

Cost Estimate of Remediation

A Cost Estimate of Standards-Based Remediation
in a Community College Developmental Education Program

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Abstract

Using the ingredients method of cost analysis, this study of the 2003 MCAS Transitional Pathways Program at North Shore Community College (Massachusetts) estimates the costs of delivering remedial instruction in a developmental educational program to standards of educational adequacy. The results indicate the costs of standards-based remediation are over two-and-a-half times as expensive as non-remedial courses. Sixty-seven percent of 24 program participants subsequently earned their high school diploma, and 25 percent earned 24 or more college credits. Therefore, the costs of producing a high school graduate and a student prepared to succeed in college are equivalent in magnitude to annual costs of enrolling students at four-year colleges. Although prior studies indicate remedial coursework is less expensive than non-remedial coursework, these findings suggest it is counterproductive to draw conclusions about remedial education costs for students with very different needs based on aggregated data. Institutional research with micro-level data is highly warranted.

Key words: Cost analysis, remediation, developmental education, community college, adequacy

A growing chorus of educational policy analysts are highlighting the need for greater understanding of the prevalence, costs, effectiveness, and ideological roots of remedial education in colleges and universities (Dowd 2008; Parker 2007; Bailey and Morest 2006; Levin and Calcagno 2008; Attewell et al. 2006; Kirst 2007). Although a precise estimate of the number of students enrolled in remedial education, which is alternatively referred to by educators as developmental or basic skills education, is not available (Kirst, 2007), there is agreement on one point. A much greater proportion of students enrolling for the first time at community colleges are required to take remedial coursework than those enrolling at four-year colleges, and that share has increased over time (Parsad and Lewis 2003). Different studies present estimates ranging from 42 percent to 60 percent of students in remediation at community colleges and 20 percent to 30 percent of students in four-year colleges and universities (Kirst, 2007, p. 12).

Community colleges play a greater role in remediation because they have lower admission standards than four-year colleges and because policy makers have pushed remediation out of the four-year public sector under the assumption community colleges can get the job done more effectively and for less cost (Jenkins and Boswell 2002; Anderson 2002; Mazzeo 2002; Merisotis and Phipps 2000; Parsad and Lewis 2003; Shaw 1997). The shift in remediation towards community colleges is part of the ideological shift among legislators that places greater emphasis on efficiency, effectiveness, quality, and high academic standards. The compensatory role of remedial education to remedy the lack of educational opportunity for “disadvantaged” students has been diminished (Anderson 2002). Surprisingly, given this context, there is very little evidence concerning the costs or

effectiveness of remediation in community colleges or, comparatively, any other sector (Levin and Calcagno 2007; Merisotis and Phipps 2000).

As Merisotis and Phipps note (2000, p. 76), “hard evidence regarding the costs of remediation nationwide is elusive,” due to a lack of reliable and current data, variation in the meaning and categorization of remedial and developmental education, and inconsistency in the types of expenditures included in cost estimates. The failure to distinguish between the cost of instruction in pre-college level course content and the delivery of fully elaborated developmental educational programs is particularly problematic because developmental programs require extensive and coordinated student support services. The difference between remedial education and developmental education, though played out most notably at the level of semantics informed by ideological and political differences, is most significant at the level of pedagogy. A truly developmental approach will inevitably carry a much higher cost.

Some strides have been made through a small number of recent studies (e.g. Attewell et al. 2006; Bettinger and Long 2007; Moss and Yeaton 2006) in using rigorous evaluation designs to determine the effectiveness of remedial education, as measured by differences in outcomes of students with matched characteristics who were enrolled in remedial and non-remedial courses. However, these studies of effectiveness have not been linked to the study of costs, which is the other essential side of the equation necessary to establish the cost-effectiveness of various policy options (Levin and Calcagno 2007). A few studies, using data now over ten years old, have attempted national remedial cost estimates and reached the admittedly large ball-park range of \$1 to \$2 billion annually (Breneman 1998; Merisotis and Phipps 2000). Several states have estimated costs per full-time equivalent student for aggregated remedial spending, but without disaggregating costs by course or program type

(Barnett 2003; Greene 2000). None of these studies have been able to adequately distinguish between the costs of providing pre-collegiate coursework in postsecondary education in a remedial mode, focused for example on meeting standardized testing criteria, versus a developmental mode, focused on providing students with new learning strategies and the ability to succeed in college.

Highly aggregated cost estimates are problematic because average estimates mask cost differences due to variation in the educational needs of the students served or in the content area. This point is highlighted by studies, such as one conducted in Arkansas, that did distinguish the costs of remedial education in different disciplinary areas. The Arkansas study, conducted in 1996-97, indicated a range of spending per full-time equivalent (FTE) student of roughly \$2,400 across content areas in community colleges and of \$4,400 in four-year colleges (Merisotis and Phipps 2000, p. 77), based on average expenditures of \$6,709 and \$7,381 in the two sectors respectively.

In addition, cost estimates obtained in one state or institution may not be relevant to other states and institutions delivering a much different quality of coursework, which is nevertheless similarly categorized as remedial. To address the need for institution-specific analyses, for example, the state of California has begun requiring community colleges to conduct cost analyses of their basic skills education programs (see www.cccbsi.org). However, much more research is needed to inform important policy decisions in this area (Levin and Calcagno 2008) and to provide models for institutional level data analysis.

This study addresses the need for additional empirical information on this topic by presenting cost estimates and relating costs to student outcomes to provide estimates of cost-effectiveness. It provides a detailed case analysis of the expenditures of a program with an

inherent remedial purpose (assisting students to pass a high school exit exam), which was delivered within a fully elaborated developmental education model for program delivery. We are able to present an “adequacy” study because the program was newly instituted and the design established based on the professional judgment of a team of educators with expertise in developmental education.

Adequacy studies have been used fairly extensively to determine the level of resources and funding that would be legally required to provide a quality education and resolve court-ordered K-12 educational finance reforms (for discussions of adequacy, see Clune 1994; Verstegen 1998; Satz 2007)¹. Such analyses have rarely been used in the study of postsecondary costs and financing. An exception is provided by the Real Cost Project conducted in 2003 by the Chancellors Office of the California Community Colleges. The Real Cost Project conducted a “quality costing” study to identify the characteristics of a prototype community college based on indicators of quality necessary to fulfill the community college mission (Real Cost Project).² In addition, in 2005 the National Center for Higher Education Management Systems (NCHEMS) conducted an exploratory study of the adequacy of public higher education finance relative to expected performance based on aggregated state data (Kelly and Jones 2005).

The program under study is the 2003 session of the MCAS Transitional Pathways Program at North Shore Community College (NSCC). The program’s purpose was to assist students who had not been successful on either one of or both of the English/Language Arts

¹ The web site of the Campaign for Fiscal Equity, www.cfequity.org, provides case archives, recent news concerning educational finance litigation, and reports on adequacy methods and studies.

² A number of prominent studies have been conducted of higher educational costs and expenditures, but they have not focused on remedial education. In addition, they document existing spending levels rather than the costs associated with the levels of resources necessary to provide a quality education and achieve desired educational outcomes (Seybert 2003; Middaugh, Graham, and Shahid 2003).

(ELA) and mathematics Massachusetts Comprehensive Assessment System (MCAS) exams to earn a passing grade on the MCAS, obtain their high school diplomas, and enroll in higher education. All of the program participants had received All But Competency Determination (ABCD) status, meaning they had successfully completed their high schools coursework, but had not earned a diploma because they had not met the high school exit standards, as measured by the MCAS examinations. Without a high school diploma, ABCD students were ineligible to enroll in credit-bearing courses at public colleges in Massachusetts. The cost study was commissioned by a planning group at the time of program implementation in order to inform the Department of Education, which retained fiscal responsibility for the ABCD students, of the funding necessary to implement the program.

Our study provides a well supported estimate of the costs of delivering remedial content and developmental student support in mathematics and English/Language Arts instruction in the year after high school to students who failed to meet college-readiness criteria. The research also models a method for other institutions to use in estimating educational costs, thereby promoting the capacity of colleges to conduct cost studies on their own campuses and address the research gap in this area. The study informs understanding of the costs of public policies requiring students to pass high school exit or college-readiness examinations. After providing further information about the program necessary to understand the purpose and context of our analyses, we describe the data collection, which entailed use of the “ingredients method” of cost analysis (Levin and McEwan 2001, 2002), analysis methods, and results. We report a cost estimate of remediation in a developmental education program per enrolled student and measures of cost-effectiveness based on participants’ academic

outcomes, using two measures of student success. A concluding section discusses the relevance of our results to remedial education policies and institutional researchers.

Background of the Study

Pathways to Success: the MCAS Transitional Programs Massachusetts was one of a handful of states that led the way in adopting college admissions and high school exit standards that imposed testing requirements for students to demonstrate academic competencies (Bastedo and Gumport 2003; High Standards 2007; Mazzeo 2002). Massachusetts' legislators approved the Education Reform Act of 1993 to improve public education in that State, requiring students to demonstrate competencies "based on the academic standards and curriculum frameworks for tenth graders in the areas of mathematics, science and technology, history and social science, and English" as "a condition for high school graduation" (*Education Reform Act 1993*). In response, the Department of Education developed a common curriculum, The Massachusetts Curriculum Frameworks, and the accompanying Massachusetts Comprehensive Assessment System (MCAS). Subsequently, high school students were required to pass MCAS exams, either in the tenth grade or later through re-tests, as part of their high school diploma requirements.

The graduating Class of 2003 was the first to be held accountable through the MCAS, which at that time tested the Language Arts and Mathematics curriculum frameworks. By graduation time in June 2003, 54,684 or 90 percent of the 60,742 high school seniors in Massachusetts had met this competency. The remaining 10 percent, or 6,058 students, were identified as All But Competency Determined (ABCD) because they had met all graduation requirements except passing the MCAS (Policy Brief, Rennie Center for Education Research and Policy, 2004). In keeping with the accountability ideal of providing both the opportunity

and support for every high school student to earn a diploma (Developmental education in New England 2002), the State moved (rather belatedly) in Spring 2003 to quickly put in place several postsecondary pathways for ABCD students.³

The various Transitional Pathways initiatives included One-Stop Career Centers (for exploring career options, conducting job searches, and learning about further educational opportunities), Innovative Programs (for participation in work and learn programs co-sponsored by employers and educational institutions, where students could earn money and gain job skills), and the Academic Support Services Program (for ongoing receipt in local school districts of MCAS tutoring that was available to students in grades 3 through 12). ABCD students were also eligible to study for the MCAS through the Community College Transitional Pathways Program, which had the dual purpose of providing MCAS remediation and familiarizing students with college courses, certificates, and associate degree programs (Policy Brief, Rennie Center for Education Research and Policy, 2004, pp.3-6). North Shore Community College (NSCC), which had three years of experience in MCAS remediation through partnerships with local high schools, was the lead college among six that developed the community college transitional program. The program implemented on the NSCC campus in the Summer of 2003—its components, instructional design, staffing, and student outcomes—is the subject of our cost study.⁴

MCAS Transitional Pathways Program Planning Although MCAS partnerships with community colleges had been emerging across the State since 2000, they had been focused on the community college's role in supporting MCAS preparation offered pre-graduation in the

³ Some of the students designated in June as ABCD had, in fact, passed the May administration of the MCAS. However the results of the May administration were not available until September, so students who had taken the May exams did not truly know their status until September.

⁴ Eight community colleges in the state implemented programs similar to the one at NSCC, with variation in

high schools. The implementation of the Transitional Programs represented the first instance in which the community colleges took on responsibility for teaching the skill sets of the Massachusetts Curriculum Frameworks and combined that with their existing mission of providing access to postsecondary education.

An MCAS Transitional Pathways Program planning team was formed at NSCC, including community college faculty, staff and administrators and high school teachers. The group designed the ABCD curriculum and evaluated student support service needs, keeping in mind the potentially stigmatizing effects of remedial education (Simpson et al. 1997). The group developed five program components a) curriculum b) student support services c) administrative structure (e.g. differentiating high school and community college responsibilities) d) instructor and counselor training and, e) instructional materials and also undertook the cost study reported here.⁵

The planning team conducted gap analyses in the areas of curriculum and student support services. In an attempt to align the Massachusetts Curriculum Frameworks with the community college developmental education curriculum, the learning outcomes were compared, in part through an item analysis of the MCAS exams (Yanchus 2004, n.d.). The analysis of student services involved identifying first the support services needed for ABCD students followed by an examination of the services currently offered at a typical community college. The faculty found few similarities and poor alignment between the state Curriculum Frameworks and the college curriculum. Planning team members therefore decided to develop new learning modules specifically to address the content of the MCAS learning standards in developmentally appropriate ways for young adults, many of whom were English language

design and enrollment.

learners or had been categorized as special education students.

NSCC Transitional Pathways Program Design The characteristics of academic assistance programs can be arrayed along a continuum focused on functional literacy skills at one end and authentic learning strategies on the other (Simpson et al. 1997). Standardized assessment exams are a primary feature of functional delivery models. In that respect, the Transitional Pathways program at NSCC had an inherent functional—and in many settings what would be viewed as a remedial—feature. A primary goal of the program was to enable students to pass the standardized MCAS exams. However, the planning group adopted a developmental rather than a remedial philosophy in designing the program. As Simpson et al explain (p. 57), “The distinguishing feature between the two terms is that the term remedial implies the student is deficient, whereas the term developmental implies no such deficiency. Developmental programs seek to build upon students’ current knowledge and skill level.”

Therefore, while the NSCC program included remedial aspects to provide content knowledge and skills to pass the MCAS exams, it also included developmental characteristics aimed at promoting college aspirations, motivation, self-efficacy, and a collegiate identity (for a review of academic assistance models, see Simpson et al. 1997). The instruction was designed to provide a deeper learning experience and learning strategies for success in college. In contrast to the remedial support available in the K-12 setting, transitional students were treated as adult learners (Yanchus 2004). The curriculum and pedagogies of the NSCC Pathways program integrated “multiple learning theories, effective learning strategies,” and materials that had proven “successful with developmental students at the community college level” (Yanchus, Undated, p. 5).

⁵The cost study does not include the human resource costs associated with the work of the planning team.

The program designed at NSCC included several pedagogical features recognized as critical elements of effective remedial education, including diagnostic use of assessment exams and individualized content delivery. Individualized instruction was supported by low student-teacher ratios, inclusion of professional tutors in classrooms and learning centers and computer software. The pedagogical features of developmental education included content area modules used in conjunction with subject matter textbooks and literature books, attention to developing students' repertoire of learning strategies, and a combination of deductive, inductive and peer learning instructional methods. Student services included career and college counseling, exposure to the college environment, and incentives for future college enrollment.

A course in English/Language Arts and a course in mathematics were designed to allow flexibility in content delivery. Each course met twice a week for two hours for eight weeks. Students received only those skill sets he or she needed to be successful on the MCAS. Determination of each student's needs was based on an item analysis of individual performance on previous MCAS exams. Through individualized instruction, the program intended to reduce the time students spent on skills they had already mastered, allowing for a more efficient use of faculty time and deeper student learning in the areas of weakness. Professors from the Communications Skills and Mathematics departments with expertise in developmental education taught the NSCC Transitional Program classes. The program design called for optimal class enrollments of fifteen students, with one instructor and three professional tutors per class.

The planned instructional ratios, therefore, were 15:1 for the students to teachers and 5:1 for students to tutors. After the professor provided the context for the day's class through

an opening, all-class lecture or demonstration, both tutors and the professor worked one-on-one with students or with small groups during the remainder of class time. Tutors, who had been selected for their content knowledge as well as familiarity with instructional strategies for teaching second language learners or special education students, also met with students outside of class to address broader academic needs and skill sets. The program was administered by a program coordinator and a counselor, whose responsibilities included serving enrolled students as well as recruiting, advising, and counseling students who did not ultimately enroll. With a counselor dedicated to the program, the student-to-counselor ratio was 30:1, a number far below the counseling ratio estimated in other studies as “in excess of 1000:1” (Grubb 2006, p. 205).

The developmental components of the program were viewed as particularly important by the planning team because many students had failed to meet the MCAS standards despite multiple attempts (as many as five) in high school. The College’s urban campus is located in an area of high poverty and its high schools had the region’s highest population of ABCD students. The location of the program on the college campus provided students with the opportunity to leave their high school experience behind and develop an identity as a college student (for a discussion of the importance of collegiate identity development, see Nasir and Hand 2006). Students were exposed to the full collegiate experience. They received student IDs, registered for courses through the College’s on-line enrollment system, had access to the College library and computer labs, and obtained supplies at the College’s bookstore.

The college provided a full set of student support services open to the Transitional Program students, including seminars on career exploration, college programs of study, college success strategies, and financial aid. The Transitional Program counselor, who was

hired specifically for the program, was on site before and after classes, often sitting with students where they congregated in the College's cafeteria and rotating among them. Through these individualized and small group conversations, the counselor could identify needed services. The counselor and program coordinator worked closely together to provide a network of support in an effort to address each student's needs holistically.

Incentives that responded to students' basic survival needs as well as development of their academic self-efficacy were integrated into the program design. These were aimed at encouraging students to enroll in the program, complete it, and feel a sense of confidence and respect for themselves. The goal was to provide these students with a sense of "hope and opportunity," a key element of the College's mission. A sampling of the incentives for the Summer 2003 student cohort includes (a) course materials, such as specially developed MCAS curriculum modules, textbooks, calculators, and literature books; (b) college sweatshirts for those students who completed the program with a 95 percent attendance rate or higher; (c) a \$100 voucher at the College Bookstore, towards the purchase of books for a college-level course, for those students who completed the program and passed the MCAS; and (d) free tuition and fees for a three-credit college course at NSCC for those students who completed the program and passed the MCAS, offered by the College's president.

To meet students' basic needs, the incentive of a daily meal on each of the class days was also provided. The majority of enrolled students came from low-income families and many were also working to help support their families. Classes were held in the late afternoon into the evening and most students came to class right from work, without necessarily eating a good meal during the day. To position students physically to learn, a boxed meal was available at a supertime break during classes.

NSCC Transitional Program Student Enrollment and Outcomes Twenty-four students enrolled in the MCAS Transitional Pathways Program at NSCC in Summer 2003. Of these 24 students, 16 (67 percent) enrolled in two or more sessions of the program between Summer 2003 and Winter 2006, which implies they had not successfully met the MCAS standards by the Fall of 2003. The enrollment did not meet the planning expectations and was not evenly distributed across the two classes offered in Summer 2003. Twenty-one students enrolled in mathematics and five in language arts (with two students enrolled in both classes).

The implementation of the program in Summer 2003 differed from what was planned, which had been based on expected enrollments of 15 students per class. The teacher-faculty ratio was higher than 15:1 in mathematics and substantially lower than 15:1 in language arts. The three planned tutors were not hired for the language arts class and instead the program counselor provided tutoring to that class. The implemented student-tutor ratio (7:1 in mathematics and 5:1 in language arts) remained close to the 5:1 planned ratio.

NSCC administrators analyzed their own MCAS Pathways Program and college data over five years to observe the academic outcomes of the Summer 2003 student cohort. Sixty-seven percent (16) were known to have earned their high school diploma. Seventy-five percent (18) were known to subsequently enroll in and attempt college credits at NSCC or elsewhere.⁶ (The college experiences of the remainder of the cohort are unknown.) Of the total cohort, 29 percent earned up to 23 credits, with the majority of those students completing a cohesive educational program with those credits. Of the total cohort, 25 percent earned 24 or more credits, implying they were on the path to becoming eligible to earn an associate's degree or to transfer to pursue baccalaureate study. Two students graduated from NSCC; one

⁶ Almost all of these students (17 of 18) enrolled at NSCC.

earning a certificate and the other an associate's degree.

Methods and Analysis

The ingredients method for social program cost analysis, which is also known as the resource cost model, carefully identifies all the components, or "ingredients," of an intervention and places a value on them (Levin and McEwan 2002, 2001). The ingredients method is the recommended approach for cost-effectiveness studies in education (Hummel-Rossi and Ashdown 2002). The ingredients for the MCAS Transitional Pathways Program were first identified and summarized in a cost analysis template, which is shown in Table 1. The template was then used to record actual expenditures for delivery of the Transitional Program at NSCC during the Summer 2003 session, which are indicated in Table 2 and summarized in Table 3.

As is often necessary in the area of cost analysis (Jones 2000; McKeown Moak 2000), we relied on administrative, budget and payroll records to obtain the data for our study. The direct costs of the salaries and benefits for new instructional, counseling, and administrative personnel were taken from human resource and payroll records and recorded in dollars. Professors and tutors were paid on a per class basis and administrative personnel were hired on an annual basis to administer multiple sessions each year. The direct costs of training, computers, computer software, instructional materials, and student incentives required for the new program were taken from purchase order and budget records and also recorded in dollars.

The cost of the time existing personnel were likely to allocate to the program was estimated, using a minimum and maximum estimate, in hours. A dollar value was then attached to the time estimates based on the annual salary and benefits associated with those positions, as indicated in human resource and payroll records. The assigned dollar value was

based on a midpoint selected from the time range. This approach is far less precise than conducting observations or collecting logs of the time existing personnel allocated to the new program. However, it generates a reasonable proxy of the “asset structure” of the staffing patterns at the college and a glimpse into the opportunity costs of new program implementation (Jones, 2000, p. 81).

The reallocation of facilities is measured in square feet by hours of use, and the square foot construction costs of those facilities, available from capital cost records, are reported. The analysis assumes that the campus already has the physical and administrative capacity to offer remedial courses without displacing other valued activities. Campuses that do not have existing physical or administrative capacity will face higher costs to hire new administrative personnel; rent classrooms, learning labs, or offices; and purchase furniture and computers. The extent to which physical and administrative resources were reallocated at NSCC is reported to enable comparisons and planning by peer institutions.

Analysis These data are analyzed to provide estimates of the cost per student of remedial education program delivery in a developmental educational model and the cost per student of effective program delivery, as measured by the costs per successful student. To arrive at per student costs, we sum expenditures on a course, session, or annual program basis, as indicated in the measurement column of Table 1, and divided using a base of fifteen students per course, or multiples of fifteen for session or program expenditures. We characterize the robustness of this estimate by calculating the proportion of our findings contributed by direct program costs (which we were able to measure very precisely from institutional records) and indirect costs (which were more subject to guesswork about the reallocation of human resources).

To contextualize the magnitude of the per student cost estimate, we compare our results to expenditures at NSCC for regular-semester course offerings, treating each of the Transitional Program classes as equivalent to three credits (a total of six credits per session). These regular-semester costs are taken from the 2001 Integrated Postsecondary Data System (IPEDS) finance survey data showing average expenditures on instruction, academic support student services, and institutional costs, which we divide by the college's full-time equivalent enrollment in that year. The findings are also compared with prior published cost estimates of remedial and non-remedial classes in two- and four-year colleges, which have been reported on an annual per student basis. In order to do so, we calculate an annual cost based on the cost of three credits, assuming the equivalent of 24 to 30 credits in annualized cost estimates.

In relating costs to program effectiveness we identify "successful" students in two ways, those who (a) earned a high school diploma and (b) earned 24 or more college credits. In focusing on this latter indicator as a measure of college success, we do not mean to imply

that those students who earn up to 24 credits (as 29 percent of our sample did) are not successful. Rather, we have chosen the latter indicator because it is a clearer marker of success in the absence of additional information on the curricular coherence of the accumulated credits. The costs of the college credits themselves are not included in our estimate, which reflects the costs of *preparing* a student to be successful in college.

We then use the proportion of Summer 2003 program participants who earned their diploma and the proportion who earned 24 or more college credits to project the costs of producing successful program completers in a program enrolled at capacity of 30 students. As we know from our sample, the total costs per successful student will vary because some will need to take the remedial program more than once. Therefore, we present a range of estimates of the program's cost-effectiveness based on the assumption that all students were successful after one year, two years, or three years.

We base our estimates on the planned program design and enrollment (i.e. 15 students per class, with one instructor and three tutors) even where the program delivery in Summer 2003 deviated from the design. This approach provides an estimate of the costs of a program design deemed as adequate to achieve educational program goals as determined by the professional judgment approach to adequacy cost analysis. At any college, the actual cost per student will be higher (or lower) when fewer (more) than 15 students enroll in each class. In light of this, we present rounded rather than precise per student estimates for ease of interpretation. All estimates are presented in 2003 dollars.

There are a number of limitations of our data concerning student outcomes. Most important, we cannot specify the proportion of students who passed the MCAS as a result of participating in the NSCC Transitional Pathways Program. It is possible some participants

had already passed the MCAS based on their performance on the May administration of the exam. Others may not have passed the exam, but were instead allowed to substitute a portfolio examination to meet the high school exit standards. In the latter case, however, completion of a Transitional Pathways program was a requirement of an acceptable portfolio, so program participation did contribute to the student's ability to earn a diploma.

In addition, while offering a more fine-grained analysis than most prior studies of college remedial costs, we do not distinguish between the effectiveness of language arts versus mathematics instruction nor the actual quality of a student's program participation. This is due to data limitations and the small sample size in the language arts class. Future analyses will ideally characterize the quality and effectiveness of program delivery in different academic content areas, the quality of student participation, and the quality of interaction of students with instructors, tutors, counselors and others in the various instructional settings.

Results

Table 2 reports the detailed expenditures or resource use estimates in each of the categories of ingredients. They are then summarized in Table 3 by category on a per student per session or annualized cost.

Personnel and Instructional Materials The rounded sum of direct expenditures on classroom and administrative personnel, instructional materials, and student incentives is estimated at \$1400. These expenditures are reported in Table 3 in categories I-III, but exclude item I.3, which is the indirect estimate of reallocated human resources. Approximately 60 percent of the direct personnel and instructional costs were expended on classroom instructors and tutors, with the remainder expended on instructional materials, including student

incentives. The use of computer-based instructional software contributed 16 percent of the total direct expenditures. The cost of reallocated administrative, academic, and student services personnel is estimated at \$300, which is a mid-range value of the low estimate of \$200 per student per session and a high of \$370. Summing the directly and indirectly estimated expenditures, the results indicate a total per student per session expenditure of approximately \$1700 for the delivery of two courses, each equivalent to a three-credit sixteen-week semester class, and a full counseling program, for administrative and instructional personnel and instructional materials.

Facilities, Furniture and Equipment To offer the program annually, NSCC set aside two classrooms and two learning labs for sixteen days of daily use, three times a year, when the program was in session. A year-round program office was required for program planning and administration, the furnishings for which cost approximately \$5000 in 2002. Three work stations were also needed when classes were in session.

Fifteen computer workstations in the learning laboratories were used by the program when it was in session. At purchase, these cost \$2400 each and the Computer on Wheels (COW) cost \$5000. The program required these resources on a daily basis approximately half time when classes were in session. Without depreciating the equipment costs, the value of the reallocated computer usage was estimated at \$83 per student per session. Adding this figure to the \$221 per student per session for computer-based instructional materials (including Plato software) produces a total of \$304 to provide computer-aided instruction. That amount equals 76 percent of the expenditures on classroom instructors and tutors and 18 percent of the total direct and indirect program costs. Similarly, in a review of eight studies examining the costs of computer-aided instruction in primary and secondary school reading and mathematics,

Levin (1989, p. 60) found the average costs of hardware and software to be about 20 percent of total program costs.

The value of the physical classroom and office space would best be estimated by determining a share of depreciated construction costs or the price of renting an equal amount of space in the community. These steps were not taken as part of this analysis. Instead the simplifying assumption of available physical capacity was adopted. The construction costs for NSCC facilities are reported and the recent value of \$220 per square foot for the new campus in Danvers, MA, built in 2002, gives an indication of the value of the space utilized. (NSCC also has a campus in Lynn, MA.) For planning purposes, a comparison of available physical capacity at alternative sites is recommended.

With a relatively small enrollment size of 30 students, the transitions program was estimated to consume a very small share (<1 percent) of the daily operations and facilities budgets.

Robustness of the Estimates The direct expenditures on personnel and materials account for 82 percent of the estimated costs of \$1700 per student for the delivery of coursework equivalent to six course credits. These expenditures were precisely documented based on payroll and administrative documents. In a review of higher education cost estimates, Jones has similarly reported that approximately 80 percent of instructional costs are expended on personnel (2000, p. 81). The remaining 18 percent of our estimate is sensitive to the assumptions made about the reallocation of time by existing personnel. The range of the cost of this reallocated time is 33 percent lower to 25 percent greater than the midpoint we chose to include in the total expenditure estimate. However, because these indirect personnel costs are a relatively small share of the total program costs, they do not have a strong effect

on the estimates.

Cost Effectiveness As noted in the description of the NSCC Transitional Pathways Program, within five years 67 percent of the program participants earned their high school diploma and 25 percent had earned 24 or more college credits. These outcomes can provide the basis for estimating the cost-effectiveness of the program, keeping in mind that 67 percent of students who participated in the Summer 2003 program, including those who were successful, enrolled in two or more MCAS remediation sessions. The distribution of participation in multiple MCAS remediation sessions among the six students from the Summer 2003 cohort who ultimately earned 24 or more college credits, for example, is three who took one session, one who took two sessions, and two who completed three sessions. A study of MCAS passing rates for students who participated in the Pathways Transitional Program in the Summer of 2003 similarly shows that 25 percent of the participants passed the exam in the following year (Pathways to graduation 2004). These figures suggest that one-half or more of successful students will require participation in more than one remedial session.

Table 4, therefore, projects a range of costs of producing successful outcomes based on the participation of all students in one, two, or three sessions, using the \$1,700 total cost of direct expenditures on personnel and materials and the indirect cost estimate of reallocated human resources. Assuming the same success rates had the program enrolled participants at its capacity of 30 students, the costs of \$1,700 per student for one session, \$3,400 per student for two sessions, and of \$5,100 over three sessions would be distributed over a base of twenty high school graduates (i.e. 67 percent of 30) and 7.5 students prepared to succeed in college (i.e. 25 percent of 30). This produces a range of cost-effectiveness estimates of \$2,550 to

\$7,650 for a high school graduate and \$6,800 to \$20,400 for a successful college student.

Discussion

Comparison with NSCC Non-remedial Costs According to NSCC IPEDS data from the 2001 finance survey, average expenditures per full-time equivalent student for a three-credit course were \$330. Therefore, the cost of delivering courses equivalent to the six-credit curricular content of the Transitional Pathways Program is \$660. This comparison indicates the remedial program was 2.6 times ($\$1700/\660) more expensive than the average cost of regular semester courses.⁷

Some states fund remedial education at lower rates than non-remedial coursework. For example, California funds remedial courses at 60 percent of the non-remedial funding rate (Shulock and Moore 2007). Other states assign a premium to community college remedial courses at community colleges to fund them at twice the level of non-remedial courses (ECS, 2000). The ratio of 2.6 estimated here is somewhat higher than that premium. The relatively high cost of the NSCC Transitional Pathways Program reflects the very low student-to-faculty and student-to-tutor instructional ratios, which were adopted based on the planning group's recommendations regarding the optimal program design.

Comparison with Other Remedial Cost Estimates Extrapolating the three-credit cost of the NSCC Transitional program to an annualized cost, based on 24 to 30 annual credits, yields an annualized cost estimate for the Transitional Program of \$6,800 to \$8,500 per student. These figures are significantly higher compared to reported estimates of annual per FTE remedial expenditures of \$4,660⁸ in the CUNY two-year colleges, \$6,709 in the Arkansas

⁷ If we use the lower bound of our estimate of the per student costs of the time reallocated by existing college personnel, the ratio is 2.5, and if we use the upper bound the ratio is 2.7.

⁸ Other cost estimates reported in real dollars, not in constant dollars adjusted for inflation.

two-year colleges (Barnett 2003), and \$6,007 among all sectors of higher education combined in Michigan (Greene 2000).

In fact, our range of estimates (\$6,800 to \$8,500 per student) is more comparable to the costs of remedial and non-remedial coursework reported for four-year colleges in these state studies. Remedial courses at CUNY four-year colleges were reported as \$7,079 per FTE and in Arkansas four-year colleges as \$7,381 per FTE. The Arkansas study reported the cost of non-remedial, general studies at community colleges as \$6,163 and of English and math courses at four-year institutions as \$8,804 and \$9,320 respectively. The CUNY study estimated a cost of \$7,709 for non-remedial education in all their academic programs combined (Barnett 2003, p. 9). The level of spending observed in the NSCC Transitional Program was similar in magnitude to typical non-remedial spending at four-year colleges. It is somewhat less than the \$9,200 annual total costs per full-time equivalent student for delivery of a high quality community college education estimated by the Real Cost Project (2003).

Remediation is likely to be less costly when provided to students who are, for the most part, academically prepared for college, but need to get up to speed in one course or subject. Such students, who include returning adults who need a “refresher” in mathematics or writing (Merisotis and Phipps 2000, p. 74), often have the option of stepping out of four-year institutions to take a remedial course at a community college, where it will be less expensive for them and less costly to the state. Community colleges save on costs when offering remedial courses by employing part-time faculty (Bettinger and Long 2007). One study estimates that only a third of the faculty teaching remedial education are full-time faculty members (Shults 2001, p. 4). For the same reason, remedial courses at four-year institutions are also likely to be less costly than non-remedial courses at the same institution (Barnett

2003). Such cost savings are reflected in funding models that allocate lower FTE funding for remedial courses. As our results show, however, programs with integrated remedial and developmental components are not less expensive because they require higher levels of instructional staffing, both for instructors and tutors.

Conclusion

There is a glaring gap in the policy literature concerning the costs and cost-effectiveness of remedial education. The findings of our study indicate that effectively providing remedial education for students who had repeatedly failed a high school exit exam is a costly endeavor. Our results show that the costs of standards-based remediation carried out in a developmental educational program is over two-and-a-half times as expensive as non-remedial community college courses. The costs of successfully producing a high school graduate and a student prepared to succeed in college are equivalent in magnitude to the annual costs of enrolling a student at four-year college.

It may be counterproductive to draw conclusions about the costs of remediation for students with very different needs based on aggregated data. Prior studies have indicated that on average remedial coursework is less expensive than non-remedial coursework. In contrast, our results, using what might be considered college-level micro-data, indicate that a remedial program designed for high need students to standards of educational adequacy (as identified through the professional judgment of a team of community college faculty) is substantially more expensive than non-remedial coursework (2.5 times greater). In fact, remediation is probably both *less* and *more* expensive than non-remedial higher education, depending on the student population and the testing standards that govern their progress towards degree completion. It is clear that remedial education can not be provided to high need students “on

the cheap.”

The adoption of high school exit exams is intended to reduce the need for collegiate remediation by providing all students with an adequate education in high school. Similarly, more stringent admission standards and collegiate placement testing policies are intended to manage the allocation of higher education resources to students with the ability to benefit from those resources by keeping less prepared students out of more selective and academically competitive institutions. Inevitably, however, some students will meet all their high school diploma requirements in their coursework, but nevertheless fail the exit exam. Others demonstrate academic preparedness and are accepted at state universities contingent on successful performance on placement tests that function as “de facto high-stakes exams” (Kirst, 2007, p. 12). Those who fail placements exams are remanded in some states to community colleges for remediation before they may apply for readmission to the state university, a step many discouraged students never venture to take again (Parker 2007; Parker and Bustillos 2007).

At the community college level, although placement tests are widely used, they are not well validated, creating significant unevenness in their use and application even within the same state systems (Brown and Niemi 2007; Shulock and Moore 2007). Now that high school exit and higher education placement testing has become more widespread (Closing expectations gap 2007), the demands of remediation to standardized assessment standards will become greater. While community colleges may previously have been able to use part-time instructors to effectively educate the majority of students in remedial courses, most of whom were students who required only one or two remedial courses (Attewell et al. 2006; Brown and Niemi 2007), their task is now complicated by testing standards that are poorly

developed and inequitably applied.

Given the large variation in the types of courses and students defined as remedial, highly aggregated national data and analyses are not likely to shed light on the costs and effectiveness of various forms of remedial and developmental education. A greater role and involvement of institutional researchers will be required to gain better understanding. Our study demonstrates use of a simplified method of cost analysis, which we recommend to administrators and institutional researchers for more routine use. A college choosing between two alternatives involving the use of existing facilities—for example creating a centralized student success center rather than multiple learning centers spread throughout campus buildings, or hiring peer tutors rather than using instructional software—will make a more informed decision by conducting a cost analysis with simplifying assumptions than by not systematically considering relative costs at all. For example, our study indicates that the costs of using the Plato educational software were equivalent to hiring four professional tutors or three counselors. Through observations of student learning and interactions with instructional software and tutors, a college can make a better informed decision about the cost-effectiveness of various educational delivery options.

Discussing the controversy surrounding the elimination of remediation in the City University of New York (CUNY) system, Anderson (2002) challenges policy makers to consider the extent to which the policy “affirm[ed] an ideology of accountability, efficiency, and standards at the expense of genuinely tackling the critical learning and pedagogical problems surrounding ‘disadvantaged’ students?” In the Spring and Summer of 2003, the Commonwealth of Massachusetts attempted to live up to the ideals of standards-based education reform by continuing to finance remedial educational opportunities for students

who had not demonstrated proficiency on the MCAS exams. As the Rennie Center for Education Research and Policy put it, the state was to be commended for continuing to meet its “obligation to provide ongoing academic support,” despite the fact this responsibility “might easily have [been] ignored” (Pathways to graduation 2004, p. 1). In partnering with community colleges, the remedial effort became enveloped in a developmental education framework. MCAS remediation to high school proficiency standards was only one purpose of the program we studied at NSCC, which treated participants as adult learners preparing for college and sought to reduce the stigma associated with remediation.

In effect, then, our study demonstrates the costs of the “no child left behind” ideal of standards-based education reform, which aims to use high stakes testing as an incentive for improved performance by students, schools, and colleges. The assumption that “all purpose remedial courses” (Grubb, cited in Anderson, 2002, p. 204) can be used cheaply to meet the obligations of that ideal is challenged by our findings. Yet, the temptations and pressures from funders to achieve cost-efficiencies in education are real—as is strongly apparent when we note that State funding for the second summer of the MCAS Transitional Pathways Program at the community colleges was cut by 80 percent (Pathways to graduation, p. 7). However, the emphasis on efficiency in the absence of real data on costs or cost-effectiveness may well be creating false economies. Most analysts of remediation conclude that the costs of remediation are likely to be outweighed by the economic benefits of producing larger numbers of college-educated workers (Attewell et al. 2006; Breneman 1998; Merisotis and Phipps 2000; Shults 2001).

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Table 1 Ingredients for Cost Analysis

Ingredient	Measurement	Assumptions
I. Personnel		
1. Course professors and tutors	Compensation per person per course	One classroom instructor (student-to-faculty ratio of 15:1) and three tutors per course (student-to-tutor ratio of 5:1), meeting two hours per class in sixteen classes per session.
2. New administrative personnel	Compensation per person per session	One program coordinator and one student counselor per session (student-to-counselor ratio of 30:1).
3. Existing administrative personnel whose time is reallocated to program	Hours expended per session as proportion of annual hours X annual compensation	Functions affected: student services, career counseling, academic assessment, computing services, technology support, academic administration.
II. Instructional Materials		
1. Instructional materials Student textbooks Student skill modules Faculty textbooks Faculty skill modules Accuplacer exams	Direct expenditure per student per course	New textbooks and skill modules purchased each course.
2. Curriculum software (Plato) with laptop computer for instructor use.	Direct expenditure per program	One combined language arts and math license per year. The number of laptops will increase to three in the first three years, with replacement in subsequent years.
3. Student incentives (College sweatshirts, book vouchers, meals, and transit passes per session).	Direct expenditure per student per session	Student engagement improves with incentives. Incentives purchased per session.
III. Faculty and Staff Orientation and Training		
Orientation, instructional planning, training of faculty, tutors, new administrators	Direct expenditure per session	One orientation per session. Returning personnel will participate each year to meet new faculty and tutors. Session includes instructional planning and software review.
IV. Computers		
Computers in computer laboratory, A-V equipment	# of units; cost of equipment purchase	Equipment is shared with other programs.
V. Office Furnishings		

Office furniture and equipment	# of units; cost of equipment purchase	Necessary furnishings are available to be reallocated to program.
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VI. Facilities		
Classrooms, learning labs, tutorial space, offices, library, lounges and cafeterias	Hours in use X square feet; Construction costs.	No other programs were displaced. Only one office is allocated on a full-time basis to Transitional Program.
VII. Telecommunications/ infrastructure and supplies		
Telephones, copiers, printer, server, electricity	percent of daily operating cost	Resources from supply shared with other programs.

Data sources: NSCC human resource (category I and III), payroll (category I), budget (category I and III), purchase order (category II and III), operational expense (category V, VI, VII), and capital cost records (category VI).

Table 2 Detailed Costs of NSCC Transitional Pathways Program

Category of Expenditure	Expenditures
I. Personnel	Salary & benefits
I.1. Classroom Personnel	(\$ per class) ⁹
Classroom Instructor (adjunct professor)	1 @ \$2,675 + \$50 (adjunct professor)
Classroom Tutors (part-time employees)	3 @ \$800 each + \$15 each (part-time tutors)
I.2. Administrative Personnel	Salary & benefits
	(\$ per session, at 3 sessions per year.) ¹⁰
Program coordinator	1 @ \$10,125 + \$190 (part-time position)
Student services counselor	1 @ \$2,575 + \$48 (part-time position)
I.3. Reallocated Personnel	Minimum and maximum estimate of hours per session; Salary & benefits
Student support services	24 hrs – 36 hrs; Annual salary \$38,000 plus benefits of \$9,422
Other student Services (Library, Enrollment Center, Etc.)	14 hrs – 26 hrs; Average annual salary is \$44,500 plus benefits of \$11,030
Career exploration services	8 hrs – 15 hrs; Annual salary is \$42,000 plus benefits of \$10,412
Academic assessment	25 hrs – 40 hrs; Annual salary is \$33,500 plus benefits of \$8,308
Computing services	12 hrs – 26 hrs; Annual is \$28,000 plus benefits of \$6,947
IT Support	18 hrs – 36 hrs; Annual salary is \$45,500 plus benefits of \$11,278
Academic administration	45 hrs – 85 hrs; Annual salary for \$83,100 plus benefits of \$20,582
Finance and budget	12 hrs – 26 hrs; Annual salary is \$33,750 plus benefits of \$8,370
Facilities and maintenance	12 hrs – 18 hrs; Annual salary \$25,000 plus benefits of \$6,205
Grants management	28 hrs – 36 hrs; Annual salary \$59,700 plus benefits of \$14,795
II. Instructional Materials	\$ per class
II.1. Textbooks and Assessment Exams	
Math Textbooks	15 @ \$32.00 per text = \$480
Language Arts/English Textbooks	15 @ \$13.25 per text = \$198.75
Math Skill Modules	15 @ \$69.60 per binder = \$1,044
Language Arts/English Skill Modules	15 @ \$23.00 per binder = \$345
Faculty Math Textbook	1 @ \$24.00

⁹ The benefits for all part-time positions are for medical tax, universal health insurance, and unemployment taxes.

¹⁰ Per session costs may be higher if personnel are hired on a per session basis.

Table 2 (Continued)

Category of Expenditure	Expenditures
Faculty Math Skill Modules Faculty Language Arts/English Textbook Faculty Language Arts/English Skill Modules Accuplacer Ability to Benefit (ATB) pretest Accuplacer College Placement Test (CPT) posttest	1 @69.60 1 @ \$13.45 1 @ \$23.00 15@ \$4.05 per exam = \$60.75 15@ \$2.70 per exam = \$40.50
II.2. Computer-Based Instructional materials Curriculum software (annual license) Laptop computer(s) for faculty use ¹¹ II.3. Student Incentives per course ¹² III. Faculty/Staff Orientation and Training Orientation, instructional planning, Plato curriculum software review, Faculty training stipends	\$ per program 1 @ \$18,048 site license 1 @ \$1,800 \$ per student 15 @ \$112 per student = \$1,680 \$ per session \$3,600 + \$68 (benefits) total
IV. Reallocation of Currently Existing Computers Learning lab computers Computer on wheels (COW) includes computer with speakers, projector, document camera, DVD/VCR player, internet	Units Per Annual Program 15 half-time use in session (cost = approximately \$2,400 per station) 1 half-time use in session (cost = approximately \$5,000)
V. Reallocation of Existing Furniture Dedicated MCAS Office furniture Shared Office Furniture	Units Per Annual Program Cost to acquire in 2002= \$5000 Units Per Session 3 work stations full-time use in-session (cost estimate at 1/3 rd full office=\$1700)

¹¹ Laptop(s) available to instructors for classroom planning and to program coordinator for recording student information from high schools. The number of computers will increase to three over three years, with replacement in subsequent years.

¹² No students required help with transportation to and from classes. The college was prepared to provide Transit Passes. In Summer 2004 a bus was arranged to take students to administrations of the MCAS exam, at a cost of \$250 per day for 3 days. Faculty stipends were paid to faculty to accompany the students, at an additional cost of \$600, for a total of \$1350 paid to transport students to the MCAS exam.

Table 2 (Continued)

Category of Expenditure	Use of Existing Capacity
<p>VI. Re-allocation of Current Facilities Lynn campus (built in 1984 at a cost of \$95 per sq. ft.) Classrooms Computer labs Tutoring space Offices Library, student lounges, and cafeterias</p> <p>Dedicated MCAS office at Danvers campus (built in 2002 at a cost of \$220 per sq. ft.)</p>	<p>Square feet of space; Number of rooms @ hours of use per class 833 sq. ft.; 2 @ 4 hrs 1,067 sq. ft.; 1 @ 4 hrs 1,067 sq. ft.; 1 @ 6 hrs 1,025 sq. ft.; 1 @ 7 hrs **Available for use—reallocated resources negligible 108 sq. ft.; 1 @ 1,950 hrs (full year)</p>
<p>VII. Re-allocation of Telecommunications, Infrastructure, and Supplies (The average daily operating cost of the College is \$1,800 per day with 60 percent expenditures at Danvers campus and 40 percent at Lynn campus.) Telephone and fax Copy and printer paper Copy machines Printers Heating and electricity Internet Insurance¹³</p>	<p>Percentage allocation, daily in session</p> <p><0.10 percent <0.05 percent <0.05 percent <0.05 percent <0.25 percent <0.05 percent <0.05 percent</p>

Data sources: NSCC human resource (category I and III), payroll (category I), budget (category I and III), purchase order (category II and III), operational expense (category V, VI, VII), and capital cost records (category VI).

¹³ Insurance is paid by the Commonwealth, not by individual campuses.

Table 3 Expenditures and Cost Estimates¹⁴

Direct expenditure categories	Amount expended / resources allocated
I.1. Classroom personnel (instructors and tutors)	\$399 per student per session
I.2. Administrative personnel (program coordinator and counselor)	\$431 per student per session
I.3 <i>reported below (indirect estimate)</i>	
II.1. Instructional materials	\$80 per student per session
II.2. Computer-based instructional materials	\$221 per student per session
II.3. Student incentives	\$112 per student per session
III.1. New personnel orientation and instructional planning	\$122 per student per session
Sum of Categories I (<i>omitting I.3</i>), II, and III	\$1,365 per student per session (<i>compare at rounded \$1,400</i>)
Reallocated Personnel	
I.3. Administrative, academic, and student services personnel	\$292 per student per session ¹⁵ (<i>compare at rounded \$300</i>)
Reallocated Computer Usage	
IV.1 Computers in learning lab and use of mobile computer	\$83 per student per session
Reallocated Facilities and Equipment ¹⁶	
V. Reallocated office furnishings and equipment (shared workstations)	13 percent of year (16 days X 3 per year = 48 days) \$1700 (1/3 rd full office) X 13 percent = \$220
V. Instructional and administrative facilities	13 percent of year (16 days X 3 per year = 48 days) <ul style="list-style-type: none"> • 2X approx. 1000 sq. ft. classrooms full day • 2 X approx. 1000 sq. ft. learning labs half day Annual <ul style="list-style-type: none"> • 1 X approx. 100 square feet program office
VII. Reallocated telecommunications/ supplies	< 1 percent of daily operating cost of \$1800 per day

Data sources: NSCC human resource (category I and III), payroll (category I), budget (category I and III), purchase order (category II and III), operational expense (category V, VI, VII), and capital cost records (category VI).

¹⁴ The analysis is based on different students in each course, all receiving the transit and incentive benefits.

¹⁵ Represents the middle estimate based on low and high estimates of hours expended on the Transitional Program. The high estimate equals \$371 per student per session and the low estimate equals \$213 per student per session.

¹⁶ Operational costs (e.g. computers and furniture) are not depreciated.

Table 4 Cost-Effectiveness Estimates*

Program delivery	Cost per student	Total cost of program delivery to 30 students	Program cost per successful high school graduate at 67 percent success rate (20 students)	Program cost per student successfully prepared for college at 25 percent success rate (7.5 students)
1 session	\$1,700	\$51,000	\$2,550	\$6,800
2 sessions	\$3,400	\$102,000	\$5,100	\$13,600
3 sessions	\$5,100	\$153,000	\$7,650	\$20,400

* Direct instructional and administrative program and indirect personnel costs only (facilities, equipment, supplies, and telecommunications expenses excluded).