

“Teachers believed that students had the right to fail and we were only there to provide an opportunity to learn. Now we accept responsibility for whether or not our students are learning.”

*George Boggs – CEO of American Association of Community Colleges*

## **I. RESULTS FROM PRIOR NSF SUPPORT**

Principal investigator for the proposed EdSTEM\$ project, Deann Leoni, served as the co-principal investigator for the first award (CSEMS) and principal investigator for the second award (TEAMS). Co-principal investigator for EdSTEM\$, Paul Bladek, also served as a co-principal investigator for TEAMS.

### **NSF DUE - 0093990 (2001-2003)**

#### **Computer Science, Mathematics and Engineering Scholarships (CSEMS)**

Of the 21 scholars, 10 were non-native speakers, 11 were persons of color, 8 were women and 4 were persons with disabilities. Thirteen scholars graduated; 4 were still at EdCC finishing their degrees and were subsequently funded by the TEAMS project (described below). EdCC was effective at recruiting women and minority students for this project (9 majored in Computer Information Systems; 9 majored in pre-Engineering; and, 3 majored in Computer Science).

### **NSF DUE 0220684 (2003-2008)**

#### **Technology, Engineering and Mathematics Scholarships (TEAMS)**

The similarly successful TEAMS project funded 76 scholars over a period of 6 years. Twenty-six percent of the TEAMS scholars were under-represented minorities (URM); 34% were women and 8% were disabled students. Seventy-six percent of the scholars graduated or transferred. Three students were still at EdCC at the end to the award period last year (32 scholars majored in pre-Engineering; 27 majored in Computer Information Systems; 8 in Computer Science; and, 7 majored in Mathematics with 4 wanting to become mathematics teachers.

### **NSF DUE - 0305131 (2002-2006)**

#### **Meeting for CSEMS Principal Investigators**

Awarded to the Mathematical Association of America, Deann Leoni participated as a co-principal investigator and member of the steering committee with five other CSEMS principal investigators from across the United States. This project supported a national meeting of CSEMS principal investigators in 2003 and four regional meetings in 2005 serving over 200 CSEMS principal investigators. Participants at the meetings submitted brief descriptions of successful aspects of their projects. These descriptions were compiled and made available to all on the MAA website for the purpose of strengthening CSEMS projects. <http://www.maa.org/csems/welcome.html>.

## **II. PROJECT OBJECTIVES AND PLANS**

The EdSTEM\$ project supports the goals of the National Science Foundation S-STEM program:

- Improved educational opportunities for students;
- Increased retention of students to degree achievement;
- Improved student support programs at institutions of higher education;
- Increased numbers of well-educated and skilled employees in technical areas of national need.

**Goal:** Provide financial and holistic academic support to assure the successful progression of our low income, academically talented STEM majors from the beginning of their academic path at Edmonds Community College through their gateway STEM courses to their transfer to baccalaureate study or chosen STEM careers.

**Objectives:**

- Recruit and retain at least 45 EdSTEM\$ Scholars with \$5,000/year scholarships for the duration of their education at Edmonds Community College
- Recruit underrepresented minority and disabled applicants to the EdSTEM\$ project such that this population makes up 50% or more of the applicant pool.
- Implement a rigorous evaluation plan that guides the EdSTEM\$ project team to make amendments that will significantly and practically benefit the scholars and measure the effectiveness of the project and its components
- Disseminate the findings of the EdSTEM\$ project locally, regionally and nationally
- Furnish and staff a STEM Study Center for all STEM students
- 100% of EdSTEM\$ Scholars will
  - meet with a trained faculty mentor throughout their participation in the project
  - participate in an intensive early alert program in their first year as a scholar
  - take weekly cohort classes in their first year as a scholar
  - participate in weekly science and math study sessions online or in the STEM Study Center
  - (with gateway course grades under 3.0) participate in diagnostic assessment and intensive courses in between quarters
  - participate in leadership, service learning or undergraduate research activities in their last year as a scholar
  - create an electronic career &/or transfer portfolio
- 100% of EdSTEM\$ Scholars will receive associate degrees or transfer to a baccalaureate program in their chosen field of study
- 100% of EdSTEM\$ Scholars in professional technical programs will receive career advising and assistance finding employment upon graduation.
- 100% of EdSTEM\$ transfer scholars will receive assistance transferring to a four-year college or university upon graduation

**Primary Activity Overview:**

**a. Recruitment:** The project team has created an ambitious recruitment plan that will assure the diversity objective of 50% underrepresented minority applicants to the EdSTEM\$ project. The plan includes working with numerous college programs and personnel (described later) focusing on personal connections with potential applicants. Externally, the project team will work the five high schools of the Edmonds School District and the district's parent advisory committee (Equity Alliance for Achievement) to recruit diverse, low-income academically talented seniors. In addition traditional methods will be employed to reach applicants such as brochures, posters, campus electronic bulletin boards and the EdSTEM\$ project website.

**b. Marketing:** The college's Communications and Marketing department is committed to assisting the project team to market EdSTEM\$ to students and their families. They will assist with creating a logo, brochures and posters to make EdSTEM\$ visible in the community and launch the project website that will later be enhanced and maintained by EdSTEM\$ scholars.

**c. Selection:** The project team met several times over the course of the 2009-2010 academic year and one of the longest and thoughtful discussions was around criteria for scholar selection. The project team decided to support a total of 45 scholars with \$5,000 scholarships/year for the duration of their education at Edmonds Community College. They also decided that along with the necessary criteria of being a low-income, full-time STEM major and US citizen or permanent

resident that EdSTEM\$ would seek to increase diversity of both students and majors represented. Additionally, the project team wanted to keep the minimum GPA requirement of 2.5 or higher from the previous CSEMS awards and continue their service to helping at risk students achieve academic excellence. Finally the team decided to emphasize the selection of students who were at the beginning of their academic careers and provide support structures dependent upon a student's academic level and standing through the receipt of their Associate's degree.

**d. Retention & Success:** EdSTEM\$ will provide a holistic set of support structures that vary according to where a scholar is in his or her academic program. There will be a concerted effort to support a cohort of majors using cohort classes, study centers, social networking and quarterly scholar meetings. The project team created a matrix, shown later in this narrative, that delineates student support based upon whether a student is *new to college*, a *freshman* (minimum of 15 credits and initial gateway STEM course completed) or a *sophomore* (final year). In addition each of these student levels is broken up according academic standing, 2.5-2.9, 3.0-3.5 and 3.5-4.0. Different student supports and opportunities will be provided depending on where a scholar falls in the matrix. Support and academic opportunities include: intensive early alert, faculty mentors, peer tutors, a STEM study center, online tutoring, math and science diagnostics plus intensive peer and faculty tutoring, cohort building, 2-credit college skills, math and job development courses, an e-portfolio, service learning and undergraduate research opportunities.

**e. Transition:** In addition to supporting students at Edmonds, EdSTEM\$ will prepare scholars to be competitive in the workforce and/or at their future baccalaureate institutions. Every scholar will take a 2 credit Job Development course, attend Career Action Center &/or Transfer Center workshops and create an electronic portfolio containing samples of exemplary work, a resume and personal statement. In their last year EdSTEM\$ scholars will be required to engage in a leadership activity, service learning project or undergraduate research. The commitment level of these activities will be tailored to the available time of each scholar.

**f. Evaluation:** Described in detail in the evaluation section, a key contribution to the intellectual merit and broader impacts of the EdSTEM\$ project is the rigorous assessment the project team has designed to measure the effectiveness of the proposed student support project and its components. EdSTEM\$ will use pre- and post-testing of student learning using nationally validated assessments in math, calculus and physics, epistemology of science, academic and career expectations. Focus groups will be conducted with scholars and faculty mentors to gauge the effectiveness of the project and its components in supporting student success. Students will be tracked through graduation to job placement or transfer; results will be reported on the NSF S-STEM tracking database and in the annual and final reports. Findings will contribute to the body of research about increasing student success in STEM.

### III. PROJECT SIGNIFICANCE AND RATIONALE

**a. About Edmonds Community College:** EdCC is located in Snohomish County 15 miles north of the King County/Seattle metropolitan area. Since 1967, EdCC has provided professional education, vocational and technical training, academic-transfer education and high school completion courses to a million students. The college serves 20,000 students annually, 35% of whom depend on financial assistance; 70% are day students; 58% are women; 35% are racial and ethnic minorities; and 10% are students with reported disabilities. EdCC's exceptional faculty and staff are continuously seeking ways to best meet EdCC's mission to "*provide quality opportunities for learning and service, responding to the dynamic needs of our diverse community*".

EdCC is known throughout the region as a Hub for Math and Science Education. The college manages the NSF-funded National Center for Materials Education and Technology (MatEd) as well as the Washington Aerospace Training and Research Center. It was recently selected to create a Mathematics Engineering Science Achievement (MESA) Student Center designed to provide academic and support services to financially and educationally disadvantaged students majoring in STEM fields. Minority students and women remain significantly underrepresented in the college's technology, mathematics and engineering programs (women represent 20% and minorities less)<sup>1</sup>.

**b. EdSTEM\$ Need:** Snohomish County is experiencing a dramatic expansion in the ethnic diversity and ranks in the very top percentage nation-wide of non-white population growth. In the past decade, the number of persons of color living in Snohomish County grew from 37,586 to 100,826, an increase of 168.3%.<sup>2</sup> Over 10% of residents live below federal poverty levels and 45% of these families are female head-of-households with children under the age of five.<sup>3</sup> An additional 20% fall below the income needed for self-sufficiency because the county's cost of living rate far exceeds the poverty and minimum wage rate.<sup>4</sup> In fact, 1 out of 8 working adults live in poverty and families of color living in poverty are 40% higher than Caucasian rates.

Research shows that the expected supply of college graduates in Washington State to be less than 50% of expected job openings in the future and the current degree production meets only 63% of the expected annual job openings through 2014 in engineering, computer and medical sciences.<sup>5</sup> Though over half of the job growth is forecasted to be in occupations that require post-secondary education or higher, 76% of the population has less than a four-year degree and 38% of adults lack any education beyond high school<sup>6</sup>.

With the State's budget deficit in excess of \$3 billion, funding that supports education has been severely cut. In fact, the number of students who qualify for but will not receive a State Need Grant this academic year is expected to more than triple, and rapidly growing student demand is expected to further reduce state financial aid availability next academic year.<sup>7</sup> Given the economic climate and population served by the college, the need to continue efforts through the EdSTEM\$ program during the next four years could not be greater. The proposed scholarships will substantially impact EdCC's ability to recruit, retain, and best serve low-income students underrepresented in biology, chemistry, computer information systems, computer science, engineering, environmental science, mathematics and physics.

**c. STEM Students at Edmonds Community College:** Because community college students do not receive transfer degrees in a specific major, it is difficult to accurately follow STEM students. As a place to begin the project team chose to look at transcript data for students who took what are considered to be STEM major courses such as calculus, majors sequences, etc., to define STEM majors. The transcripts of these students were then individually assessed and majors were estimated. In order to better support STEM students, the college create a tracking system for STEM majors beginning this Fall 2010.

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<sup>1</sup> EdCC Research Office 2009

<sup>2</sup> <http://www.co.snohomish.wa>

<sup>3</sup> <http://quickfacts.census.gov/qfd/states/53/53061.html>

<sup>4</sup> <http://www.seattlepi.com/specials/workingpoor/>

<sup>5</sup> WA Higher Education and Training Coordinating Board, Economic Vitality GMAP, March 2008

<sup>6</sup> Snohomish County Business Journal, Market Facts, 2009

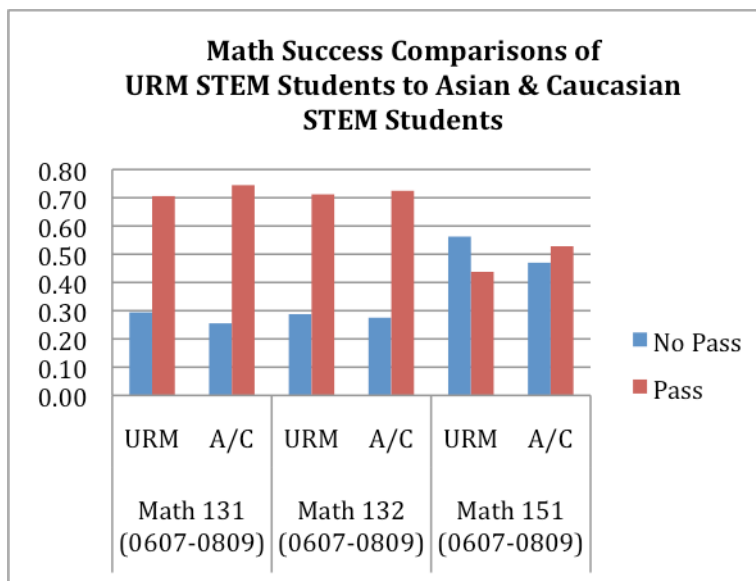
<sup>7</sup> WA Higher Education and Training Coordinating Board, "More students going without state financial aid as demand outstrips supply, June 22, 2010

For the four-year period of 0506 to 0809 this method of estimating STEM majors identified 2,151 students, 1826 of these could be classified in particular majors. Of these students only 37% were women, 35% identified themselves as first generation, 16% were underrepresented minority students. An audit of degrees for these students resulted in only 264 Associate of Science, Associate of Applied Science and Associate of Technical Arts degrees. This small number was not surprising because it is known that many students transfer when they are “junior “ ready for their major rather than finish their degrees. The Washington State Board for Community and Technical Colleges reported that Edmonds transferred 1,714 students to Washington state colleges and universities over the four-year period. Of the 34 community and technical colleges in Washington state, EdCC ranks fifth overall in transfer students to state colleges and universities. A National Student Clearinghouse report showed that 688 of the STEM majors in our study transferred to public or private baccalaureate institutions and 286 of the STEM majors had already graduated from a public or private college or university.

The project team also categorized individual transcripts for students who appeared to have been successful, (success) and students who did not succeed (loss). Using success and major estimates the project team looked for gatekeeper courses and at mathematics progression. (See graphs in supplemental documents.) What was learned was very sobering and not all together surprising. After looking at all of the main STEM courses, mathematics was the filter. Our data show that our STEM students begin their math in either intermediate algebra or pre-calculus I. Very few (less than 5%) begin at lower level mathematics. At intermediate algebra all STEM students do quite well with an overwhelming percentage earning between a 3.0-4.0. *Success vs. Loss* chemistry, biology, computer science and engineering majors all begin to separate with pre-calculus I (math 131). At

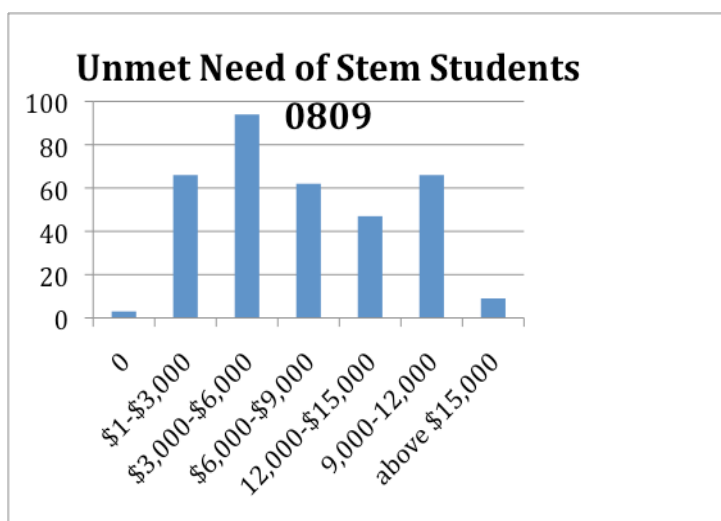
pre-calculus II (math 132) the grade separation between the two groups widens and things fall apart at calculus I (math 151). The graph to the right is probably the most humbling showing the tailspin to be even more dramatic for our underrepresented minority STEM students. These data directed the EdSTEM\$ project team to focus our intervention efforts primarily in mathematics. The project team also identified two gatekeeper science courses:

the chemistry preparatory class and the first course in the majors biology. Students take these courses while they are beginning their pre-calculus. *First* courses in physics and computer science did not show as gatekeepers likely because calculus I is a pre-requisite.



Rationale for Number of Scholarships and Amount of Awards

The EdSTEM\$ project will support approximately 30 students a year with an average of \$5,000/year scholarships. The graph to the right shows the unmet need for the estimated STEM majors in 0809. Over 160 STEM students had unmet need over \$6,000. Although data for this last year are unavailable, our financial aid director has reported that because of the greatly increased enrollment and national unemployment crisis requests for financial aid were up 40% this past year. State aid and tuition waivers were exhausted by the end of fall quarter, 2009.



**IV. ACTIVITIES UPON WHICH THE CURRENT PROJECT BUILDS**

The EdSTEM\$ project activities build upon the experience of the project team with the previous two CSEMS awards and a review of the literature of best practices that has fortunately become so broadly disseminated in support of community college student success in the past five years.

**a. Building Upon the CSEMS projects:** Along with \$3,100/year of funding, the previous CSEMS projects supported scholars with two main interventions: 2-credit weekly cohort classes (Career, College and Life Success, Bridge to College, Math Projects and Job Development) and faculty advising. In addition to funding, exit evaluations of the scholars identified the cohort classes as being academically helpful as well as creating a space and time where they felt supported. While the CSEMS project had an 80% success rate, this percentage can be turned around to reveal that one in five scholars left the program. The EdSTEM\$ project adapts the CSEMS projects’ two main supports and adds six more. Faculty advisors will be trained as mentors and frequent meetings with mentors will be required. The ratio of mentee to mentor will go from 8:1 to 3:1 allowing more time for personal attention. Faculty will meet monthly to discuss student issues and identify early interventions. An early alert system, mathematics assessment and intervention, required time in study rooms or online tutoring, leadership activities, service learning or undergraduate research, and an e-portfolio – all create an holistic set of high impact learning experiences known to support student retention and success.

**b. Utilizing College Resources:** The EdSTEM\$ project will interface with the TRiO SSS and MESA programs. All offer comprehensive support structures serving low-income and educationally disadvantaged students and complement each other. Both directors; Heather McKnight and Rshanah Botley are part of the recruitment team. EdSTEM\$ will work closely with the two directors to assist scholars in taking advantage of all resources that can contribute to their success. Along with these student services programs, EdSTEM\$ scholars will be apprised of the many other college resources at their disposal including those in the table below.

Free Bus Transportation	Advising Services	Women’s Center
Subsidized Child Care	Career Action Center	Disabled Student’s Center
Counseling Services	Multicultural Center	Veteran’s Center
Student Clubs	College Wide Tutoring	E-tutoring Consortium

## **V. PROJECT TEAM AND MANAGEMENT PLAN**

The EdSTEM\$ project team, shown below, consists of the principal investigator and four co-principal investigators. This team met throughout the 0910 academic year to research and design all aspects of management, student need, student support services and selection criteria to best serve the EdSTEM\$ scholars. They also met with other college faculty, financial aid and student services personnel to garner their support and determine the best way to harness current resources to support the new scholars. Each member of the project team plays at a key role in the management of the project. The project team will meet frequently throughout the quarter to work together to solve problems that scholars may be encountering. All project team members will contribute to the writing of annual reports and dissemination. All project team members will server as faculty mentors and advisors for scholars in their discipline along with other STEM faculty who have been specifically recruited as mentors for scholars in their discipline.

Deann Leoni: Principal investigator and full-time mathematics faculty has had nine years of leadership experience on the college's previous two CSEMS awards. She will lead the team meetings and the writing and submission of annual and final reports. Her key role is to work with the financial aid office in the determination of need for scholars, in the awarding of scholarships and in working with scholars on academic probation.

Marti Baker: Co-principal investigator, is a full-time computer information systems (CIS) faculty member. Her key roles are to set-up, monitor and maintain the intensive early warning system that has been designed for EdSTEM\$ scholars, organize the training and assignment of faculty mentors for each scholar and to work with her scholars to maintain the EdSTEM\$ website.

Paul Bladdek: Co-principal investigator, is the chair of the computer science department. He has six years of experience with the last CSEMS awards and was acting PI for a year. His key roles are to submit the quarterly reports on the scholars to the NSF S-STEM reporting site and to organize, schedule and find instructors for the 1-2 credit supplemental courses for scholars.

Patrick Burnett: Co-principal investigator, is a full-time engineering faculty. The engineering department transfers the most students in the STEM disciplines each year. He will lead the marketing and recruiting component of the project both internally and externally. He will work with the college's Communications and Marketing department to create materials. He has extensive experience with middle school and high school STEM outreach and will lead the EdSTEM\$ recruitment effort with the five area high schools. He will also work with his students to create fun STEM nights for the local community, such as a haunted house for Halloween.

Tom Fleming: Co-principal investigator and full-time physics faculty will serve as a faculty mentor and advisor for the physics and engineering scholars. He is leading the project assessment (described below), which is creating a robust system of tracking STEM majors from entrance to the college to graduation and transfer and utilizing national validated conceptual assessments to measure the effectiveness of the STEM curriculum.

### **Other Key Personnel at Edmonds Community College:**

- Rashanah Botley is the director of the new Mathematics, Engineering and Science Achievement (MESA) program. She will work closely with the project team to recruit MESA students as scholars and to help coordinate student support services across the two projects.

- Robin Datta is the director for the new Honors Program. He also directs the new Undergraduate Research Program. He will assist with coordinating Honors Program related activities and with developing undergraduate research projects for scholars.
- Pat Marks is the director of the Learning Support Center. She will assist in training the scholars to become peer mentors and tutors.
- Heather McKnight, director of the TRiO program, will work closely with the project team to recruit TRiO students and coordinate student support services across the two programs.
- James Mulik is the director of Institutional Research. He will assist with the evaluation of project outcomes and the assessment of student learning.
- Amy Johnson is the director of the Service Learning program and will assist in developing service learning projects for scholars.
- Dee Olson is the director of the Services for Students with Disabilities Center. She will assist in recruiting scholars with disabilities.
- Rae Ellen Reas is the director of the Office of Financial Aid. She met with the project team to determine the best practices for applications and awards. She will assist in determining need and awarding scholars.
- Shirley Sutton is the executive director of the Office for Diversity Affairs. She will assist in recruitment to diverse student populations.
- Stephanie Wiegand is the director of Communications and Marketing. She and her staff will create the EdSTEM\$ logo and marketing materials.
- Mary O’Brien (chemistry), Sara Selfe (chemistry), Eva Smith (computer information systems), Tracey Miller (biology), Jenny McFarland (biology), Maria Kelly (environmental science), Rachel Wade (astronomy & physics) and Chris Eaton (mathematics) have all agreed to participate as faculty mentors and advisors for EdSTEM\$ scholars.

**Other Key Personnel at the Edmonds School District :** Nick Bressoit is the superintendent for the Edmonds School District and will assist with working with the EAACH parent advisory committee to recruit diverse scholars for the project. Principals Dave Golden (Lynnwood HS), Michelle Trifunovic (Edmonds-Woodway HS), Tracy Stoops (Meadowdale HS), Greg Schwab (Mountlake Terrace HS) and Kathy Clift (Scriber Lake HS) will assist with recruitment and host application workshops for potential scholars.

**Other Key Personnel University of Washington:** Janice DeCosmo and Jennifer Harris are the director and associate director for the Undergraduate Research Program at the University of Washington. They will provide workshops at the college and at the UW for transfer scholars.

**EdSTEM\$ Management Plan:**

The table below shows a comprehensive list of the project activities with the quarter they will be performed and the person(s) responsible. A key to abbreviations is at the bottom of the table.

EdSTEM\$ Management Plan			
Why	What	When*	Who
Recruitment	Send out invitation letters to URM and disabled students	W	PT
	Provide application, FAFSA and personal statement workshops	W	PT
	Post application on EdSTEM\$ website with FAQs	W	PT, MB
	Visit all STEM classrooms announcing scholarships	W	PT
	Design & implement recruitment to high schools	W	PBu, HSC
	Design family information sessions with EAACH	F	PBu, EAACH
	Hold family application workshops at local high schools	W	PBu, HSC



*Edmonds Community College STEM Scholarships – EdSTEM\$*

	Meet with potential high school applicants at the high schools	W	PBu, HSC
<b>Marketing</b>	Meet with marketing depart. to develop promotional materials	F	PBu
	Distribute brochures and present at college meetings	W	PT
	Post posters across campus	W	PT
	Add EdSTEM\$ announcement to electronic bulletin boards	W	PBu
	Add EdSTEM\$ announcement to college web page	W	PBu
	Create and maintain website	All	MB, E\$
	Host fun science nights for college and community	F, Sp	PT, PBu, E\$
<b>Select &amp; Renew Scholars</b>	Acceptance of Applications until April 20	Sp	DL
	Vet applications for minimum requirements	Sp	PT
	Read and rank applications	Sp	SC
	Select Scholars	Sp	SC
	Notify applicants of selection status	Su	DL
	Accept scholar award letters	F	DL
	Notify financial aid office of scholars and awards	Su	DL
	Check each quarter for scholar academic standing	FWSp	DL
	Notify financial aid office, scholar and scholar's mentor of probation	FWSp	DL
	Check for NSF and EdSTEM\$ min. requirements for yearly renewal	SpSu	DL
	Notify scholars of renewal status & accept scholar award letters	SuF	DL
<b>Scholar Support</b>	Orientation and quarterly meetings for scholars	FWSp	PT, FM, E\$
	Train, assign and monitor faculty mentors	FWSp	MB
	Scholars meet with mentors twice a quarter	FWSp	FM
	Set up and monitor EdSTEM\$ early alert for new college scholars	FWSp	MB
	Schedule and assign faculty for cohort classes	FWSp	PB
	Set up STEM Study Center & faculty, peer tutor schedule	FWSp	PT
	Set-up and monitor use of Study Center	FWSp	TF
	Use math diagnostic (ALEKS) to determine scholar's math needs	FWSp	TF, DL
	Design online math course to address scholar's math needs	F	PT, DL
	Set-up and participate in EdSTEM Scholar Facebook site	All	MB, E\$, PT
	Create service learning and undergraduate research projects	F	PT, RD, AJ, UW
	Take scholars to UW for transfer workshops & UR symposium	FWSp	PT
	Give transfer workshops to scholars	F	PT
	Scholars assemble e-portfolios for transition to work or transfer	All	FM, E\$
	Scholars present final e-portfolios to college & community	Sp	E\$
<b>Assessment &amp; Reporting</b>	Initiate intake and tracking database for STEM Students	fy 1011	PT, TF, JM
	Report quarterly to NSF S-STEM tracking system	FWSp	PB
	Set up proctored pre and post assessments for all relevant majors	F	TF
	Give pre and post epistemology assessments to EdSTEM\$ Scholars	FSp	TF
	Analyze assessment result and report out to project team	WSu	TF
	Facilitate student and faculty focus groups	FWSp	JM
	Write annual or final reports	Su	PT, DL
*The timetable above is for years 2-4. In the first year internal recruitment and scholar selection will be done in the fall due to the late award cycle. Only 15 scholarships will be awarded in the first year.			
PT = Project team, SC = Selection committee, FA = Financial Aid Office, FM = Faculty mentor, PT = Peer tutor, E\$ = EdSTEM\$ Scholar, EAACH=Equity Alliance for Achievement, HSC = High school counselor, DL= Deann Leoni, PB = Paul Bladek, PBu = Patrick Burnett, TF=Tom Fleming, MB=Marti Baker, JM=James Mulik, RD=Robin Datta, AJ=Amy Johnson, UW=University of Washington			

## **V. OUTLINE OF STUDENT SELECTION PROCESS**

**a. Selection Criteria:** The project team determined that the EdSTEM\$ project would strive to support not only low-income, academically talents students but to also include underrepresented

and educationally disadvantaged students. Consequently along with the NSF minimum requirements, the project team has created an application (in supplemental documents) that asks students to write a personal statement discussing their career plans, their commitment to graduating in a STEM major and any extra challenges, special circumstances or educational obstacles they have had to overcome. Applicants will also submit a letter of support from a teacher or community member. Additionally the project team designed the EdSTEM\$ project to support students from the beginning of their college careers and will prioritize applications from student who have 2 years or more left before graduation. The committee chose to have a 2.5 minimum GPA as a way of making the program available to the students who need it most.

Once applications have been sorted for the minimum requirements of need, 2.5 GPA and full time STEM major (intention for new students), they will be read by the selection committee and ranked according to commitment to overcoming obstacles and majoring in STEM and time left to degree. After this ranking is complete a second set of selection criteria will be imposed. The EdSTEM\$ project has agreed to guarantee one scholar for each major at the college with a participating faculty mentor: biology, chemistry, computer information systems, computer science, engineering, environmental science, mathematics and physics (as long as an eligible applicant exists for a particular discipline). The project team added this option as a way to assure that scholars from a variety of disciplines would make up the cohort and that there would be plenty of mentors to support the scholars. Additionally, the project team will be recruiting from the Edmonds School District high schools and has guaranteed one scholarship each year for three years to an eligible graduate from each high school.

**b. Selection Committee:** The selection committee will be comprised of members of the project team, counselors from each high school, two representative from the EAACH committee and directors from the Office of Diversity Affairs, MESA and the TRiO program. They will independently read and rank all applications that have met the NSF minimum requirements then meet together to discuss and select the final make up of each year's cohort.

**c. Payment of Scholars:** Once the scholars have been selected. Letters will be sent to all applicants. New scholars will be asked to come to the college and meet with Ms. Leoni with a signed acceptance of the scholarship and its responsibilities. The scholar's contact information will be verified for future correspondence and their name and information will be sent to the financial aid office for processing. The financial aid office will cut the student a check after all tuition and fees have been paid.

**d. Number of Scholarships Each Year:** The overall intent is to fund 45 scholars with \$5,000 scholarships each year until they graduate. The capacity of the program is approximately 30 scholars/year. Because funding may not be assured until August, 2011 the committee will select 15 scholars from Edmonds Community College in the Fall 2011. High School and Edmonds applicants will be recruited beginning in Winter 2012 for selection of an additional 15 scholars for fall, 2012 (total of 30 scholars). The remaining three years the project team intends to maintain a cohort of around 30 scholars.

**e. Quarterly Renewal:** Principal investigator Leoni will check in on scholar eligibility according to academic standing once grades are submitted at the end of each quarter. She will discuss any issues with the financial aid office.

**f. Probation:** Scholars who lose academic standing (not full-time or below 2.5 GPA) will be put on probation. A scholar on probation will be required to participate in early alert the following quarter and meet with their mentor before the beginning of the quarter to create an academic plan

to improve their success. Scholars will be allowed two quarters of probation for the duration of their participation in the EdSTEM\$ project.

**g. Yearly Renewal:** Scholars will be renewed for the next academic year by maintaining their financial need eligibility, full-time STEM major status, 2.5 GPA or higher and high participation in required student support services.

## VI. STUDENT SUPPORT SERVICES AND PROGRAMS

**Student Support Across the Spectrum of Student Experience and Success:** EdSTEM\$ provides an holistic suite of student support structure based upon the knowledge that a low-income students need a comprehensive set of supports to assure success.<sup>8,9</sup> The table below describes the different support services EdSTEM\$ will provide.

<b>Student Supports Distributed According to Academic Level and GPA in STEM Classes</b>			
	<b>2.5-2.9</b>	<b>3.0-3.4</b>	<b>3.5-4.0</b>
<b>New to College</b>	<ul style="list-style-type: none"> <li>• Early alert</li> <li>• Faculty mentor</li> <li>• Peer tutor</li> <li>• Study room or online tutoring (4 hr/week)</li> <li>• Weekly cohort class</li> <li>• Social networking</li> <li>• Math diagnostic</li> </ul>	<ul style="list-style-type: none"> <li>• Early alert</li> <li>• Faculty mentor</li> <li>• Peer tutor</li> <li>• Study room or online tutoring (4 hr/week)</li> <li>• Weekly cohort class</li> <li>• Social networking</li> <li>• Math diagnostic</li> </ul>	<ul style="list-style-type: none"> <li>• Early alert</li> <li>• Faculty mentor</li> <li>• Be a Peer tutor or supplemental instructor</li> <li>• Study room or online tutoring (4 hr/week)</li> <li>• Weekly cohort class</li> <li>• Social networking</li> <li>• Math Diagnostic</li> </ul>
<b>Freshman</b> (min. of 15 credits and an initial STEM course completed at EdCC)	<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Peer tutor</li> <li>• Study room or online tutoring (4 hr/week)</li> <li>• Weekly cohort class</li> <li>• Social networking</li> <li>• Math diagnostic</li> </ul>	<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Peer tutor</li> <li>• Study room or online tutoring (2 hr/week)</li> <li>• Weekly cohort class</li> <li>• Social networking</li> </ul>	<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Be a Peer tutor or supplemental instructor</li> <li>• Study room or online tutoring (2 hr/week)</li> <li>• Weekly cohort class</li> <li>• Social networking</li> </ul>
<b>Sophomore</b> (one year left before graduation or transfer)	<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Be a Peer tutor or supplemental instructor</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Engage in SL or UGR</li> <li>• Study room or online tutoring (4 hr/week)</li> <li>• Job dev class</li> <li>• Prepare to transfer or transition to work</li> <li>• Social networking</li> <li>• Summer study</li> </ul>	<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Be a Peer tutor or supplemental instructor</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Engage in SL or UGR</li> <li>• Study room or online tutoring (2 hr/week)</li> <li>• Job dev class</li> <li>• Prepare to transfer or transition to work</li> <li>• Social Networking</li> </ul>	<ul style="list-style-type: none"> <li>• Faculty mentor</li> <li>• Be a Peer tutor or supplemental instructor</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>• Engage in SL or UGR</li> <li>• Study room or online tutoring (2 hr/week)</li> <li>• Job Dev Class</li> <li>• Prepare to transfer or transition to work</li> <li>• Social Networking</li> </ul>

<sup>8</sup>Purnell, R. & Blank, S., Opening Doors: Services That May Help Low-Income Students Succeed in Community College, MDRC, November 2004.

<sup>9</sup> Swail, W., Student Success: Institutional Strategies, Educational Policy Institute, March, 2006.

## Description of Student Support Components

**a. Orientation, quarterly meetings and social networking:** Based on research and experience, creating and maintaining personal connections early on is a key element to facilitating student success. Each year the EdSTEM\$ scholars will meet before the beginning of the quarter for a required day of orientation. There they will meet each other and their faculty mentors. They will participate in a fun STEM service learning activity. Scholars will fill out tracking information and be introduced to the expectations of the project. They will participate in any necessary pre-assessments. They will meet with their mentor/advisor to plan their year and future meetings. They will apply to receive a netbook, which will be on loan to them for the duration of their participation in EdSTEM\$. They will also receive an electronic notepad for use in online tutoring. Scholars, mentors and other project staff will meet at the end of each quarter to celebrate the accomplishments of the scholars and debrief the quarter. A Facebook page for the EdSTEM\$ project will be set up with scholars, mentors and other project personnel as friends.

**b. Faculty mentors and advisors:** All full-time faculty at EdCC act as academic advisors in their disciplines as part of their contract so EdSTEM\$ scholars would have been part of their regular advising load. The faculty mentors will receive training on how to mentor scholars. Mentors will meet with *new-to-college* scholars bi-weekly and *freshman* and *sophomore* scholars monthly. Mentors will use a rubric to chart the various successes and concerns of their scholars and to report back to the project team.

**c. Early alert:** While the college has an early alert system, the alerts are requested after the first two weeks of the quarter and are voluntarily submitted by faculty. EdSTEM\$ will place a tag on this system that will send results to Co-PI Marti Baker. In addition all *new-to-college* scholars and probationary scholars will participate in the EdSTEM\$ early alert system where each day of the first two weeks of the quarter, their instructors sign off on attendance and progress. If a scholar misses class or fails an assessment during this time period their mentor will meet with the scholar to find the resources to help them catch up immediately.

**d. Weekly cohort classes:** *New-to-college* scholars will take one 2 credit cohort class each quarter. The classes meet weekly for two hours. The first class CCLS 100 teaches students how to navigate college resources, the second; Bridge 110 teaches study, test-taking skills and time management, the third class; Math 155 teaches mathematics principles in a collaborative and active format. *Freshman* and *Sophomore* scholars who are exemplary students can work as supplemental instructors in these courses. *Freshman* scholars will participate in JobDv 130 which interfacing academic planning and career planning.

**e. STEM study rooms and online tutoring:** EdCC has four study rooms available for STEM students. MESA, physics, engineering and biology/chemistry each have a study room. EdSTEM\$ will simply formalize them. Each room will be equipped with a student ID card reader to keep track of use. Faculty and peer tutors will staff the rooms at posted times. Depending on their academic standing and level scholars will be required to study in a room for a certain amount of time each week. Scholars who can not study on campus due to work schedules or family commitments will put in their study time using the state's e-tutoring consortium along with posted online evening or weekend office hours staffed by faculty mentors.

**f. Math diagnostic catch up – ALEKS:** Because mathematics was the clear gatekeeper for success of STEM majors, the project team will use two types of mathematics interventions for students who are underprepared or earn a grade less than 3.0 in their mathematics courses. ALEKS will be used to diagnose weaknesses in student's mathematics preparation and to help the

students catch up on their skills and understanding. Students who earn a grade in their math courses below 3.0 will be encouraged to take an online one credit Math 155 course based on the use of ALEKs and taught by a math instructor over the break to hone their skills in preparation for taking the next course in the sequence or retaking the previous course if they did not pass.

**g. Leadership activities, undergraduate research or service learning:** Scholars will be required to take part in an high impact learning experiences. The time requirement will be negotiated with each scholar. Leadership activities include peer tutoring, assisting with outreach and working as a supplemental instructor. Amy Johnson, the director of the Service Learning program will work with the project team to design a variety of team service learning opportunities that fit with the interests and level of commitment available to the scholars. With assistance from the Council for Undergraduate Research and the Undergraduate Research Program at the University of Washington, Edmonds has initiated an undergraduate research program serving STEM majors (including social science majors). Most Edmonds UGR projects will be ongoing community based projects for individual or teams of students (and EdSTEM\$ scholars).

**h. Transfer and transition to work:** With help from the college’s transfer advisor, Stephanie Baron, the Career Action Center and their faculty mentor and peers, scholars will be assisted in either transferring to a baccalaureate institution or placed in employment. Transfer scholars will attend transfer workshops and receive assistance in applying for financial aid and writing personal statements. Job seeking scholars will receive assistance writing resumes and practice being interviewed.

**i. Electronic portfolio:** Scholars will be required to develop an e-portfolio of exemplary work, a resume and personal statement that they can use to demonstrate their accomplishments after leaving the program. Scholars will present their portfolio in an open college forum at the end of spring quarter celebrating their graduation, transfer or job placement.

## **VII. EVIDENCE OF QUALITY EDUCATIONAL PROGRAMS**

Edmonds Community College (EdCC), a public-supported institution, and is accredited by the Northwest Commission on Colleges and Universities. Edmonds is a leader in providing high-quality education in STEM fields. Our college staff, faculty, and administration are committed to preparing students to enter and succeed in STEM fields. A key strategic direction approved by the College’s Board of Directors in 2006 is to “serve the community as a hub of math, science and engineering”. EdCC offers numerous opportunities and supports for STEM students through academic programs, clubs and associations, and special grant-funded programs. The College has received 12 grants from the National Science Foundation during the past 11 years, many of which have supported under-represented STEM students.

Edmonds Community College (EdCC) offers an Associate of Science degree, Track 1 or 2, designed to prepare science majors for transfer to a four-year college with junior standing with at least 90 credits (60 semester credits). Most coursework is in specified mathematics and sciences requirements, but also includes general requirements, and distribution requirements in humanities, social sciences and health or physical education. This degree satisfies some, but not all, of the general requirements at the receiving four-year college or university. In addition, the College offers a transfer - Associate of Arts (AA) degree in ChemCore which consists of 90 quarter credits earned in General Requirements, Distribution Requirements and Electives. The public community colleges and the four-year colleges and universities of the State of Washington have an established direct transfer agreement. Transfer agreements have been established with over 20 private and public baccalaureate institutions.

Calculus-based transfer programs offered at EdCC are: Biology; Chemistry; Environmental Science; Geology; Earth Sciences; Physics; Computer Science; General Engineering; Atmospheric Sciences, Bioengineering; Chemical Pre-Engineering; Computer and Electrical Pre-Engineering ; Mechanical, Civil, Aeronautical, Industrial, Materials Science Pre-Engineering.

## **VIII. PROJECT ASSESSMENT AND EVALUATION**

### **Methods**

Ideally, the project team would want to do a fully randomized experimental study comparing S-STEM participants to the total population of STEM students at EdCC. Although this is not possible due to the program selection bias inherent in the EdSTEM\$ recruitment process, we do feel that we will be able to make meaningful comparisons between EdSTEM\$ and Non-EdSTEM\$ subpopulations of our total STEM population by studying both within-groups and between-groups matched-pairs data.

Potential Non-EdSTEM\$ comparison subpopulations will be determined by matching students with comparable academic, demographic, and financial need measures after these measures have been determined for the entering EdSTEM\$ students, then study volunteers will be contacted for recruitment into the Non-EdSTEM\$ comparison group. Since the limited number of students participating in any particular EdSTEM\$ cohort and their matched Non-EdSTEM\$ counterparts may result in substantial sample-size effects, exact matched-pairs statistics, such as exact McNemar and exact logistic regression, will be used in-parallel with other methods based on assumptions of large-N asymptotic normality, such as analysis of variance, in order to try to determine which program components and other predictors, such as student GPA or un-met financial need, are the most important predictors of student success. Since we have no prior comparison data on these population measures, we will at first perform a posteriori statistical analyses to establish reasonable guidelines for effects sizes required in order to be able to measure statistically significant changes in predictors of success. These guidelines will then be used to inform the construction of subsequent formal hypothesis tests concerning project outcomes.

Similarly, faculty mentors will meet at mid-quarter and the end of each quarter to review and rate all EdSTEM\$ students' progress according to a single progress rubric. Quantitative measures of inter-rater reliability on progress assessments will be used to determine internal reliability of the rubric, developmental redesign will be used for low-reliability items, and quantitative comparisons of progress rubric scoring with actual student success outcomes will be made in order to gauge progress rubric validity.

### **Activities**

**a. Establish a STEM Student Data Base:** Beginning in fall, 2010 Science and Mathematics Division will establish new institutional procedures for tracking student retention rates in STEM disciplines. The Division will collect information on Entering Student Intent vs. Exiting Outcome for all students. EdSTEM\$ project students will be a subset of this data. Comparisons between EdSTEM\$/STEM populations can be made as a measure of EdSTEM\$ project success relative to Non-EdSTEM\$.

Quantitative measures for success will include 1) Completion of Associates degrees, 2) Transfer to a Baccalaureate program in STEM, 3) Institutional Attrition-Stage Completion in STEM

gateway classes and 4) increased STEM student retention to degree completion. Initial factors to be studied as potential predictors include; coursework grades, quarterly GPA, cumulative GPA, amount of use of internal EdSTEM\$ project components and other college resources.

**b. Attitudinal Change:** All entering EdSTEM\$ students will be surveyed and interviewed regarding their intent and expectations. A sample of Non-EdSTEM\$ students will be surveyed and interviewed regarding their intent and expectations.

The same populations will be re-surveyed and re-interviewed at end of first quarter. Pre/post survey data will be studied for reliability and validity. Interviews will be two-phase, structured followed by open response. Students will be surveyed/interviewed for suggested improvements to their curriculum/resources. Dominant factors will be identified and interventions implemented.

**c. Retrospective Baseline Data:** The project team will attempt to determine what variables among those historically collected by the institution are most correlated with historical success rates in each degree attainment, e.g., gpa, quarterly course load, financial need, un-met financial need, total time of attendance, repeat/attrition courses.

**d. Quantitative Skills, Conceptual Diagnostics and Epistemology of Science Assessments:**

The project team will conduct a large-scale implementation of Basic Skills Diagnostic Test (BSDT-Epstien) on all entering STEM students to determine state of their basic mathematical skills. Faculty mentors will score and analyze the results and develop interventions based on the results. EdSTEM\$ and non-EdSTEM\$ students will be post tested to assess the interventions. The Calculus Concept Inventory (CCI - Epstien) and Force Concept Inventory (FCI – Halloun & Hestenes) will also be administered pre and post to STEM students taking the appropriate courses. Additionally the project team will consider administering the Maryland Physics Expectations (MPEX – Redish) and the Views about Sciences Survey (VASS – Halloun & Hestenes) to understand students' views about the nature physics and/or science.

**e. Faculty and Student Focus Groups:** James Mulik and Tom Fleming will conduct student focus groups to determine how the student's perceive that the project and its components are working. Faculty will also engage in focus groups to check agreement on what they believe the students are experiencing.

**f. Student Progress Monitoring:** Formal scholar progress reviews will be performed by faculty mentor each time they meet with their mentee. A regular panel review by faculty mentors will be conducted to review and rate progress of all EdSTEM\$ scholars using a (progress rubric). Quantitative assessment of inter-rater agreement on student progress will be performed and agreement measures compared with actual student progress outcomes.

## **IX. DISSEMINATION**

Project findings will be broadly disseminated through several avenues. All project team members will present at annual regional discipline specific meetings such as Northwest Bio, the American Association of Physics Teachers, the Pacific Northwest Association of College Physics, and the American Mathematical Association of Two-Year Colleges. Faculty also regularly attend and present at the national meetings for mathematics, physics and biology and presented CSEMS poster sessions in the past. The project team anticipates participating in poster sessions again. The project website will also publish findings. The project team will also publish in appropriate journals as finding become available.