Proposal Details

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Project Description I

Title:
Is Better? A Case Study of the Impact on Student Success due to a Policy Change for Placement in Developmental Mathematics Courses at a Community College

Statement of the research problem and national importance:
The place and prevalence of community colleges in our nation's higher educational scheme is difficult to overstate. In general terms, over six million students attended community colleges during the 2006–2007 academic year—a number that represents almost 40 percent of the total number of students attending college nationwide (NCES, 2008). Just as tellingly, of the students who receive a baccalaureate degree in this country, half attend community college at some point along the way, according to data from the American Association of Community Colleges (AACC, 2009). And beyond sheer volume, the community college's role as a socioeconomic stepladder is attested by the fact that many of the students educated in such institutions are those who might otherwise not have continued their education beyond the secondary level. Community colleges provide access to higher education for many nontraditional students,[1] minority students, first generation college students, and students of low socioeconomic status (National Center for Educational Statistics, 2008), enrolling the largest number of low income and first-generation college students (Bailey, Jenkins, and Leinbach, 2005).

Such extensive inclusiveness, and the open admissions policies[2] that make it possible, do have curricular implications. If we examine the spectrum of income alone, we find that McCabe's national study has found poverty has the highest correlation with underpreparedness (academic) at any level of education (McCabe, 2001): a reality that in turn suggests that the community colleges who open their arms to, among others, the economically disadvantaged are confronted

[1] A nontraditional student has at least one of the following characteristics: part-time student, working full-time, financially independent from one's parents, having dependents, being a single parent, does not have a high school diploma.
[2] Open admissions means that students neither need to compete for admission at a set time of the year nor demonstrate a level of academic proficiency to enroll." In 2005 – 2006, 95% of community college had open admissions. http://nces.ed.gov/programs/coe/2008/analysis/sa04.asp.

with many students unprepared for college-level work. To address this issue, remediation[3] (or developmental work) has become a central mission of these institutions (Bragg, 2001; Perin and Charron, 2006). McCabe (2000) equates remedial education at community colleges as a 'critical bridge' to success in life.

Researchers have found that students who require remedial coursework are less likely to complete any type of credential at a community college (Bailey, Jenkins, and Leinbach, 2005). Far too many of the students at community college become "stuck" and never complete their academic goals (Goldrick-Rab, 2007). The vast majority of students who enter developmental coursework never successfully complete the sequence of courses (Bailey, Jeong, Cho, 2008). Based on NELS data, only thirty percent of students successfully remediate in mathematics (Attewell, et. al, 2006). This in turn seems to be a piece of the puzzle that explains why graduation rates for community colleges are so low.

Given the grim statistics facing those students who find themselves subject to remediation, it is worthwhile to consider the institutional policies by which students are required or encouraged to take such developmental coursework. Policies governing which students will be designated for remediation vary by institution (Perrin, 2006). Assessing students and placing them at time of entry is one method colleges have employed (Perin, 2006). The policy for remedial placements at community colleges may in fact disproportionately (and adversely) impact the very students who use the community college as the point of access for higher education many for whom socioeconomic factors[4] play a role in the outcome of the placement exam.

Bettinger and Long state that the placement exam "has become the key academic gate-keeper to postsecondary study" (Bettinger and Long, 2005). Further complicating the student's understanding of the process is the remedial sequence that becomes an "obstacle course" to navigate to ever reach the credit math course (Bailey, Jeong, and Cho, 2008). McCabe's study of 25 community colleges found that only 1 in 6 developmental students finish this "obstacle course" (2000). Researchers have noted the lack of critical examination of the institutional policy related to placement in developmental courses and/or the effectiveness of such courses (Bailey, 2009; Bailey, Jeong, and Cho, 20008; Calcagno, 2007; Bahr, 2008; Oudenhoven, 2008; Grubb, 1999; Rosenbaum, Deli-Amen, Person, 2006).

The proposed research will take a step to fill this void, seeking to determine the impact on student success due to a change in the policy determining developmental placement in mathematics at a large multi-campus community college. The change necessitated additional remediation before allowing access to college-level mathematics courses. Unlike previous research, the focus will be on students of traditional college age who initially placed at the lower level within the developmental math sequence, introductory algebra.[5] The research is unique in that it will specifically exploit a change in placement policy allowing an estimation of that

[3] Remediation or developmental work refers to coursework that is below college-level. For the purpose of this paper, the words developmental and remedial will be used interchangeably.
[4] Capturing the multidimensional nature of socioeconomic status will be aided by using both individual and community factors.
[5] The institutional data that will be employed for the research has a three course sequence for developmental math – Basic Mathematics, Introductory Algebra, and Intermediate Algebra.

policy's impact on the success of developmental math students. Among the questions to be answered: does more developmental coursework in math in fact increase student success[6] or does it simply increase the barriers barring access to higher education for the underprepared student? Simply stated, is more better?

Research in this vein could hardly be timelier. Community colleges are now more than ever in the national headlines. President Obama's American Graduation Initiative, underscores the critical role community colleges will play in the training and education of Americans, and the extent to which the country supports the mission.[7] The Gates Foundation's Postsecondary Success initiative has pledged millions to support community college with the goal of increasing the number of low-income students who graduate with a 'valued postsecondary degree'.[8] This is the time for community colleges to begin to revaluate policies that may ultimately serve as a key barrier for college completion. The proposed research is a natural starting point focusing on the underprepared student at the community college.

Review the literature and establish a theoretical grounding for the research:
The topic of developmental education at the postsecondary level continues to conjure great debate at the national, state, and local level. "Remediation in higher education," Oudenhoven states, "is a complicated issue that has complex causes, uncertain solutions, and critical implications for both education and society" (2008). The community college plays a critical role in developmental education given that it is the entry point for higher education for approximately half of all students entering postsecondary education, with a large percentage arriving unprepared. McCabe notes that almost half of all students entering community colleges are academically underprepared (2003). The risk factors associated with underpreparation are higher for community college students than students who go elsewhere (Roueche and Roueche, 1999).

Community colleges have responded to the call of the underprepared student by offering developmental education.[9] Developmental education has become one of the central missions of the community college (Cohen and Brawer, 2003). The term 'developmental education' is an umbrella term that encompasses more than academic preparation for which developmental coursework is one aspect of the education (Roueche and Roueche, 1999). The goal of developmental education is to equip the student with the necessary skills to be successful in college credit courses. Close to one-hundred percent of community colleges offer developmental coursework (National Center for Education Statistics, 2003). Effective remediation brings with it access to postsecondary credentials and the potential for success. The demand for developmental courses has increased in the last several decades (Dougherty, 2003). For many supporters of

[6] In the analysis, 'success' will be defined as completing the developmental sequence and enrolling in a credit math course for the main model. The definition of success will be change in subsequent analyses and be defined in terms of (1) persistence in the college environment, (2) accumulating a specific number of institutional (3) accumulating a specific number of college credits.
[7] http://www.cnn.com/2009/POLITICS/07/14/obama.community.colleges/index.html.
[8] http://www.gatesfoundation.org/press-releases/Pages/fundamental-changes-to-community-college-education-091203.aspx.
[9] The use of the words developmental and remedial will be used interchangeably in the presentation. Roueche and Roueche (1999) have noted the negative connotation of the use of the word 'remedial' in terms of a characteristic of a student. The use of the work 'remedial' will refer to the coursework that is below college-level only and not as an adjective for a student.

developmental education, the courses allow for a second opportunity to master concepts that were presented in high school. The remedial courses, McCabe believes, offered at community colleges are critical to our country's well-being (2000). Given their extensive use and importance at the community college, it is surprising the research on their effectiveness is sparse (Bettinger and Long, 2008, Bailey, 2009; Perin, 2006; Levin and Calcagno, 2007). Research related to the institutional policies governing developmental courses is equally limited. Roueche and Roueche state in High Stakes, High Performance (1999) that the "majority of community colleges do not know how effective their remediation is because they do not assess their effectiveness very well, do not know how to assess it, or do not want to know."

The limited research that has been conducted fails to consistently support the institutional policies as vehicles for ensuring student access and success for the underprepared student. Policies governing which students will be designated for remediation vary by institution (Perrin, 2006). Assessing students and placing them at time of entry is one method colleges have employed for identifying students for developmental coursework (Perin, 2006). Supporters of mandatory assessment and placement believe it leads to an increase in student success and outcome (McCabe, 2003; Hadden, 2000). The implementation of the assessment policies requires numerous decisions including the selection of an instrument that will demonstrate high predictive validity (McCabe, 2003). Bettinger and Long argue that the placements test have become the 'key gatekeeper' to postsecondary study (2008). Some states have agreed upon minimum standards for credit classes but rely on institutional policy for courses within the developmental sequence. Too stringent a policy would cause a great percentage of students to enroll in developmental classes; yet too lax a policy would cause problems with course expectations in credit courses that may lead to hidden remediation within the credit courses. Further complicating developmental placements is the number of courses that constitute the remedial sequence. Not only must the major cutoff score between credit and noncredit be determined but cutoffs within the sequence must be set. If developmental courses result in increased success of student outcomes, then high cutoff scores within the sequence are beneficial to students. If however, developmental courses do little to increase positive student outcomes, then cutoff scores should be set low and required only for students who are in need of the greatest amount of enhancement of skills. The placement into the remedial sequence can lead to the end of postsecondary studies as students may be discouraged and never enroll for coursework (Rosenbaum, Deli-Amens, and Person, 2006). Using data from Achieving the Dream (ATD), Bailey notes that only 31% of students referred to the developmental math sequence actually complete the sequence (Bailey, 2009). The outlook is far worse as the distance between the placement and the credit course increases (Bailey, Jeong, and Cho, 2008). At each course within the sequence, there exists the potential for the underprepared student to become 'stuck' (Goldrick-Rab, 2007) or 'lost' (Bailey, 2009). To make matters even more complicated at the most basic level, there is not universal agreement among the educators on the level of pre-college preparedness needed for success in the college environment (Bailey, Jeong, and Cho, 2008). Earlier studies on the estimation of the effectiveness of developmental courses have been conducted but results have been questioned due to methodological shortcomings. Recent large scale studies using data from Ohio, Texas, and Florida have provided causal estimation of effectiveness on student outcomes such as persistence, transfer, credits accrued, and future coursework success (Calcagno, 2007; Calcagno and Long, 2008; Bettinger and Long, 2005; Matorell and McFarlin, 2007). The most important outcome for access and success is

completion of the course sequence. The research dichotomized students using developmental and college ready groupings, thus, little is known about the students who placed lower in the sequence of courses. Using data from Ohio, Bettinger and Long found an increased probability of transferring to a four year institution for students who complete developmental coursework compared to similar students who do not complete this work (Bettinger and Long, 2005). Although the Texas and Florida studies did find some evidence that students who completed developmental coursework had slightly higher persistence rates and accumulated more credits, they did not conclude that completing developmental coursework in math led to increased success in the credit -math course (Calcagno and Long, 2008; Martorell and McFarlin, 2007).

The proposed study will fill a gap in the research on effectiveness of math developmental courses at community colleges for students who place two developmental courses below credit coursework. The study will further allow a better understanding of the students enrolled in developmental math and the role that changes in placement policy play on student outcomes.

Describe the research method that will be used:

To allow an estimation of the impact on student success due to a change in developmental math placement policy at a large community college a multistep approach will be employed. The first stages will employ basic descriptive analysis. The final stage will use a regression discontinuity methodology.

Stage 1: The first stage (1A) of the research will provide the background to understand the characteristics of students who attend the community college in the observation period of fall 2000 to spring 2010. The characteristics of the students will be disaggregated as a function of math placement,[10] English placement,[11] age, gender, race/ethnicity, high school classification, high school (if public), high school characteristics, application for aid, degree or certificate intention (as noted on the application for admission), neighborhood characteristics (using census data). The later part of the first stage (1B) will compare the student demographics and academic preparedness of the overall student body and the subpopulation of students requiring developmental coursework at the study institution to two national representative student populations using the National Educational Longitudinal Study (NELS:88) and the Educational Longitudinal Study (ELS:2000).

> (1A) What are the observable characteristics of traditional aged (18 – 24 yrs) students placing within the developmental mathematics sequence as compared to the general population of students at the institution in the observation period? Do the observable characteristics in the observation period remain relatively stable? What is the course taking pattern of students in the math sequence? What percentages of students persist?

[10] Math placement will be dichotomized as college-ready and developmental as well as by the multinomial categories of placement within the developmental math sequence, Adult Basic Education (ABE), and credit. At the institution a three-tiered developmental sequence is offered through the Mathematic s Department. Students who score below a specified cutoff, are referred to ABE.

[11] Research has demonstrated a link between the number of developmental courses, placement in the courses, and retention, successful completion of the program (e.g., Adelman, Kiss of death, Bahr, 2008a, 2008; Bailey, Jeong, Cho, 2008).

Are there any observable characteristics of students who dropped out of the math sequence?

(1B) Are the demographic and rates of placement in developmental courses of the study institution similar to the NELS and ELS respondents? Are the demographic characteristics of student placed in developmental coursework at the study institution comparable to the characteristics of the NELS and ELS respondents for students entering a community college within two years of high school graduation? Are there any changes in the trends in developmental placement and characteristics of students in developmental coursework for students entering community colleges comparing NELS and ELS? If so, are these trends observed at the study institution? Are the characteristics of students who delay entry to a community college comparable to the NELS: 88 study? Are the rates of developmental placement for delay entrants similar when comparing the study institution population to NELS: 88?

Stage 2: The second stage will examine the impact of the change in institutional policy on the enrollment patterns within the developmental math sequence. The characteristics (as noted above in stage 1) of students who were placed at a lower level in the post-policy period will be examined.

(2) What percentages of students were required to complete an additional remedial math class in the post-policy period? What are the observable characteristics of the students impacted by the new policy?

Stage 3: The third stage will examine the institutional policies mandating placement and allowing retesting for placement within the developmental math sequence.

(3) What is the distribution of initial placements scores in the observation period? What percentage of students retested during the observation period? Are there any observable differences in the characteristics of retesters to single testers? Were the rates of retesting constant over the observation period? Did retesting result in different placements? Is there a relation between retesting outcomes and elapsed time between test administrations? What percentage of students who tested into algebra I actually enrolled?

Stage 4: The fourth phase of the research will examine the predictive validity of the commercially available placement exam in the pre and post policy periods for the developmental math placements. This type of validity study will provide an indication as to whether the exam used for placement successfully predicts student outcome in the development course based on cutoff scores in the pre and post-policy periods.

(4) What is the predictive validity of the placement score (initial or final) and course outcome in the pre and post policy period?

Stage 5: The final phase of analysis will result in an estimate of the effectiveness of the math developmental coursework in both pre and post policy periods for a student who was placed two levels below credit math courses. This analysis will allow an evaluation of the change in placement policy and the impact it had on a student's success.[12]

(5) What was the average amount of time required to pass the algebra I and algebra II in the pre and post policy periods? What is the estimated causal effect on students who placed at the divide of one and two levels below credit math who completed the math sequence and enrolled in a credit math course in the pre and post policy period? Does the program effect differ by socioeconomic characteristics noted in stage (1)?

In response to Cook's 2008 article titled Waiting for life to arrive: A history of regression discontinuity in psychology, statistics, and economics,[13] it seems that life has finally arrived for this method of analysis. It has recently found favor in analyses of the effectiveness of developmental coursework (Mosses and Yeaton, 2006; Calcagno, 2007; Calcagno and Long, 2008; Bettinger and Long, 2005; Lesik, 2006; Martorell and McFarlin, 2007). RD is a quasi-experimental method that relies on an exogenous variable for assignment to the control or treatment groups. Mandatory placement with strict adherence to the running variable—cut score—creates a sharp discontinuity that allows for unbiased estimates of local average treatment effects (LATE). RD analysis is based on the premise that students right above and below the cutoff possess the same characteristics. The strict adherence of the cutscore, in effect, randomly places student right at the cutoff into treatment or control group, thus imitating a randomized experiment (Trochim, 1984; Lee and LeMieux, 2009). If there is not strict adherence of assignment based on the running variable, modification to the analysis must be implemented (Calcagno and Long, 2008; Lee and LeMieux, 2009, Trochim, 1984). The analysis will exploit two institutional policies: (1) mandatory assessment and placement for math and (2) a change in policy in 2005 that upwardly changed the cut scores for placement in the developmental sequence and non-developmental courses.

By using data from one institution, the issues that arise with aggregation of data sources are eliminated. The institutional policy mandating placements and cut scores is constant in the pre and post policy period, the sequence itself is consistent in terms of the number of classes that comprises the sequence, the courses within the sequence follow a common course outline of topics, and there exists some level of consistency regarding grading in the individual classes mandated within the Mathematics Department at the institution. The strength of the data is that it will allow for a causal estimation of the impact of the institutional policy related to placement of developmental math students on student outcomes.

[12] The definition of success will vary in the model and several models will be run. The proposed measures of success are as follows: (a) completion and subsequent enrollment in a credit math course (b) completion of all developmental coursework (c) completion of 10 credits (institutional or college) (d) completion of 10 college credits.

[13] Cook, T. (2008). Waiting for life to arrive: A history of regression discontinuity in psychology, statistics, and economics. Journal of Econometrics, 142(2).

Because retesting is allowed at the institution, a fuzzy RD design will be used (Trochim, 1984).[14] The data set includes scores of the multiple administrations[15] thus allowing an instrumental variable approach to deal with noncompliance (Imbens and Angrist, 1994) using the placement as an instrument. Separate analyses will be done for the time periods before and after policy enactment. Using student-level institutional data, students will be tracked for a total of 15 consecutive terms (fall, winter, spring, summer I, summer II) which is equivalent to a three year period. The change in the LATE pre- and post-policy at the cutoff score for placement will provide an unbiased causal estimation of the policy's impact on student success.

Model Summary:Stage 1:
In the first stage, the highest score received on all administrations will be used along with all other covariates (refer to variable list in separate section) to determine the probability that the student will be enrolled in the developmental course. The dependent variable is a dichotomous variable that assumes a value of 1 if the ith student enrolls in algebra 1 the first semester of enrollment at the institution; in other words the T value indicates whether the student received the actual treatment. D_i is a dichotomous variable assuming a value of 1 if ith student was assigned to algebra 1based on the results of the placement exam. $f(Z_i)$ is a smooth function of the placement exam score and includes all other covariates of the student characteristics.

$$T_i = \delta D_i + \varphi f(Z_i) + \varepsilon_t \qquad \text{Equation (1)}$$

Stage 2:

$$Y_i = \beta \hat{T}hat_i + \psi f(Z_i) + u_t \qquad \text{Equation (2)}$$

Where Y_i is a dichotomous variable assuming the value of 1 if the student met the requirement for success[16] and 0 if not. $\hat{T}hat_i$ is the predicted probability of student i enrolling in the developmental math course from the first stage. The impact of the policy on student success will be found by running the model in pre and post policy periods and taking the difference of the estimated treatment effects (ψ). The analysis will have its challenges. RD is very sensitive to misspecification of functional form; varying functional forms will be employed for robustness in estimates (Trochim, 1984). To address RD validity concerns, several investigations will ensue as suggested in the research literature (Lee and Lemieux, 2009; Lee and Card, 2008; Calcagno and Long, 2008; Levin and Calcagno, 2007; McCrary, 2008; van der Klaauw, 2002; Shadish, Cook and Campell, 2002; Imbens and Lemieux, 2008; Lesik, 2006).

Uploaded Appendix Document(s):

Project Description II

[14] A sharp-continuity will be employed and compared to the fuzzy results. In the sensitivity analysis varying functional forms will be run with and without covariates. Results will also be compared to OLS results.
[15] Previous research using state-level data did not allow including multiple scores of the placement variable due to lack of availability.
[16] The definition of success will vary in the model and several models will be run as noted earlier in the proposal.

Will you use NCES target dataset?
Yes.

Please check all NCES datasets that apply
NELS:88
ELS:2000

Explain why each dataset best serves this research. Include a variable list for each dataset used.
The NCES data sets will allow the examination of the student demographics and academic preparedness of the mean characteristics of the community college respondents and the subpopulation of students requiring developmental coursework. By employing the data sets, basic demographic and academic variables of students entering a community college within one and two years after graduation will be compared with the students at the institution under analysis. The NELS and ELS comparison will allow for an examination of any changes in basic demographic characteristics of nationally representative groups of community college students entering a community college within two years of graduation from high school; while also providing a basis for comparison of students at the institution under study who enter within two years of graduation from high school. The NELS will allow further examination of students who delayed entry to a community college by comparison with other first time entrants at the study institution.

Educational Longitudinal Study ELS 2002: Base Year to Second Follow-up Data File (publically available variables through EDAT 2010-328)
Student Level
BYSEX
BYDOB_P
BYPARED
BYINCOME
BYHOMLNG
BYSES1and 2
BYSTEXP
BYRACE
BYS58

F2 Survey (Postsecondary Education)
F2B04
F2B05A,B,C
F2B10
F2B11A-J
F2B13A-F
F2B16A -C
F2B17A-K
F2B20A-H
F2PS1FTP
F2PSSTRT
F2HS2PS1
F2ENRGAP
F2PSPRE4

PELL0405-08
F2RTYPE F2
F2PS1LVL
F2PS1CTR
F2PS1SEC
F2PS1SLC
F2PS1GRT
F2PS1WKS
F2PS1WVR
F2PS1AID
F2PS1FTP
F2B29A-K
F2B30

Associated Weights

National Educational Longitudinal Study NELS88: Base Year to Fourth Follow-up Data File (publically available variables through DAS)

F2SCHTY
BIRTHDTE
RACE
BYS67CR
BYINCOME
BYSES1QU and 2
BYSES1 and 2
F2PSSTRT
F2HS2PS1
F2PS04(5..)01-12
BYRISK2
REFTYPE
F2S13A-K
HIGHMATH
NUMBCRSE
NUMBCRSE
REMCRSE
REMLEVEL
REMATH
REMREAD
WITHCRED
F4CCDEG
F4EFMY
F4EFST
F4JRAC1
F4HAIDR
F4S2SES1
F2SCHTYP
AIDAPEUR
REASONSS1-4
F2S59A-R
HSMATHCR
ADVCRRD
MTHCHCRED
TCREDB

MTHCRD6
HSREMATH
F4P74
F4STATUS
ACTST1

Associated Weights

Will you use NSF target dataset?
No.

Please check all NSF datasets that apply - Institutions

Explain why each dataset best serves this research. Include a variable list for each dataset used.

Variable List for Analysis (using Institutional Data from a Community College)
Please note: The analysis will be limited to first-time enrolled students at the community college who noted a goal of transfer, certificate, or degree on the application, in the age bracket 18 – 24 who placed two levels below credit math courses (based on the institutions' placement test) and enrolled in the developmental math course within the observation period. The following is a list of possible variables for analysis purposes: age, gender, race/ethnicity, persistence rates (calculated using enrollment data for a three-year period including winter and summer terms), student status (full or part-time), placement score (subsequent placement scores if completed more than once), high school attended, applied for aid, program goal (degree or certificate), high school characteristics, community characteristics (using zip codes to access to community information), course completion rates, course success rates, SAT scores (if available electronically), enrollment history, number of developmental courses required in English and reading, elapsed time between placement exam and math enrollment, success will be defined in terms of completion of sequence, or 10 total credits, or 10 college credits or persistence

Will you address the NPEC focus topic?
Yes

If yes, please briefly describe:
The proposed research does focus on the effect of socioeconomic factors on students' access to and success in postsecondary education, specifically community colleges. These institutions cater to over half of the students enrolled in postsecondary education nationwide—the majority of whom, through a combination of socioeconomic factors and potential institutional barriers, find themselves forced to bridge gaps through developmental coursework before beginning their higher educational careers in earnest. My research will focus on assessing what may be a key institutional barrier—the policy mandating placement in the developmental program itself and its relation to student outcomes. Should the research yield avenues for improving the institutional policy, the path to success for the millions of developmental students already facing socioeconomic hurdles will be that much smoother. The case study will employ data from a large east coast community college that provides education to a diverse student body with a minority enrollment that exceeds forty percent. Approximately sixty percent of the students work part-

time and forty percent qualify for financial aid. Multi-year data is available that straddles a change that made it more difficult for a student to place higher within the developmental math sequence, such that pre- and post-policy impact on student outcomes can be examined and compared. The proposed research will allow a better understanding of the characteristics and manner in which the underprepared student at the institution accesses opportunity through developmental education. The potential impact in IPEDs would be the inclusion of the significant covariates on socioeconomic status and consistent recording of placement within a developmental sequence to allow a researcher to track student success based on entering level of academic preparedness.

Project Description III Provide a timeline of key project activities:

Proposed Timeframe

Month - Goal

May - In-depth Literature Review

June - In-depth Literature Review, Begin data cleaning*

July - In-depth Literature Review, Begin data cleaning

August - Write programs for Merging Data Sets

September - Create data set and run descriptives

October - Analysis of descriptives

November - Develop and test model

December - Develop and test model

January - Begin write-up of results

February - May - Continue preparing dissertation and Forum presentation

June - Present at Forum, Submit final results to AIR

*The data cleaning phase consists of preparing in excess of 50 files for use for the study.

List deliverables such as research reports, books, and presentations that will be developed from this research initiative:
A final paper will be prepared for AIR (multiple copies will be provided). The community college that provided the data will be provided the results of the analysis in a condensed, written format. I anticipate the preparation of the findings for a peer-reviewed journal article.

Describe how you will disseminate the results of this research:
The results will be presented at the AIR Forum in 2011. The community college that provided the data will be provided a summary of the analysis. I plan on presenting at a professional organization annual meeting such as the National Association of Developmental Education and/or American Association of Two-Year Colleges. I anticipate the preparation of the findings for a journal article.

Provide a reference list of sources cited:

Adelman, C (1998). The kiss of death? An alternative view of college remediation. National Crosstalk, 6(3), San Jose: National Center for Public Policy and Higher Education.

Angrist, J. and Imbens, G. (1995). Two-stage least squares estimation of average causal effects in models with variable treatment intensity. Journal of the American Statistical Association 90(430):431-442.

Attewell, P., Lavin, D., Domina, T., and Levey, T. (2006). New evidence on college remediation. Journal of Higher Education 77(5):886-924.

Bahr, P. (2008). Does mathematics remediation work? A comparative analysis of academic attainment among community college students. Research in Higher Education 49: 420-450.Bailey, T. (2006). Defending the Community College Equity Agenda. Johns Hopkins University Press, Baltimore, 305 pp.

Bailey, T. (2009). Challenge and opportunity: Rethinking the role and function of developmental education in community college. In: New Directions for Community Colleges, 145, Wiley Interscience, New York.

Bailey, T., Jeong, D.W., and Cho, S.W. (2008) Referral, enrollment, and completion in developmental education sequences in community colleges. Working Paper No. 15. Community College Research Center. New York: Teachers College, Columbia University.

Bailey, T., Jenkins, D., and Leinbach, T. . (2005). Community college low-income and minority student completion study: Descriptive statistics from the 1992 high school cohort. New York: Columbia University, Teachers College, Community College Research Center.

Bettinger, E. and Long, B. (2005a). Addressing the needs of under-prepared college students: Does college remediation work? NBER Working Paper No. 11325. Cambridge: National Bureau of Economic Research.

Bettinger, E. and Long, B. (2005b). Remediation at the community college: Student participation and outcomes. New Directions for Community Colleges 129(1):17-26.
Campbell, D. (1969). Reforms as experiments. American Psychologist 24(4):409-429.

Calcagno, J. (2007). Evaluating the impact of developmental education in community colleges: A quasi-experimental regression-discontinuity design. Unpublished doctoral dissertation, Columbia University.

Calcagno, J. and Long, B. (2008). The impact of postsecondary remediation using a regression discontinuity approach: Addressing endogenous sorting and noncompliance. Working Paper. National Center for Postsecondary Research

Cohen, A. and Brawer, F. (2003). The American community college. San Francisco: Jossey-Bass.

Cook, T. (2008). "Waiting for life to arrive": A history of the regression-discontinuity design in psychology, statistics and economics. Journal of Econometrics 142:636-654.

Dougherty, K. (2003). The evolving role of the community college. In J. Smart (ed.), Higher Education: Handbook of Theory and Research, 17:295-348.

Goldrick-Rab, S. (2007). Promoting academic momentum at community colleges: challeneges and opportunity. Working Paper No. 5. Community College Research Center. New York: Teachers College, Columbia University.

Grubb, N. and Associates (1999). Honored but invisible: An inside look at teaching in community colleges. New York: Routlege.

Hadden, C. (2000). The ironies of mandatory placement. Community College Journal of Research and Practice 24:823-838.

Horn, C., McCoy, Z, Campbell, L, and Brock, C. (2009). Remedial testing and placement in community colleges. Community College Journal of Research and Practice 33:510-526.

Imbens, G and Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. Journal of Econometrics 142:615-635.

Lee, D. and Card, (2008). The regression discontinuity design: theory and applications. Journal of Econometrics 142(2): 655-674.
Lee, D. and Lemieux, T. (2009). Regression discontinuity designs in economics. Working Paper No. 14723, National Bureau of Economic Research, Cambridge, MA.

Lesik, S. (2006). Applying the regression discontinuity design to infer causality with non-random assignment. Review of Higher Education 30(1): 1 – 19.

Levin, H. and Calcagno, J.C. (2008). Remediation in the community college: An evaluator's perspective. Community College Review 35(3):181-207.

Martorell, P. and McFarlin, I. (2007). The effects of college remediation on academic and labor market outcomes. Dallas: University of Texas at Dallas.

McCabe, R. (2000). No one to waste: A report to public decision-makers and community college leaders. Washington, DC: Community College Press.

McCabe, R. (2003). Yes we can! A community college guide for developing America's underprepared. Phoenix: League for Innovation in the Community College.
McCrary, J. (2006). Testing for manipulation of the running variable in the regression discontinuity design. Unpublished manuscript. University of Michigan.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. Journal of Econometrics 142:698-714.

McEwan, P. and Urquiola, M. (2005). Precise sorting around cutoffs in the regression-discontinuity design: Evidence from class size reduction. Unpublished manuscript. Columbia University.

Moss, B. and Yeaton, W. (2006). Shaping policies related to developmental education: An evaluation using the regression-discontinuity design. Educational Evaluation and Policy Analysis 28(3):215-229.

Perin, D. (2006). Can community colleges protect both access and standards? The problem of remediation. Teachers College Record 108(3):339-373.

Perin, D. and Charron, K. (2006). Lights just click on every day: Academic preparedness and remediation in community colleges. In T. Bailey and V. Morest (eds.), Defending the Community College Agenda. Baltimore: Johns Hopkins University Press.

Rosenbaum, J., Deil-Amen, R., and Person, A. (2006). After Admission: From College Access to College Success. Russell Sage Foundation, New York. 267 pp.

Roueche, J. and Roueche, S. (1999). High stakes, high performance: Making remedial education work. Washington, DC: Community College Press.

Roueche, J. and Rouche, S. (1993). Between a Rock and a Hard Place. The Community College Press. 294 pp.

Shadish, W., Cook, T., and Campbell, D. (2003). Experimental and quasi-experimental designs for generalized causal inference. Boston, MA: Houghton-Mifflin.

Trochim, W. (1984). Research design for program evaluation: The regression-discontinuity approach. Newbury Park: Sage.

Van der Klaauw, W. (2002). Estimating the effect of financial aid offers on college enrollment decisions: A regression-discontinuity approach. International Economic Review 43(4):1249-1287.

IRB Statement of Institutional Review Board approval or exemption:
I have already received IRB approval for proposed research from my home institution and the institution that is providing data.

Statement of Use of Restricted Datasets
The publically available versions of NELS:88 and ELS: 2000 will be used for the study. The institutional data that will be employed is restricted. I have already received IRB approval for its use for the study.

Biographical Sketch
Elizabeth M. Flow-Delwiche is a graduate student in the Department of Public Policy on the evaluation and analytic techniques track at the University of Maryland, Baltimore County, UMBC. Her formal education includes a Bachelors of Science in Civil and Environmental Engineering from the State University of New York at Buffalo. She also possesses a Masters in Teaching from Johns Hopkins University with a specialty in teaching mathematics and a Masters of Arts in Applied Sociology from UMBC. Her professional experience includes over twenty years of teaching at the community college level, in addition to several years experience at the middle school level. She held the position of visiting instructor at a community college in upstate New York in the Department of Civil and Environmental Technology within two years of graduating with bachelors. After relocating to Maryland in 1990, she began teaching part-time in the Department of Mathematics at a large community college and continued to do so for fifteen years. Currently, she is an Associate Professor of Mathematics at a community college. She has distinguished herself as an educator and as such was named Adjunct of the Year in 2002 while working part-time. She was promoted to the rank of associate professor within three years of being hired full-time. Flow-Delwiche was selected as a member of the honor's faculty at the College within a year of joining the faculty full-time. Her responsibilities extend beyond the classroom and she currently leads and serves on numerous committees. She is the co-coordinator for the multi-campus statistics committee in which she oversees policy regarding the design and implementation of the statistics. Currently, she is leading a three-year outcomes assessment for statistics. She serves as the coordinator for adjunct evaluation and actively mentors new faculty. She served as a designer for a college-bridge course with the county public school system and serves as a liaison for the course. She has written numerous lessons for teaching developmental skills including a college grant funded study guide for students enrolled in developmental courses at the College. The Guide was designed to assist students' transition to the community college environment and become successful in achieving goals and dreams. In addition to teaching at the community college, she teaches a graduate-level statistics course at UMBC. She served as a lead math teacher for Johns Hopkins Center for Talented Youth and as a middle school math teacher at a blue-ribbon public school in Maryland for two years on a full-time basis. As a middle school teacher, she was selected as one of only 28 teachers in the State to participate in the National Security Agency's Summer Institute. She not only co-authored a unit plan for NSA focusing on development of basic math skills but was awarded a NSA grant. For the past several years, she has served as an AP Statistics grader and as a reviewer for several publishers for undergraduate and graduate level statistics texts and reference books. She has presented at the National meeting for the American Association of Mathematics of Two-Year Colleges on the use of portfolios. Last year, she co-authored a paper for presentation at the National American Sociological Association conference on middle school's girls' perception of

information technology. This year she will present at The National Association of Developmental Education conference on the use of writing prompts in developmental math courses. She was an invited guest lecturer for Hopkins School of Education on alternative assessment.

Her past research experience includes assisting with research on healthcare access for children with special health care needs, funded by the Maternal Health Bureau. The research employed several national databases. She assisted faculty at UMBC and University of Alabama on a NSF funded research on gender studies related to middle-school students. She served as a full-time research technician at Cornell University, conducting and preparing reports for funding agencies. Within the last five years, she has interned at the Social Security Administration and the Center for Medicare and Medicaid which allowed the opportunity to apply her analytical skills in a different setting. Her computer skills include proficiency in SAS, Minitab, and SPSS.

Elizabeth Flow-Delwiche has spent the majority of her professional career developing the understanding and skills necessary to undertake the current research. The selection of her topic for the dissertation reflects her strong commitment to expand the research base to better understand the barriers to access and success underprepared students experience in postsecondary education. Flow-Delwiche's experience as an educator at community colleges can provide a perspective that only an insider can offer to the research community.

Budget Requirements
Salary/Stipend:
$10,000.00

Tuition and fees:
$4,500.00

Travel:
$1,500.00

Other travel related expenses:
$0.00

Other research expenses:
$1,000.00

Total Request:
$17,000.00

Funding History
I have not received funding for the proposed research. I have not received funding from AIR in the past.

Letter of Support from Dissertation Faculty Advisor
Letter of Support