whether peer tutoring improves grades and/or affects college persistence. She noted that making such determinations is difficult (if not impossible) because peer tutoring can take many forms—individual, group, drop-in, adjunct, etc. Even reviewing the studies of individual peer tutoring provides no clear answers. Although Maxwell concluded that some studies provide evidence that tutoring may not assist the weakest students, other studies find that tutoring results in higher grades for certain underprepared students who receive sufficient tutoring regularly and early enough. Further, Maxwell pointed to evidence that students who are tutored remain in college longer than those who are not tutored. However, it is very difficult to assess the impact of peer tutoring programs on grades, GPA, and retention rates; not only because they are often combined with adjunct courses, but also because of their wide variability in design and content (Maxwell, 1990; see also Boylan, Bliss, & Bonham, 1997).

One aspect of tutoring does appear to enhance remedial student performance, however—tutor training. Boylan, Bliss, and Bonham (1997) found that "[s]tudents participating in tutoring programs featuring a training component were more likely to have higher first-term GPAs at both two-year and four-year institutions. They were also more likely to have higher cumulative GPAs and to be retained at four-year institutions. Tutoring programs featuring training components were associated with higher pass rates in developmental English courses at both two-year and four-year institutions" (Boylan et al., 1997, p. 4). The authors also found that tutoring without tutor training has little impact on student success. Thus, conclude the authors, the conflicting findings regarding tutoring may be explained by the presence or absence of tutor training.

Moving from a specific strategy to a more holistic approach toward academic support services, there exists a small and growing body of literature on learning assistance centers. Although necessarily diverse in the services offered, there seem to be several essential components to an effective learning assistance program. In their recent book, Cassazza and Silverman (1996) put it this way:

> There is no one formula for developing and managing a successful learning assistance program. The particular characteristics and needs of each individual institution drive the organization of programs, the format of service delivery, the overall management and operation of the program, and the methods of program evaluation. However, this does not mean that each successful program develops in a vacuum devoid of basic principles of organization and management. We know a great deal about how to operate successful programs (p. 71).

Attempting to synthesize "what we know" about successful learning assistance centers, one article identified nine essential variables culled from research and theory on effective learning assistance programs (Van, 1992). According to Van, "[a] comprehensive review of literature was conducted into the areas of remedial education, student development, and college retention. Based upon these data, nine variables were identified which are associated with effective practices in learning assistance programs" (Van, 1992, p. 28):

> 1. systematic planning and design of the program based on level of student needs . . . .;
>
> 2. written policies, procedures, and goal statements indicating the university's commitment to the education of underprepared students . . . ;
>
> 3. administrative support for the program demonstrated by budgetary, staffing, and facility allocations . . . ;
>
> 4. divisional or departmental status of the program . . . ;
>
> 5. program administered by a director and staffed by committed, well-qualified, and experienced educators who have chosen to work with underprepared students . . . ;

6. individualized instruction, paired learning, and flexible programming structures which allow students to progress at their own pace . . . ;

7. support services to assist students in developing a positive self-concept and an internal locus of control . . . ;

8. assessment and placement strategies that ensure students are enrolled in correct course levels . . . ;

9. program evaluations which are based on program goals and include both formative and summative data . . . ." (Van, 1992, pp. 28-29).

Van then elaborates on the theoretical and empirical underpinnings of each of the nine essential variables. Many of these variables were echoed and further fleshed out in Cassazza and Silverman's (1996) work on designing an effective learning assistance center. The self-identified primary audience for that work is "the community of practitioners, both novices and the more experienced" (Cassazza and Silverman, 1996, p. xiii), and it provides an instructive treatment of the issues to consider when developing a learning assistance center.

At minimum, learning assistance centers are useful in addressing the needs of underprepared (indeed all) students and providing comprehensive academic services to the college community. Such centers are not the focus of this project, however. Rather, the project aims to identify and design specific educational interventions that will replace traditional remedial educational strategies and accelerate the learning of underprepared students. Linked and paired courses may be one such intervention.

Linking Skill-Building to Content-Based Courses

Remedial education experts and practitioners frequently recommend that basic skills be taught in conjunction with content course materials so that the student may immediately transfer those skills to tasks perceived to be "real" (Commander & Smith, 1995; Dimon, 1988; Harding, 1981; Luvaas-Briggs, 1984; Stahl, Simpson & Hayes, 1992; Wilcox, delMas, Stewart, Johnson, & Ghere, 1997; see also Cross, 1976, p. 42). The corollary is that remedial education programs that focus on basic-skills acquisition in isolation from content courses do not provide such transfer skills: "Many postsecondary skills-development programs function outside the domain of 'academic' departments; they teach strategies in isolation from the actual work to which they are meant to be applied and thus may fail to emphasize transfer of these skills to actual coursework" (Gebelt, Parilis, Kramer, & Wilson, 1996). To alleviate this transfer problem, remedial education experts frequently suggest tying basic-skills development to actual content coursework.

Although the literature and practitioners use different names and different models for remedial courses that are tied to content courses, e.g., adjunct courses, tandem classes, paired courses, packaged courses, linked courses, and, more broadly, supplemental instruction and learning communities, this report identifies them as "linked courses." At their very essence,

linked courses offer a remedial course subject, such as writing or study skills, to students who are simultaneously registered in a specific, credit-bearing, content course, such as history or sociology, and materials from the content course are used as instructional materials in the remedial course. In such content-based remedial courses, the content course may be one of the student's own selection (typically one of a handful of lower-division courses) or it may be tied to a specific lower-division course (sometimes deemed "at risk" courses). Moreover, the remedial course may be taught independent of the content course, or it may (and some argue should) be taught in collaboration with the department or instructor of the content-based course (Mallery & Bullock, 1985; Stahl, Simpson & Hayes, 1992).

Ideally, in a content-based linked course, remedial coursework is tied to actual content-coursework which the student is required to complete for the content course. Unfortunately, some institutions do not permit students to be enrolled in remedial courses concurrently with content courses.[9] In that case, experts recommend that remedial skills should be taught through a model that simulates actual content coursework (King, Stahl, & Brozo, 1984; Nist & Hynd, 1985; Stahl, Simpson & Hayes, 1992). For a description of the "simulation model," see Stahl, Simpson & Hayes (1992).

As is further discussed below, there is evidence to support the notion that linked courses improve student persistence, enhance the student's social and academic integration into the college experience, and, perhaps, increase academic achievement at least in the linked content course. In other words, some evidence suggests that linked courses "work." In one article, Dimon (1988) provides six reasons for the stated success of linked courses during the prior six years of being offered at California State University at San Bernadino: (1) they have a definable purpose; (2) they function as support groups; (3) they challenge students; (4) they promote participation; (5) they are flexible; and (6) they deliver what they promise in a quantifiable manner. Although the model discussed in Dimon's article most resembles the Supplemental Instruction model (discussed below), the reasons she posits for why the model works apply equally to most versions of linked coursework.

Tying content coursework to the acquisition of basic skills is also consistent with a body of educational psychology research that highlights the effectiveness of situated learning or situated cognition (Greeno, 1997; Greeno, Collins, & Resnick, 1995; Greeno, Smith, & Moore, 1993; Lave & Wenger, 1991). The situative perspective of cognition "views knowledge as distributed among people and their environments, including the objects, artifacts, tools, books, and the communities of which they are a part" (Greeno, Collins, & Resnick, 1995, p. 3). This view of knowledge has profound implications for learning. Particularly, the situative perspective suggests that teachers organize the activities of learning to include participation in inquiry, discourse about concepts, claims, and arguments. This type of organization requires students to formulate and solve "realistic" problems, rather than requiring students to obtain basic skills with the hope that those skills will transfer to "real-world problems." With situative learning, basic skills are embedded and can be taught in the context of the problem-solving project or activity. Knowledge is not segregated between basic skills and content. Similarly, content-based linked courses require students to use basic skills in the context of problem-solving in their content courses. For instance, in a content-based linked course, students may use their developing writing skills in constructing an argument for a history course.

As is discussed in detail below, research into the efficacy of content-based remedial courses suggests that although there is no definitive evidence that a student's cumulative academic performance is enhanced by linked courses, it appears that students who take such courses fare better in the content course to which the basic skills course is linked and tend to persist in college at a rate at least similar to the student population at large (Blanc, DeBuhr & Martin, 1983; Gebelt, Parilis, Kramer, & Wilson, 1996; Levin & Levin, 1991). Some studies indicate, however, that content-based remedial courses may also enhance students' achievement beyond the linked courses (Blanc, DeBuhr and Martin, 1983; Olson, 1995). What follows is a description of three of the more prevalent models that use linked courses—linked/paired courses, supplemental instruction, and learning communities—and a review of certain research studies that attempted to gauge the efficacy of such models.

Linked/Paired Courses

In this section, the report describes the details of certain linked course programs and, to the extent available, the results of any evaluations of those programs.

1. Sam Houston State University

In the spring of 1991, an experimental remedial reading program was implemented at Sam Houston State University to coordinate the existing remediation curriculum with required academic courses (Olson, 1995). Before the program, students who had failed the Texas Academic Skills Program Test (TASP) were required to take remedial classes which dealt "with isolated skills and exercises which had no functional link to content courses" (Olson, 1995, p. 53). Moreover, the remedial courses gave students only institutional credit; they did not carry credit toward graduation. Those students who failed the TASP and enrolled in remedial courses, however, also were permitted to enroll in beginning history courses which had a heavy reading requirement.

The experimental program was a collaboration between the History Department and the Department of Language, Literacy, and Special Populations (LL&SP). Nineteen remedial reading and writing students (who apparently failed the reading and/or writing sections of the TASP and therefore were required to take remedial courses) enrolled in the spring 1991 History 164 course, United States History from 1877 to the present. Another 270 students who had already passed the TASP also enrolled in the class. All 289 students met each week in two one-hour lectures by the professor and spent another hour in a smaller discussion section.

The 19 remedial students all were assigned to one discussion section which was led by a graduate assistant in the history class and held in the Learning Resource Center. The nineteen students also enrolled in a remedial reading and/or writing class required by the state TASP legislation, in which class the LL&SP professor agreed to use as materials the required texts from History 164. Moreover, the reading tutors in the Learning Assistance Center read the history texts and prepared to help any history student seeking assistance. The history professor, the graduate assistant, and the remedial instructor

held frequent meetings to coordinate activities and evaluate progress. Specific remedial methodologies are described in the article.

The program reportedly enjoyed some success in enhancing student attitudes towards academics, improving student reading abilities, assisting students in performing well in the history class, and retaining students at the university. First, remedial students participating in the program had greater confidence in their own abilities and a greater appreciation of history after participating in the experiment. At the beginning of History 164, the LL&SP instructor administered to all students in the class (remedial and non-remedial) a survey assessing attitudes toward academics and reading in general and knowledge of history in particular. The survey was again administered at the end of the semester. At the beginning of the semester, the remedial students scored an average of 36 on a 100-point scale, while the entire class average was 58. At the end of the semester, the entire class scored an average of 79, while the remedial students averaged 80, indicating substantial gains in attitude toward academics and history.

Second, remedial students made larger gains than non-remedial students in knowledge of history. A 100-item history content test was administered to all students before and after the semester. While non-remedial students averaged a gain of 26 points on the test during the semester, the remedial students gained 32 points.

Third, the article claims that "[i]n terms of final grades for the semester, the developmental students did significantly better than the average for the entire class" (Olson, 1995, p. 55). The article does not provide, however, any comparative data to support the claim.

Finally, all nineteen of the remedial students passed the reading and/or writing section of the TASP in the summer after the program. Moreover, at the time the article was written (at least 14 months after the remedial intervention), all nineteen students were still enrolled at the university.

2. Georgia State University

Educators at Georgia State University (GSU) have implemented and evaluated two linked course packages: an introductory history course linked to a basic skills reading course dubbed "Learning Strategies for History" and a college algebra course linked to a basic skills math course called "Learning Strategies in Algebra" (Commander & Smith, 1995; Commander, Stratton, Callahan, & Smith, 1996; Stratton, 1996). Their experience with those courses provides some limited evidence of the favorable impact of linked courses on student performance in the content course.

The linked reading and history package. At GSU students may be conditionally accepted to the university with a required course in basic reading skills (Commander et al., 1996; Commander & Smith, 1995). Typically, such students would not be permitted to register in any content area course until they had completed the reading course. Students who scored a minimum of 340 on the verbal section of the SAT as well as being placed in the

second of a two-course remedial reading sequence, however, were permitted to enroll in an American History introductory course as well as the Learning Strategies for History (LSH) course for institutional (non-degree) credit.

The LSH curriculum focused on three main instructional components: (1) a traditional study and learning strategies component; (2) a component that sought to "increase students' metacognitive awareness through learning logs, weekly observations of student behaviors, and learning styles inventories" (Commander, et al., 1996, p. 10); and (3) an historiography component, i.e., ways of reading, writing, and thinking that give structure to the study of history. The linked courses were evaluated over a five-quarter period. In the first quarter, students were permitted to enroll in one of eight different history sections, while in the second quarter, students were permitted to enroll in one of three different history sections. Because the materials, curricula, and instructors differed among the various history sections, the LSH course was more difficult, and this difficulty led Commander & Smith (1995) to recommend that adjunct courses be paired with only one content course section. Consequently, for the final three quarters of the evaluation, the LSH course was paired with only one section of history.

Commander et al. (1996) reported that, in those courses in which LSH students were paired with only one history section, the mean grade in the history course for the LSH students was 1.85/4.0 (sd = .91), while the grade for the regularly admitted students in the history course was 1.97 (sd = .96). The authors did not report whether this difference was significant. The authors also reported that of the LSH students who completed the history course, 88.7 percent earned a passing grade (A, B, C, D), while 86.9 percent of the regular admits received a passing grade. Using an independent *t*-test, the authors found that this difference was insignificant and circumspectly concluded that "both groups could have come from populations with identical means" (Commander et al., 1996, p. 12).

This study provides some evidence that linked courses may favorably impact students' performance in the linked content course, but the results should be interpreted with caution. The comparison the authors made was between the LSH students and the regular admits. Although this is a useful comparison, it cannot be concluded that the linked courses made the difference. Because there was no control group of non-regular admits who were enrolled in history but not the LSH course, one could argue that the non-regular admits would have fared as well with or without the LSH course. Moreover, as is the case with other studies discussed in this report, there may have been a selection bias as the authors did not control for the self selection of the more motivated remedial students.

The linked math courses. In this pairing, students co-registered in a college algebra class and a remedial course called Learning Strategies in Algebra (LSA) (Stratton, 1996). The LSA course "emphasized the processes of learning mathematics, learning study skills specific to mathematics, and understanding instructions on the use of the graphing calculator using the content of college algebra" (Commander, et al., 1996). The course also fostered collaborative learning and anxiety reduction techniques. One significant difference from the reading/history linked courses was that the LSA students were not

strictly "developmental" students. Rather, they were (1) former remedial math students who felt the need for further academic support; (2) students who failed or withdrew from a previous college algebra class; or (3) other students interested in assistance.

According to Commander et al. (1996), "[s]tudents who participated in the adjunct course along with college algebra demonstrated equal or greater mathematics proficiency by satisfactorily completing the college algebra course with equal or higher scores than students who did not take the cocourse" (Commander et al., 1996, p. 12). Specifically, the authors reported that the LSA students' mean grade in the college algebra course was 2.25 (sd = 1.05), while the mean grade for the non-LSA students was 1.57 (sd=1.31). The authors further reported that "[o]n the average, students who participated in the adjunct earned a higher score by 7 percentage points or by more than one-half letter grade higher in college algebra than did the students who did not participate in [the LSA course]" (Ibid.). This difference was significant and indicates that the students taking the LSA course performed better than those who did not. Finally, 100 percent of the LSA students who completed the college algebra course had a passing grade while only 80 percent of the non-LSA students had completed with a passing grade.

These findings should be tempered by the fact that the students in LSA were not necessarily underprepared students and the fact that the authors were unable to control for selection bias. Nevertheless, the study provides some limited support to the efficacy of linked courses.

3. The Gateway Program in Psychology, Rutgers University

The Gateway Program at Rutgers, the State University of New Jersey, is a content-based remedial program in which each of the 10 academic departments administers its own remedial classes at the introductory, first-year level (Gebelt, Parilis, Kramer & Wilson, 1996). These classes integrate course content with basic skills, thus allowing the remedial student to transfer those learning strategies directly to the content courses. "High risk" students are selected for the program by a complex algorithm that considers their performance on the Sentence and Reading scores on the New Jersey College Basic Skills Test and the SAT. Those who are placed in the program must take one or two Gateway classes which cover the same amount and type of material as the regular content course and provide regular degree credit to the students.

Particularly, the Gateway Program in Psychology combines the following aspects: (a) small-group discussion sessions to support lecture classes; (b) graduated increases in material assigned and autonomy required; (c) frequent assessment and feedback; and (d) innovative teaching strategies. A 1996 study of the Gateway Program in psychology presented data that show that students in the Program are retained at a rate comparable to the university at large (Gebelt et al., 1996).

To evaluate the success of the program, Gebelt et al. examined data for all program participants from the fall, 1991 through the spring, 1994 semesters (n=460). To assess the

persistence of the Gateway participants, they compared students from each semester's Gateway class with an equal number of students selected from the regular psychology course during the same semester. That comparison sample contained 461 students. Students who registered for the fall, 1995 semester or who had graduated prior to that were counted as "persisters." Of course, although non-persisters were no longer registered at Rutgers, the authors could not determine whether they had transferred to a different school, planned to return, or had permanently withdrawn.

The authors found that persistence in the Gateway sample was 78.7 percent and in the non-Gateway sample was 82.7 percent—a non-significant difference (chi-square = 2.305, p = .13), indicating that Gateway students persist at roughly the same rate as non-Gateway students. The authors also noted that the 78.7 percent persistence rate compared quite favorably with the national average persistence rate of 48.3 percent reported by Boylan and Bonham (1992). Because there is the possibility that students from the 1991-92 samples could have graduated, the authors compared the Gateway and non-Gateway samples from those years in terms of whether the students had withdrawn, graduated, or were still enrolled. Although the non-Gateway students graduated at a rate far higher than the Gateway students, the latter were significantly more likely to still be enrolled, thus suggesting that although they are persisting, they may be taking a longer time to graduate. The authors attribute this difference to the greater number of "distractors" the Gateway students may face: the need to take non-degree credit, non-Gateway remedial courses; the need to work full or part time; and other familial obligations.

Supplemental Instruction

Initially developed at the University of Missouri, Kansas City (UMKC) to assist health science professional school students, Supplemental Instruction (SI) has become a widely accepted and often evaluated model that is designed to assist students who are enrolled in "at risk" courses. Although SI does not link a specific skill-building course to the "at risk" course, it embeds effective learning and study strategies in a course that supplements the at-risk course. According to the National Center for Supplemental Instruction (NCSI), SI is defined as

> a student academic assistance program that increases academic performance and retention through its use of collaborative learning strategies. The SI program targets traditionally difficult academic courses, those that typically have 30 percent or higher rate of D or F final course grades and/or withdrawals, and provides regularly scheduled, out-of-class, peer facilitated sessions that offer students an opportunity to discuss and process course information. . . . SI thus avoids the remedial stigma often attached to traditional academic assistance programs, since it does not identify high risk students but identifies high-risk classes.
>
> Students of varying abilities participate, and no effort is made to segregate students based on academic ability. Many underprepared students who might otherwise avoid seeking assistance will participate in SI, since it is not perceived to be remediation and there is no stigma attached. Such stigma can cause motivation problems for develop-

> mental students. . . . SI enables students to master course content while they develop and integrate effective learning and study strategies. Therefore, learning/study strategies (e.g., note-taking, organization, test preparation) are integrated into the course content during SI sessions (Arendale, 1997).

The goals of SI are to (1) improve student grades in targeted historically difficult courses; (2) reduce the attrition rate within those courses; and (3) increase the eventual graduation rates of students (Martin, Arendale, & Assoc., 1997). Despite the facts that SI was not designed solely for underprepared students and that it does not seek to link reading or writing skill-building to content courses, evidence that its linking of study skill-building to content courses provides academic benefit to students supports the broader proposition that basic skills acquisition is best fostered in the context of a content course.

As it operates today, SI involves four key persons. The SI supervisor, a trained professional, is responsible for identifying the at-risk courses, garnering faculty support, selecting and training SI leaders, and monitoring and evaluating the program. The faculty member who teaches an SI course is critical in that such person must invite and support SI in his or her classroom. The SI leader is a student or learning center staff member who has been deemed "course competent, approved by the course instructor and trained in proactive learning and study strategies. SI leaders attend course lectures, take notes, read all assigned materials, and conduct three to five out-of-class SI sessions a week" (Martin et al., 1997, pp. 1-2).

The instructional approach of the SI program is to maximize student involvement with the at-risk course material. The SI course meets for at least three or more hours per week per course. During the SI session,

> [t]he SI leader neither relectures nor introduces new material. Instead, the SI leader guides students in using their own class notes and reading materials to help students clarify course concepts. Although the SI leader provides structure and guidance, the responsibility for processing course material remains with the students.
>
> Although the faculty members who teach courses targeted for SI are very supportive and involved in the program, they do not receive information regarding the names of their students that participated. . . .
>
> . . . . During the SI session, the SI leader models application of study strategies such as note taking, graphic organization, questioning techniques, vocabulary acquisition, and test prediction and preparation. Students learn to trust each other to verbalize what they do understand and clarify what they don't understand. At the beginning of the semester, the SI leader provides the structure for the study session. However, as the semester progresses, the students assume responsibility for the structure by creating informal quizzes, visual models, note cards or time lines, brainstorming, designing paired problem solving activities or predicting test questions. This is a powerful use of collaborative learning strategies. (Ibid. pp. 5-6).

Proponents of SI also tout its cost-effectiveness. For instance, UMKC claims that the average cost per student per year for its SI program is $46.89 and provides additional economic revenue to the university in that it promotes re-enrollment of some upper level students who otherwise would not have continued at the university (Ibid., pp. 10-11). Moreover, the United States Department of Education has recognized SI as an "Exemplary Educational Program" and provided funds in the past from the National Diffusion Network to disseminate information on SI (Ibid., p. 2). As of October 1996, some 667 United States institutions either planned to implement or had implemented the SI program (Ibid., p. 8).

Most important for this report, however, SI is one of the more heavily studied and evaluated educational interventions that has application to underprepared students. Indeed, a recent bibliography of SI manuscripts revealed that some 32 journal articles, 15 books, chapters, and/or monographs, twodissertations, and 21 unpublished manuscripts have considered SI programs. Following are the results of one large-scale review of the impact of SI and a smaller scale study of SI.

1. Large-Scale Research Concerning the Effectiveness of SI

Researchers and analysts at the NCSI maintain an ongoing database of the research concerning the effectiveness of SI (Martin, Arendale, & Assoc., 1997). This research is maintained to support three primary claims made by SI:

Claim 1. Students participating in SI within the targeted historically difficult courses earn higher mean final course grades than students who do not participate in SI. This is still true when differences are analyzed, despite ethnicity and prior academic achievement.

Claim 2. Despite ethnicity and prior academic achievement, students participating in SI within targeted historically difficult courses succeed at a higher rate (withdraw at a lower rate and receive a lower percentage of D or F final course grades) than those who do not participate in SI.

Claim 3. Students participating in SI persist at the institution (re-enrolling and graduating) at higher rates than students who do not participate in SI (Martin et al., 1997, p. 10).

Because the NCSI collects certain recommended data regarding the three claims from both UMKC and from nearly 100 other colleges and universities throughout the country, the authors were able to analyze that data under a single research design.[10] The design, like nearly all of the designs reported herein, is a quasi-experimental study that compares the performance in terms of achievement in the content course, re-enrollment, and graduation of a treatment group—the SI participants, and a control group—the non-SI participants.

In an attempt to control for selection bias, the analysts administered a survey on the first day of the course to find out the motivation level of the students concerning SI. At the time of the survey, the SI meeting times had not been announced, so students could not

have known of any scheduling conflicts. Interest in SI was gauged on a five-point Likert scale (5 = high; 1 = low). Those who designated a four or five were deemed "highly motivated." Another survey was administered on the last day of the course to determine who attended the SI course, gain evaluative information on the SI course, and determine students' reasons for not participating in SI. If a student attended the SI course, she was assigned to the "SI-participant" group. If a student did not attend SI, but selected either time conflict with work or with another college class *and* had also indicated high motivation to attend SI on the first-day survey, that student was assigned to the "Motivational Control" group. The rest were assigned to the "Non-SI" group.

The data were analyzed using simple chi-square (level of significance set at $p < .01$) and independent *t*-tests (level of significance set at $p < .05$). The chi square test was used to compare among the groups the percentage of A and B final course grades, the percentage of D and F final course grades and withdrawals, and the percentage of re-enrollment. The *t*-test was used to compare mean final course grades among groups.

The findings from the analysis provide evidence to support each of the three claims. First, in the 1995-96 academic year SI students at UMKC were significantly more likely to achieve an A or B (52.0 percent) than the Non-SI group (37.8 percent); were significantly less likely to obtain a D, F, or withdrawal (21.6 percent vs. 39.6 percent); and achieved a significantly better grade (2.64 vs. 2.27). Similarly significant results were achieved from the national data. Comparing the SI group to the Non-SI group, statistically significant differences were found among the following: likelihood of obtaining an A or B (46.8 percent vs. 35.9 percent), likelihood of obtaining a D, F, or withdrawal (23.1 percent vs. 37.1 percent), and mean final course grade (2.42 vs. 2.09). These significant differences, though not the exact percentages, existed across institution type—public two-year, private two-year, public four-year, and private four-year.

Second, these findings held true when controlling for motivation. SI students at UMKC in the winter of 1996 were significantly more likely to achieve an A or B (58.9 percent) than the Non-SI group (33.9 percent); were significantly less likely to obtain a D, F, or withdrawal (17.2 percent vs. 26.8 percent); and achieved a significantly better grade (2.78 vs. 2.16).

Third, even when using a factor to control for prior academic achievement, SI was found to promote achievement and persistence into the following semester. Previous academic achievement was defined by mean composite score on the ACT. Students were divided into quartiles on the basis of their mean composite ACT scores. The authors found that "[s]tudents in the bottom quartile group used SI services at nearly the same rate as did students in the top quartile" (Martin et al., 1997, p. 15). Regardless of quartile ranking, "SI-participating students earned significantly higher grades than their nonparticipating counterparts" (Ibid.). "SI -participating students in the bottom quartile and the middle two quartiles re-enrolled at the institution at significantly higher rates than their nonparticipating counterparts" (Ibid.).

Fourth, the analysts provided findings that suggest that SI makes a positive difference in terms of increased re-enrollment and college graduation. In the fall of 1996, UMKC

students who participated in SI during the fall of 1995 were likely to re-enroll at a rate of 74.5 percent, while only 58.2 percent of the non-participants re-enrolled. Similarly, among those who participated in a fall 1989 SI course, the cumulative graduation rate by the fall of 1996 was 46.0 percent, while the cumulative graduation rate for non-SI participants was 30.3 percent. It should be noted that these results did not account for selection bias (*i.e.*, motivation and prior academic achievement).

One final observation should be made: because the analysts used independent *t*-tests to analyze the achievement data, it is difficult to parse out the individual effects of and interaction effects among ethnicity, prior academic achievement, and student motivation. Other statistical methods, such as factorial analysis of variance or covariance, might address these shortcomings.

2. SI at the University of Missouri, Kansas City

In a seminal article, Blanc et al. (1983) described the early SI program and reported the results of a study of SI. Like its progeny, this SI program identified at-risk *courses* rather than at-risk *students* (Blanc et al., 1983). The program was implemented at an urban institution at which the first-year and sophomore attrition rate was 40 percent.[11] The program identified seven particularly difficult courses in which D and F rates and withdrawals traditionally exceeded 30 percent. Participation in the program was on a voluntary, drop-in basis. Indeed, the authors noted that because participation was voluntary and open to all in the content course, the program was not viewed as a remedial program.

The program then assigned a "leader" (i.e., instructor) who attended the content course and instructed students in a remedial course linked to the content course. The leaders used the sessions to instruct students on basic reading and vocabulary skills as well as appropriate note-taking, study, and test-taking skills.

Based on performance, admission, and re-enrollment data on 746 students enrolled in the seven at-risk courses, the article reported a significant improvement in the grades and retention rates among those participating in the program. In particular, the authors recorded average scores on five measures for three groups of students: (1) the SI group ($n = 261$) who attended one or more supplemental instruction session, (2) the non-SI motivational control group ($n = 132$) made up of those students who indicated a high interest in the instructional sessions but could not attend due to scheduling conflicts, and (3) all other non-SI students ($n = 353$) who elected not to participate in the supplemental instruction session.

Regarding between-group performance, Blanc et al. reported the following: The SI group had a significantly higher average semester GPA than both non-SI groups ($p < .01$)—average GPA of SI group: 2.70; motivational control group: 2.36; and other non-SI group: 2.25. The authors also reported that the SI group had a significantly higher average grade in the at-risk course than the other two groups ($p < .01$)—average course grade of SI group: 2.50; motivational control group: 2.12; and other non-SI group: 1.57.

Finally, the SI group had considerably fewer D's, F's, and withdrawals ($p < .05$)—percentage withdrawals for SI group: 18.4 percent; motivational control group: 26.5 percent; and other non-SI group: 44 percent. The article also found that SI students re-enrolled at the institution at a higher rate than the non-SI students. One semester later, the SI group re-enrolled at a rate of 77.4 percent, while the non-SI group re-enrolled at a rate of 67.3 percent; two semesters later those statistics were 73.2 percent and 60 percent, respectively. Although these data suggest that motivation alone does not account for the differences between SI and non-SI students, the data tell us nothing about how the linked courses affected the performance of students actually requiring remedial attention (as opposed to those who did not require remedial attention but took the linked course anyway).

To fill in that data gap, the article analyzed the relevant performance of SI and non-SI students based upon their performances on the university admissions tests (SAT, ACT, etc.). The authors compared the course grades and re-enrollment statistics of students in the top and bottom quartiles in admissions tests. The authors found that 30 percent in the top quartile ($n = 149$) and 31 percent of those in the bottom quartile ($n = 75$) used the SI services. Those in the top quartile utilizing SI services had an average course grade of 3.10 and a subsequent semester re-enrollment rate of 86 percent while those in the top quartile not utilizing SI services had an average course grade of 2.30 and a re-enrollment rate of 78 percent. Those in the bottom quartile utilizing SI services had an average course grade of 1.72 and a re-enrollment rate of 74 percent, while those in the bottom quartile not utilizing SI services had an average course grade of .88 and a re-enrollment rate of 62 percent. These data suggest that in both the top and bottom quartiles, SI services enhance both performance and retention. Interestingly, the authors did not provide information from the top or bottom quartiles regarding differences or similarities between the SI group and the motivational control group. Thus, one cannot determine the effect of motivation within the at-risk (i.e., bottom quartile) students.

As a final note, initial research on the relationship between SI and student affect suggests that SI enhances student self-efficacy, self-esteem, and locus of control (Visor, Johnson, & Cole, 1992). These findings regarding a possible relationship between SI and student affect further argue for the general model of linking skill-building to content coursework.

Learning Communities for Underprepared Students

Although learning communities differ in their specifics from campus to campus,[12]

> [a] common feature among [learning community] models is the co-registration of students in at least two classes during a particular term. The courses that are packaged together may be built around a common theme or major, taught by a team of faculty, have a "content" course linked to a writing course, or include an academic success/study skills course or other weekly meeting in which students can ask questions about school structure and function. These latter meetings are often led by "peer advisors," usually upper division students. Some of these programs are under the direction of

student support staff, whereas others involve both faculty and advising staff (Wilcox, delMas, Stewart, Johnson, and Ghere, 1997).

The design of most learning community programs is to involve students in the college experience by fostering a community among the students, enhancing intellectual interaction among and between students and instructors, and creating coherence and connections among courses. The ultimate aim of such courses is to not only enhance the transfer and linkage of course knowledge to improve academic achievement, but also to promote retention by enhancing social and academic integration of students.

Learning communities have been advocated by many and frequently the subject of research over the past two decades (see Gabelnick, MacGregor, Matthews, & Smith, 1991; Matthews, 1986; Tinto, Goodsell-Love, & Russo, 1993a, 1993b; Wilcox, et al., 1997). Some studies report that those who participate in learning communities have increased GPAs and persistence rates (Luvaas-Briggs, 1984; Sorenson, 1988; Tinto, Goodsell-Love, & Russo, 1993), but most advocates point to the development of a social and academic sense of community as the critical aspect of a learning community (Leigh Smith, 1991; Tinto, Goodsell-Love, & Russo, 1993a, 1993b).

Because learning communities, like supplemental instruction programs, are not specifically designed to meet the needs of underprepared students, it is useful to determine whether the reportedly positive effects of learning communities have been experienced by underprepared students. Several institutions have developed learning communities specifically for underprepared students. For instance, the New Student House at LaGuardia Community College and the "package course" program offered at the General College of the University of Minnesota, Twin Cities are both learning communities designed to address the needs of underprepared students. Evidence from studies at both of these institutions suggests that learning communities may enhance persistence and initial term GPA among remedial students.

Reporting the findings from a qualitative and quantitative study of the New Student House, Tinto, Goodsell-Love, and Russo (1993b) described participants in the New Student House as a group of underprepared students who had placed into remedial courses at the college. These students enrolled as a group in a thematically linked cluster of courses (some of which are basic skills courses) in which instructors integrate the content across courses according to the theme (see also Gallagher, et al. (1994)). In addition to the content courses, students also enroll in a one-hour per week seminar that provides a forum to discuss with a professor the content from all the courses and to integrate the learning experience. Finally, the seminar for New Student House participants includes academic advising, problem solving, study skills seminars, and test-taking strategies.

Although Tinto, Goodsell-Love, and Russo (1993) do not provide any specific quantitative data from their study, they report the following findings and observations:

> The experience of students in the New Student House at LaGuardia Community College bears testimony to the potential of learning community programs to help developmental level students succeed in college. Students in that program were as actively

> involved in learning as other students, and were more positive about their experiences than their peers who were not admitted to the New Student House. Moreover, they persisted at a rate that was comparable to their peers.
>
> It's not surprising that learning communities help students who need more preparation for college. What is surprising is that so few institutions have looked to learning communities to help these students. Most institutions have, instead, continued to rely on supplemental "add-on" programs that are largely the work of student affairs. While such programs can be very valuable, they typically fail to address the totality of student educational and social experience in college (Tinto et al., 1993, p. 15).

At the University of Minnesota, General College (GC), a package course consisted of a content course, the first or second of a two-course first year composition sequence, and an academic success/study skills course (Wilcox, et al., 1997). Some packages included a math class as well. Additionally, each package was assigned a professional and/or peer advisor to work with the program. Significantly, the content and basic-skills courses were intended to have a common theme (*e.g.,* When biology and culture collide: How we learn femaleness in America).

Using a quasi-experimental design, Wilcox et al. compared the package course participants (n=117), who all were deemed in need of remedial assistance, to a control group of students (n=80), who too were in need of such assistance and enrolled in one of the content courses. A third group of students, the baseline group, was another randomly selected group of students (n=107) from the GC first-year class who were in need of remedial assistance, but were not enrolled in any "special" program. One-way analyses of variance were conducted to verify that the three groups did not statistically differ with respect to mean high school GPA, high school percentile rank, or ACT score.

Results from the study provide some evidence that the package course program had a positive impact on academic performance for the initial term, as the treatment group had a significantly higher GPA (2.73) than the control group (2.36), but not the baseline group (2.60). By the fourth term, however, there were no statistically significant differences among the groups in terms of GPA (*i.e.,* there was no main effect for group membership on GPA using a multivariate ANOVA model). Finally, there was no significant difference between the experimental and control groups in terms of persistence into the next year.

All of this led Wilcox et al. to conclude that although the package course participants performed better in the term in which the package was offered, "[t]he package course effect does not appear to be long lasting. Although [treatment] group students maintained an average cumulative GPA over several terms that was consistently higher than that of students in the control and baseline groups, the difference was not statistically significant. The effect on GPA appears to be specific to the term during which a student was enrolled in the package courses" (Wilcox et al., 1997, p. 24). Moreover, "[t]here was no statistical support for the hypothesis that package course enrollment would increase credit completion ratios or the likelihood of retention" (Ibid.). Finally, the authors reported that, based on follow-up surveys, those enrolled in the package course program were more aware of institutional resources, knew their fellow students better, interacted with advisors more often, and were more comfortable collaborating

with other students. Thus, although the achievement and persistence effects of the package course program were limited, the qualitative experience of participants appeared to be better than non-participants.

Critical Thinking Programs

Critical thinking, complex problem solving, and abstract reasoning have long been the hallmark of the academically gifted, but not within the realm of possibilities for most remedial students who supposedly need to acquire "basic" skills first. Several educators have now begun to challenge that notion and claim that instruction in critical thinking can benefit all students, including remedial students (Barnes, 1992; Chaffee, 1992; Elder & Paul, 1994, 1996; See, 1996; Paul & Elder, 1994, 1997). Chaffee (1992) makes the case for critical thinking in remedial education as follows:

> The need to foster higher-order critical thinking abilities is particularly acute in developmental education. Since developmental students have typically not had the opportunity to develop the appropriate language and conceptual skills needed for higher education, they often founder when they encounter rigorous, mainstream college courses (Chaffee, 1992).

Although much of the literature regarding critical thinking is rich in advice, there is very little research into the effectiveness of critical thinking in improving the performance of remedial students. Notwithstanding this dearth of empirical support for its effectiveness, however, experts and practitioners have begun to devise methods to integrate critical thinking skills into the curriculum for remedial students. Nearly every critical thinking model for remedial students emphasizes the integration of thinking skills into the academic content arena. As Elder and Paul (1994) describe it:

> Critical thinking is not something *additional* to content, but rather *integral* to it, something which in fact "defines" the manner in which content is organized, conceptualized, and applied by experts in the field. Content is not fragmented bits and pieces of information (which is the underlying assumption in didactic teaching) but a system with a definite set of logical relationships; an organized structure of concepts, principles, and understandings; a system that requires the asking and answering of a certain set of questions and problems; and, ultimately a disciplined mode of thinking (Elder and Paul, 1994, p. 34).

Although the specifics of critical thinking programs differ, one such program is discussed here by way of example. Under the direction of Dr. John Chaffee, the Critical Thinking Program begun in 1979 at LaGuardia Community College focuses on meeting three primary objectives: literacy, reasoning and problem solving, and critical attitudes. Although this program is not deemed a "remedial program" and permits the enrollment of any student in the college, as a practical matter it targets students in remedial need as it is an entry level course at a college at which 85 percent of the first-year class typically requires remediation (Chaffee, 1992).

Using Dr. Chaffee's text, *Thinking Critically* and funded by two National Endowment for the Humanities grants, the program is based on the assumption that thinking is a process that can be understood through proper study and practice. The program seeks to accelerate the intellectual development of students by getting away from the basic skills acquisition model to one that focuses on problem solving and developing critical attitudes and fundamental thinking abilities. Moreover, the program seeks to integrate critical thinking abilities across the college's curriculum. The vehicle for such integration has been course "pairings" (what might be called linked courses) in which sections of the Critical Thinking course are linked to courses in other academic areas. (This report will not discuss in detail the Critical Thinking curriculum—the content of that curriculum is described in Chaffee's text, Chaffee (1992), and the *Final Report: Critical Thinking at LaGuardia Community College* (Chaffee, 1985)).

An evaluation of the Critical Thinking Program conducted by Dr. Garlie Forehand of the Educational Testing Service (ETS) concluded that:

> The cumulative conclusion of the two years of observation is that essential question of program functioning—questions regarding meetings, coordination, class assignments, student evaluation—have been answered affirmatively. Critical Thought Skills is a mature educational program; evaluative attention can be focused on program variations, enhancement and dissemination. Faculty members commented on the wide variety of students in this year's programs, and their differences from last year's students—variety in age, intellectual maturity, previous background and skill. Thus, the program has been tried and succeeded with a wide spectrum of students (quoted in Chaffee, 1985).

Dr. Chaffee also found that "students enrolled in one key part of the program have nearly doubled the college-wide pass rate on standardized exit examinations in writing and reading" (Chaffee, 1992, p.2). Although the Critical Thinking Program cannot alone address students' need to acquire basic skills, its focus on problem-solving and transfer of thinking skills to content courses is instructive to the design of any remedial program.

Broadening Conceptual Background Knowledge

Nearly all of the literature surveyed concentrated on providing basic skills to the underprepared college student, rather than providing conceptual background knowledge to students who do not possess such knowledge. One article, however, specifically identified the problem of deficiencies in background knowledge and how that might affect remedial coursework. Specifically, Stahl, Simpson and Hayes (1992) recommended that any remedial program should also broaden students' conceptual background knowledge. Those authors describe the problem and their recommendation as follows:

> Most students required to take a college reading course can read but are not efficient and effective independent learners. Because these students are often aliterate and suffer wide gaps in their prior knowledge, they are not generally prepared to read regularly, widely, or critically. Furthermore, many of these students have not been required to

> undertake higher level reading/learning tasks while in the secondary school . . . . Hence, the instructor must meet the needs of students who have both deficiencies in content knowledge and misconceptions about the learning process. Moreover, as recent research has demonstrated in a college freshman-level history course . . . , students may even have misconceptions about specific content areas (Stahl et al., 1992, p. 4).

The authors recognize the impossibility of overcoming such content deficiencies in one course, but recommend that remedial instructors intervene by, among other things, promoting the habit of regular reading through use of periodicals and/or in-depth study in specific thematic areas or concepts.

Moreover, the 1996 NCES Report found that 25 percent of institutions that offered remedial reading, writing, or math courses in 1995 also offered remedial courses in other academic subjects (NCES, 1996). 36 percent of the public two-year institutions offered such courses, while 9 percent of private two-year institutions, 27 percent of public four-year institutions, and 14 percent of private four-year institutions offered such courses. "The most frequently mentioned subject areas were science (general science, biology, chemistry, and physics), English as a second language, and study skills" (NCES, 1996).

Student-Centered Instruction/Individualized Learning

Many educators have advocated that the emphasis of remedial education should be placed on individual learning experiences based upon each student's unique learning characteristics (Cross, 1976; Keimig, 1983; Spann, 1977; Van, 1992). Their arguments are based upon the notion that students bring unequal learning achievements, abilities, and experiences to the college classroom and instruction must therefore be tailored to these varied individual needs. Particularly, instruction must involve students in their own learning, should have an ongoing evaluation component, and may involve collaborative learning (see Van, 1982). Of specific importance is allowing variable entry and exit time frames that permit students to work at their own rates. Despite the seeming flexibility of this approach, however, some have stressed the "mastery of basic skills and the use of competent study skills" as being a component of individualized learning and, perhaps, a necessary precursor to success for underprepared students (see Van, 1982, p. 32 and sources cited therein). Basic skills and study strategies acquisition are indeed necessary to success, but, as we noted above, such skills acquisition is not best obtained through isolated basic skills coursework.

VI. Summary of the Findings in Our Areas of Inquiry

Remediation in higher education is extensive. Some 30 percent of all first-year students take some type of remedial course. Those who take such courses cut across all racial/ethnic lines, though African-American and Hispanic students tend to utilize such services at a higher rate than white students. Selection criteria for remedial courses are highly varied, though placement tests are the most common method of selection. Although more than 70 percent of those institutions that offer remedial courses require that students take them when they are selected for such courses, a substantial percentage of the institutions merely recommend such courses.

Regarding the content of remedial courses, little comprehensive information is available. We suspect, however, that because "successful" or "innovative" remedial programs are often studied in the literature, most remedial courses use traditional methods of drills and repetition with low-level skills unrelated to any content coursework. For such courses, there is little research into their success in terms of the achievement and persistence of students. Though some studies reported that persistence and achievement is enhanced, those findings are questionable in light of methodological flaws and other studies contradicting such findings.

There are, however, many "exemplary" remedial programs that claim to have made gains in terms of persistence and achievement. One such program is the content-based linked course that ties basic skills acquisition to content courses. There is substantial evidence that such content-based courses enhance persistence rates, increase performance in the linked content course, and may even enhance future academic achievement. Finally, there is growing support for the notion that courses in critical thinking will assist students who are in need of remedial attention. At bottom, however, the varieties of remedial programs offered are many and diverse and more research into the efficacy of such programs is needed.

VII. Other Areas of Inquiry

Finally, although our research focused on the three primary areas of inquiry, we identified several other issues that are relevant to developing a successful remedial program. Those issues are addressed below.

The Credit Status of Remedial Courses

As the 1991 NCES Study stated, "[c]redit for remedial courses is an issue of considerable debate among educators. Some argue that awarding some form of credit is an incentive for completion of the course, while others believe credit for such courses represents a lowering of standards" (NCES, 1991, p. 7). Another author advocated "transcript credit for basic skill courses to increase motivation and to enable students for financial aid funding" (Van, 1992, p. 30).

The 1991 NCES Study provided some information regarding the credit status of remedial courses, including the percentage of institutions that offer no formal credit for remedial courses (11 percent), institutional credit for remedial courses (does not count toward degree completion) (69 percent), degree credit toward electives (15 percent), and degree credit toward major requirements (5 percent) (NCES, 1991). The 1996 NCES Report provided similar data: among institutions that offered remedial mathematics 71 percent gave institutional credit, 13 percent gave no credit, 11 percent gave elective degree credit, and 5 percent gave subject degree credit (the patterns for remedial reading and writing courses were similar) (NCES, 1996). The SREB's study of institutions in its region reported that only about 2 percent of public and 5 percent of private institutions award degree credit for remedial courses, while approximately 80 percent of public and approximately 40 percent of private institutions offered institutional credit for remedial courses (Abraham, 1992). Based upon those figures, the SREB study concluded that "[r]eforms of the 1980s have all but eliminated the controversy over the awarding of degree credit for remedial studies" (Abraham, 1992, p. 3). Apparently, institutional credit, rather than no credit or degree credit, is the favored form of credit awarded for remedial courses in most colleges. Despite the policy consensus on this issue, further research in this area may be useful to determine the impact of the credit status of remedial courses. To the extent that the credit status of remedial courses may be related to student persistence rates in college—if the student is not receiving degree credit for remedial courses, she may view her time as wasted and simply drop out, rather than complete the remedial courses—further research could better inform policy.

Faculty Teaching Remedial Courses

To the extent one views remediation in higher education as ineffective, one reason for such ineffectiveness may be the failure of institutions to dedicate faculty and resources to the remedial courses. Van stressed the need for "experienced, full-time instructional staff members who possess a clear understanding of the underprepared learner, have elected to teach this population, and hold high expectations of the student" (Van, 1992, p. 31). The fact that higher education institutions fail to dedicate such faculty and resources is revealed in the 1991 NCES Re-

port. The report found that among those teaching remedial courses in 1989 (an average of 15 such instructors per institution), an average of 8.2 of those instructors were specifically hired for the purpose of teaching remedial courses, an average of 3.2 instructors had degree credentials specific to remedial education, and an average of only 5.8 instructors were given specific training by the institution (NCES, 1991).

Policies or Laws Affecting Remedial Education

According to the 1996 NCES Report, many states have enacted policies or laws that affect remedial education offerings (NCES, 1996). Fully a third of the institutions that offer remedial courses reported that there were state policies or laws that affected remedial course offerings at their institutions. Naturally public institutions were more likely to be affected by such policies than private institutions: 57 percent of public 2-year; 40 percent of public four-year; 3 percent of private two-year; and 7 percent of private four-year. "The major way in which state policies or laws affected the remedial offerings of institutions that offered remedial courses was to require or encourage institutions to offer remedial education" (NCES, 1996, p. 29). Thus, 59 percent of those institutions that reported that policies or laws affected remedial course offerings also reported that state policy or law required such offerings; 19 percent reported that they were encouraged to offer such courses. Interestingly, 11 percent of those institutions reported that state policy or law either discouraged them from offering such courses or restricted such course offerings. There is also evidence that this type of restrictive policy may be continued in the future as states adopt policies that either shift all remedial coursework from four-year colleges to two-year colleges or place restrictions on the type and number of remedial courses offered in four-year colleges (Shaw, 1996).

Activities to Reduce the Need for Remedial Education

Although there is very little information on what postsecondary institutions are doing at the K-12 level to reduce the need for remedial education, we may want to consider such activities when designing an accelerated program for higher education. Moreover, this may be one area of overlap with the work being done by Professor Michael Kirst for the NCPI regarding the coordination of standards and skills among K-12 and postsecondary education.

Endnotes

[1] Because "remedial" education has a stigma or negative connotation, it has been replaced in many settings by the term "developmental" education. Although we are highly sympathetic to reducing opprobrium when referring to students who are found to be educationally wanting, we do not feel that "developmental" education is an accurate term. Virtually all education is developmental implying growth in the learner. Therefore, we will use the more conventional term of "remedial" education in this paper.

[2] The 1991 NCES Report presents the findings of a Fast Response Survey System (FRSS) survey of colleges on remedial programs offered during fall 1989. As stated by the author, "[t]he survey was conducted to meet the need for information at the national level on the extent of remedial education and the characteristics of remedial programs" (p. 1). The report noted that 473 questionnaire responses from institutions throughout the country were used in compiling the data presented.

The 1996 NCES Report presents the findings of a survey conducted with the Postsecondary Education Quick Information System (PEQIS). PEQIS is designed to conduct brief surveys of postsecondary institutions or state higher education agencies on postsecondary education topics of national importance. Included in the sample from which the 1996 NCES Report was derived were two-year and four-year institutions of higher education located in the 50 states, the District of Columbia, and Puerto Rico. Of the 847 eligible institutions surveyed for the 1996 NCES Report, 797 responded (a 94 percent response rate).

[3] This study is discussed in greater detail in Part V of this report.

[4] It is worth noting that the CSU trustees adopted a policy in January 1996 that will result in the elimination of remedial courses. The trustees adopted three goals for phasing out remedial education: (1) By the fall of 2001 there will be a 10 percent decline in the number of regularly admitted new freshmen who need remediation; (2) by the fall 2004 the number of new freshmen who need remediation will be half of current levels; and (3) by fall 2007 the number of freshmen who need remediation will be 10 percent of the current level. To meet those goals, CSU officials plan to define clearly their standards to elementary and high school administrators. For their part, K-12 schools will be asked to make sure students are tested early enough so that students in need of assistance will be identified and provided assistance while still in middle and high school.

[5] In 1992-93, these statistics were similar, as 78.4 percent and 95.6 percent of the public four-year and two-year colleges, respectively, offered some remedial service. The comparable figures for private institutions were 66.2 percent and 65.4 percent, respectively (NCES, 1995).

[6] The information provided by the NCES and analyzed in the ACE Brief is based on data reported by undergraduates who took at least one remedial course during the 1992-93 academic year. More generally, the NCES National Postsecondary Student Aid Study collects information on student and parent demographic characteristics and the ways that students and parents pay for higher education. The study also collects data on special populations including low-income, racial minority and remedial students. The 1992-93 academic year data was derived from telephone interviews conducted on a nationally representative stratified sample of undergraduate, graduate, and professional students and parents. Approximately 52,000 students and 12,500 parents were interviewed for the study (Knopp, 1995).

[7] O'Hear and MacDonald (1995) identified flaws in the design as the most prevalent type of flaw in quantitative studies in remedial education, followed by errors attributed to imprecise purpose, errors in reviewing research, errors in sampling and errors in the adequacy of measures. Notably, O'Hear and MacDonald did not identify all of the studies they reviewed and which of those studies contained flaws. They did, however, provide four reasons for the lack of quality research in the field: (1) most people in remedial education are not research professionals, but rather, practitioners; (2) producing research is not typically part of the promotion and job evaluation processes for remedial educators; (3) a lack of research in the field hinders the construction of a theoretical base on which to build further research; and (4) there is a scarcity of graduate programs in which scholarship in the field can be studied and developed.

[8] Persistence and graduation rates of remedial students at the Johnson County Community College are discussed in the next section.

[9] The 1996 NCES Report found that about two-thirds of all institutions placed "some" restrictions on the regular academic courses that students could take while they were enrolled in remedial courses; while about one-third did not place any restrictions on regular academic courses (NCES, 1996). Only 2 percent of institutions did not allow students to take any regular academic courses while taking remedial courses, however.

[10] For the sake of economy, specific data and findings on each aspect of these claims will not be presented here.

[11] Because all of the authors of the article are instructors at the University of Missouri at Kansas City, it may be assumed that the "urban institution" described in the article is the same.

[12] Learning community models also differ in their labels, as they exist under several different mantles — freshman interest groups (FIGS) (Tinto, Goodsell-Love, & Russo, 1993a, Tinto, Goodsell-Love, & Russo, 1993b); federated learning communities (see Gabelnick, et al., 1991); coordinated studies (see Matthews, 1986; Tinto & Russo, 1994; Tinto, Goodsell, & Russo, 1993a); and learning clusters (Matthews, 1986).

References

Abraham, A. A., Jr. (1992). *College remedial studies: Institutional practices in the SREB states*. Atlanta: Southern Regional Education Board.

Alfred, R.L., & Lum, G.D. (1988). Remedial program policies, student demographic characteristics, and academic achievement in community colleges. *Community/Junior College Quarterly*, 12, 107-120.

Arendale, D. (1997, June 18). *Understanding the supplemental instruction (SI) model*. Kansas City, MO: National Center for Supplemental Instruction. (Unpublished document located on the world-wide web at http://www.umkc.edu/centers/cad/si/sidocs/).

Barnes, C.A. (Ed.) (1992, Spring). Critical thinking: Educational imperative. *New directions for community colleges, No. 77*. San Francisco: Jossey-Bass.

Blanc, R., DeBuhr, L.E., & Martin, D.C. (1983). Breaking the attrition cycle: The effects of supplemental instruction on undergraduate performance and attrition. *Journal of Higher Education, 54*, 80-90.

Boylan, H.R., Bliss, L.B., & Bonham, B.S. (1997). Program components and their relationship to students performance. *Journal of Developmental Education, 20*, 1-8.

Boylan, H.R., & Bonham, B.S. (1992). The impact of developmental education programs. *Review of Research in Developmental Education, 9*(5), 1-3.

Boylan, H.R., Bonham, B., & Bliss, L. (1994). Characteristic components of developmental programs. *Research in Developmental Education, 11*(1), 1-4.

Boylan, H.R. (1984). The effectiveness of developmental education programs. *Research in Developmental Education,5*(3), 1-3.

Brint, S., & Karabel, J. (1989). *The diverted dream: Community colleges and the promise of educational opportunity in America, 1900-1985*. New York: Oxford University Press.

Casazza, M., & Silverman, S. (1996). *Learning assistance and developmental education: A guide for effective practice*. San Francisco: Jossey-Bass.

Chaffee, J. (1992). Critical thinking skills: The cornerstone of developmental education. *Journal of Developmental Education, 15*(3) 2-8, 39.

Chaffee, J. (1985). *Final Report: Critical thinking at LaGuardia Community College*. Prepared for the National Endowment for the Humanities, Washington, DC.

Clark, H.H. (1982). *The effectiveness of remediation among high-risk college freshmen of different ages*. Unpublished paper.

Commander, N.E., & Smith, B.D. (1995). Developing adjunct reading and learning courses that work. *Journal of Reading, 38*(5), 352-360.

Commander, N.E., Stratton, C.B., Callahan, C.A., & Smith, B.D. (1996). A learning assistance model for expanding academic support. *Journal of Developmental Education, 20*(2), 8-10, 12, 14, 16.

Cross, K.P. (1976). *Accent on learning*. San Francisco: Jossey-Bass.

Cross, K.P. (1971). *Beyond the open door*. San Francisco: Jossey-Bass.

Deegan, W.L., & Tillery, D. (1985). *Remaking the American community college*. San Francisco: Jossey-Bass.

Dimon, M. (1988). Why adjunct courses work. *Journal of College Reading and Learning, 21*.

Eaton, J. (1994). *Strengthening collegiate education in community colleges*. San Francisco: Jossey-Bass.

Elder, L., & Paul, R. (1994). Critical thinking: Why we must transform our teaching. *Journal of Developmental Education, 18*(1), 34-35.

Elder, L., & Paul, R. (1996). Critical thinking: A stage theory of critical thinking: Part I. *Journal of Developmental Education, 20*(1), 34-35.

Gabelnick, F., MacGregor, J., Matthews, R., & Smith, B.L. (1991). Learning communities: Creating connections among students, faculty, and disciplines. *New Directions for Teaching and Learning*, No. 41. San Francisco: Jossey-Bass.

Gallagher, B., Matthews, R., Amoako, S., Koolsbergen, W., Van Slyck, P., &

Horwitz, M. (1994). *The new student house program of coordinated basic skills study: A learning community at LaGuardia Commuity College, City University of New York.* Unpublished report.

Gebelt, J.L., Parilis, G.M., Kramer, D. A., & Wilson, P. (1996). Retention at a large university: Combining skills with course content. *Journal of Developmental Education, 20*(1), 2-10.

Greeno, J.G. (1997). On claims that answer the wrong questions. *Educational Researcher, 26*, 5-17.

Greeno, J.G., Collins, A., & Resnick, L.B. (1995). Cognition and learning. In D. Berliner & R. Calfee (Eds.), *Handbook of educational psychology*. New York: Simon & Schuster.

Greeno, J.G., Smith, D.R., & Moore, J.L. (1993). Transfer of situated learning. In D.K. Detterman & R.J. Sternberg (Eds.), *Transfer on trial: Intelligence, cognition, and instruction* (pp. 99-167). Norwood, NJ: Lawrence Erlbaum Associates.

Grubb, W. N. (1998). *From Black Box to Pandora's Box: Evaluating Remedial/Developmental Education*. Paper presented at the Conference on Replacing Remediation in Higher Education, Stanford University, January 26 & 27, 1998.

Harding, I.B. (1981). *Adjunct courses: Integrating study skills into content courses.* Paper presented at the XIVth Annual Meeting of the Western College Reading Association, Dallas, TX.

Hull, G., & Rose, M. (1989). Rethinking remediation: Toward a social-cognitive understanding of problematic reading and writing. *Written Communication, 6*(2), 139-154.

Keimig, R.T. (1983). *Raising academic standards: A guide to learning improvement*. (AAHE/ERIC Higher Education Research Report, No. 4). Washington DC: American Association for Higher Education.

King, J.R., Stahl, N.A., & Brozo, W.G. (1984). Integrating study skills and orientation courses. *Forum for Reading, 16,* 6-13.

Knopp, L. (1995). *Remedial education: An undergraduate student profile*. Washington, D.C.: American Council on Education, Division of Policy Analysis and Research.

Kulik, C.L., Kulik, J., & Schwalb, B. (1983). College programs for high risk and disadvantaged students: A meta-analysis of findings. *Review of Educational Research, 53*, 397-414.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Lavin, D., Alba. R., & Silberstein, R. (1981). *Right versus privilege: The open admissions experiment at the City University of New York*. New York: Free Press.

Lavin, D., & Hyllegard, D. (1996). *Changing the odds*. New Haven, CT: Yale University Press.

Legislative Analysts Office. (1995). *Remedial education, California State University*. Sacramento, CA: Author.

Leigh Smith, B. (1991). Taking structure seriously: The learning community model. *Liberal Education, 77*(2), 1991.

Levin, M.E., & Levin, J.R. (1991). A critical examination of academic retention programs for at-risk minority college students. *Journal of College Student Development, 32,* 323-334.

Luvaas-Briggs, C. (1984). Integrating basic skills with college content instruction. *Journal of Developmental and Remedial Education, 7*(2), 6-9, 31.

Malley, A.L. & Bullock, T.L. (1985). Two models of developmental reading instruction: Fused or paired. In G.H. McNinch (Ed.), *Reading research in 1984: Comprehension, computers, communication — Fifth yearbook of the American Reading Forum*. (pp. 87-91). Athens, GA: American Reading Forum.

Manno, B. (1995, May 1). Remedial education: Replacing the double standard with real standards. *Change, 27*(3), 47-49.

Martin, D.C., Arendale, D., & Assoc. (1994, 1995, 1996, 1997). *Supplemental instruction (SI): Review of research concerning the effectiveness of SI from the University of Missouri-Kansas City and other intsitutions from across the United States*. Kansas City, MO: National Center for Supplemental Instruction. (Unpublished document located on the world-wide web at http://www.umkc.edu/centers/cad/si/sidocs/sidata97.htm).

Matthews, R. (1986). Learning communities in the community college. *Community, Technical, and Junior College Journal, 57*(2), 44-47.

Maxwell, M. (1985). *Improving student learning skills*. San Francisco: Jossey-Bass.

Maxwell, M. (1990). Does tutoring help? A look at the literature. *Research in Developmental Education, 7*(4), 1-4.

McCoy, K.R. (1991). *An analysis of developmental students in Fall 1990*. Unpublished paper.

McGrath, D., & Spear, M. (1991). *The academic crisis of the community college*. Albany: SUNY Press.

Morante, E.A., Faskow, S., & Menditto, N. (1984a, Spring). The New Jersey Basic Skills Assessment Program: Part II. *Journal of Developmental and Remedial Education, 7*(3), 6-9, 32.

Morante, E.A., Faskow, S., & Menditto, N. (1984b, Winter). The New Jersey Basic Skills Assessment Program. *Journal of Developmental and Remedial Education, 7*(4), 2-4, 32.

National Center for Education Statistics. (1991). *College-level remedial education in the Fall of 1989. Contractor report*. By Mansfield, W. Rockville, MD: Westat, Inc.

National Center for Education Statistics. (1995). *Digest of education statistics 1995*. U.S. Department of Education.

National Center for Education Statistics. (1996). *Remedial education at higher education institutions in Fall 1995*. By Lewis, L. & Farris, E. Washington D.C.: Author.

Nist, S.L., & Hynd, C.R. (1985). The college reading lab: An old story with a new twist. Journal of Reading, 28, 305-309.

Noel, L., Levitz, R., & Suluri, D. (1985). *Increasing student retention: Effective program practices for reducing the dropout rate*. San Francisco: Jossey-Bass.

Office of Institutional Planning and Research, Sinclair Community College. (1994). *The impact of developmental education on student progress: A three year longitudinal analysis*. Dayton, OH: Author.

O'Hear, M.F., & MacDonald, R.B. (1995). A critical review of research in developmental education: Part I. *Journal of Developmental Education, 19*(2), 2-6.

O'Hear, M.F., & MacDonald, R.B. (1996). A critical review of research in developmental education: Part II. *Journal of Developmental Education, 19*(3), 8-14.

O'Hear, M.F. (1993). College reading programs: The last 25 years. *Journal of College Reading and Learning, 24*(2).

Olson, J. E. (1995). Course-based reading remediation: A collaborative experiment. *Reading Improvement, 54*(1), 53-55.

Paul, R., & Elder, L. (1994). Critical thinking: Using intellectual standards to assess student reasoning. *Journal of Developmental Education, 18*(2), 32-33.

Paul, R., & Elder, L. (1997). Critical thinking: Implications for instruction of the stage theory. *Journal of Developmental Education, 20*(3), 34-35.

Ready or not: California plans to cut down remedial courses at four-year colleges. (1995, March 31). *Chronicle of Higher Education,* p. A23.

Roueche, J.E. (Ed.) (1983). *A new look at successful programs*. San Francisco: Jossey-Bass.

Roueche, J.E., & Roueche, S.D. (1994). Responding to the challenge of the at-risk student. *Community College Journal of Research and Practice, 18*, 1-11.

Roueche, J.E., & Roueche, S.D. (1993). *Between a rock and a hard place: The at-risk student in the open door college*. Washington DC: The Community College Press.

Roueche, J.E., & Snow, J.J. (1977). *Overcoming learning problems*. San Francisco: Jossey-Bass.

See, P. (1996). Ideas in Practice: An introspective approach for developing critical thinking. *Journal of Devlopmental Education, 20*(3), 34-35.

Seybert, J.A., & Stoltz, D.F. (1992). *Assessing the outcomes of developmental courses at Johnson County Community College*. Unpublished paper.

Shaw, K.M. (1996). *Remedial education as ideological battleground: Emerging remedial education policies in the community college*. Paper submitted for publication.

Simpson, N.L., & Nist, S.L. (1990, December). *A situation analysis of academic tasks*. Paper presented at the National Reading Conference, Miami, Fla.

Sorenson, V.P. (1988). Bibliographic instruction in a developmental studies program: A paired course approach. *Research Strategies, 6*(4), 161-167.

Spann, M.G. (1977). Building a developmental educational program. In J. Roueche (Ed.), *Increasing basic skills by developmental studies*. San Francisco: Jossey-Bass.

Stahl, N.A., Simpson, M.L., & Hayes, C.G. (1992). Ten recommendations from research for teaching high-risk college students. *Journal of Developmental Education, 16*(1), 2-10.

Stratton, C.B. (1996). Effects of learning support on college algebra. In J.L. Higbee & P.L. Dwinell (Eds.), *Defining developmental education: Theory, Research, & Pedagogy*. 29-37.

Texas Higher Education Coordinating Board (1995, August). *Annual Report on the TASP and the Effectiveness of Remediation.* Texas Academic Skills Program, Texas Higher Education Coordinating Board.

Tinto, V. (1987). *Leaving college: Rethinking the causes and cures of student attrition*. Chicago: University of Chicago Press.

Tinto, V., with Goodsell Love, A., & Russo, P. (1993a). *Building learning communities for new college students: A summary of research findings of the collaborative learning project*. Syracuse, NY: National Center on Postsecondary Teaching, Learning, and Assessment.

Tinto, V., Goodsell Love, A., & Russo, P. (1993b). Building community. *Liberal Education, 79*(4), 16-21.

Tinto, V. & Russo, P. (1994). Coordinated studies programs: Their effect on student involvement at a community college. *Community College Review, 22*(2), 16-25.

Traub, J. (1995). *City on a hill: Testing the American dream at City College*. Reading, MA: Addison-Wesley.

Van, B. (1992). College learning assistance programs: Ingredients for success. *Journal of College Reading and Learning, 24*(2).

Van Allen, G., & Belew, V. (1992). *Mandatory Remediation in Tennessee: Strategy for Promoting Excellence While Serving the Underprepared*. Nashville, TN: Nashville State Technical Institute.

Visor, J.M., Johnson, J.J., & Cole, L.N. (1992). The relationship of supplemental instruction to affect. *Journal of Developmental Education, 16*(2), 12-18.

Wilcox, K.J., delMas, R.C., Stewart, B., Johnson, A.B., & Ghere, D. (1997). The "package course" experience and developmental education. *Journal of Developmental Education, 20*(3), 18-26.