From Gateway to 'Pathway': Mentoring-the-Mentors to provide Academic and Motivational Support for Struggling STEM Majors

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Alisa Greenberg, Department of Mathematical Sciences, Florida Atlantic University. She is the coordinator and instructor for the Intermediate Algebra program. Her teaching assignments have ranged from Intermediate Algebra through Calculus. To support the growing numbers of underprepared students and to support those in need of mathematics for their bachelor's degree program, Ms. Greenberg initiated two projects. The first, Math Boot Camp, provided intensive guided instruction for those students unlikely to pass even the most remedial of math courses. As an offshoot of that successful project, she created the Math Emporium Project which was implemented into the Intermediate Algebra program. The Emporium uses two different instructional approaches operating concurrently, resulting in students completing their

degree seeking programs in a timely manner and well within the recommended timeframe. Ms. Greenberg was a part of the ETW, or Effective Teaching Workshop, for graduate students which was designed to prepare them with instructional techniques necessary for their teaching assignments. Ms. Greenberg is also coordinating the mentoring-the-mentors initiative in partnership with the College of Engineering and Computer Science and the USDOE Title III Hispanic Serving Institution grant project. Mentors are learning how to guide mentees in thinking mathematically using concepts rather than helping them solve problems for homework.

From Gateway to Pathway: Mentoring-the-Mentors to Provide Academic and Motivational Support for Struggling STEM Majors

Abstract

This paper reports the results of the first two years of a 5-year USDOE project designed to increase the graduation rates of students transferring from two-year (state) community colleges to major in computer science, computer engineering, or electrical engineering (CS). The initial two years of the project focused on the design and piloting of academic support components to improve student success rates in mathematics and computer science gateway courses that provide a foundation for subsequent success in upper division CS courses leading to an undergraduate degree. Working in collaboration with state colleges, this paper overviews the design and piloting of the project mentor support model including the project gateway course refinement component that provides the setting for mentor utilization. Discussed is the role of the mentor component in relation to other key project components.

Lower division undergraduates across the spectrum of ethnicities continue to struggle with gateway mathematics courses (Bressoud, 2014, 2015; Saxe & Braddy, 2015) required for degrees in computer science and engineering. The continued poor performance of large numbers of state college and university entering undergraduates especially those from underrepresented groups can be related to issues documented across national and international assessments of educational progress, namely National Assessment of Educational Progress [NAEP], (National Center for Educational Statistics [NCES], 2016) and TIMSS (Martin, et al., 2016) studies which reported that students in K-12 schools continue to perform below the proficient level in both mathematics and reading. In particular, the NAEP report indicated that only 37% of all high school seniors were prepared for college reading and only 27% for mathematics. And, for Hispanic students, their overall performance was even bleaker, with only 12% proficient in mathematics and 25% in reading. The recent PISA study indicated that US performance in mathematics was lower than the overall OECD average, and for top performing 15-year old students, only 6% scored at proficiency level 5 and above (Kastberg, 2016). For community (and/or state) college students, specifically, research by Bailey, et al., (2010) indicated that up to two thirds of entering students were underprepared for college level work. also indicates that The ramifications resulting from poor achievement outcomes in mathematics is that thousands of potential jobs in computer science and engineering will go unfilled as many students are unable to complete a rigorous degree in engineering and most other STEM fields.

The problem of not filling available engineering and high-tech jobs is further exacerbated by the large numbers of retiring engineering professionals and those in national defense research-based laboratories. The general under-preparedness of underrepresented minority students (URMs) to complete either an AA degree, a BS degree, or both, is an ongoing challenge for post-secondary institutions (Hyde & Mertz, 2009; National Academy of Science, Engineering and Medicine [NASEM], 2016). Many students who do enroll in STEM courses do not complete those courses because they are uninteresting, do not actively engage the learner, are too hard, and not particularly relevant (Eagan, et al., 2014; President's Council of Advisors on Science and Technology [PCAST], 2012). In addition to their academic under-preparedness, they also face challenges associated with college life, matriculating from one institution to another, and for many who are the first member of their family to enter college (FTIC), they are unable to receive guidance about what to expect and how to address the many issues that arise across the academic, socio-psychological, and financial aspects of college attendance. Of equal importance is the fact that many URMs entering college are placed in remedial and/or developmental programs for mathematics and reading with the sad realization that these programs have not, in general, been effective in preparing them for academic success. This, in turn, has led to many dropping out of college (and STEM degree programs) before they ever enroll in regular college courses (National Academy of Engineering [NAE], American Society of Engineering Education [ASEE], 2014; National Research Council [NRC], 2011).

In addressing these issues, two state colleges and a local university, all of whom are designated as Hispanic Serving Institutions, are collaborating on a multi-part intervention designed to address the barriers faced by URMS (specifically Hispanic or Low Income - FAPSA) in completion of a Bachelor's degree in computer science, computer engineering and electrical engineering. The broad goals of the collaborative are to increase representation of Hispanics or low-income students in computer science careers, provide necessary course-specific academic support especially for gateway mathematics courses and introductory computer science courses across all three institutions.

Project leadership is provided by a research-intensive university that has experienced a rapid increase in the number of Hispanic and low income minority students who either are directly enrolled at the university or who transfer from the two-local state colleges The two feeder state colleges have more than 100,000 students whose demographics are represented as follows: 65% Hispanic, African-American, low income, or first time in college. Both state colleges have open-admission policies as directed by Board of Regents. This policy results in a large number of students entering college who, without sufficient proficiency in both mathematics and reading, are immediately assigned to remedial or developmental courses (e.g., intermediate algebra, math 'boot' camp) for which no credit is awarded, thus delaying their efforts to obtain an AA or AS degree. Faculty acknowledge and research supports the fact, that such remedial courses at both the community college and university levels do little to prepare students for the more challenging courses in mathematics (and English/language arts) that follow (Chen, 2009; Ganga, 2018; Xu, 2016). In effect, students are bogged down with a full semester of remediation (i.e., as they usually take more than one remedial course, i.e., reading) that actually delays their enrollment in regular-level college classes for at least one semester, thus increasing their time toward graduation, and often resulting in many dropping out of college, and/or exiting a STEM degree program. While approximately 45% of the State College students transfer to the local university, many are still under-prepared for upper division mathematics, computer science, and physics associated with attainment of a bachelors degree in science or engineering.

Specifically, this paper addresses how the partnership is (a) providing participants, who are working toward completing the requirements for an AA degree, with course-specific academic support for gateway mathematics courses, (b) providing participants course-specific mentoring support offered by the University’s engineering majors for the same gateway courses, (c) working with math faculty across all three institutions by forming a learning community that is addressing issues involving curricular coherence across the gateway courses which, in turn, provides an additional academic support for project participants who are enrolled in courses taught by the faculty, and (d) refining the gateway mathematics courses with an emphasis on core concepts, curricular coherence and curricular alignment that supports student conceptual understanding.

Project Intervention

Gateway Mathematics Course Curricular Refinement

The mathematics partnership includes faculty, department chairpersons, and chairpersons who are collaboratively engaged in the process of curricular refinement of the gateway mathematics (e.g., College Algebra, Pre-Calculus-Algebra, Trigonometry, and Calculus with Analytical Geometry) courses which required, in part, for the AA and for the BS degree programs in computer science and engineering (see Figure 1).

Addressing Curricular Coherence

The process used in addressing the task of determining the curricular coherence within each of the gateway courses consisted of several strategies. The first strategy involved addressing the project’s initial Curricular Framework Guide as a fluid document that would initially support faculty as they pursued identifying what the task involved, what was needed in order to determine conceptual coherence within a gateway course, what were the major learning issues for students enrolled in each course, and what constitutes meaningful learning in mathematics (Bransford, et al., 2000; Saxe & Braddy, 2015). The discussions were focused and lively, with faculty building upon a range of experiences and backgrounds, including their sharing of institutional course syllabi. There faculty noted similarities and differences in the identified topics, time-frame allocated for teaching each cluster of topics, and the instructional sequence used in teaching the math topics. Faculty also detailed the learning issues facing their students in each of the courses.

Determining Conceptually-Relevant Learning Outcomes For Each Course

Faculty were divided into three math focus groups (leaving College Algebra for the end) where they specifically addressed main learning outcomes for the course, the core ideas upon which each course is grounded, and the supporting concepts that make up the core idea(s). This approach builds upon a theoretical framework resulting from the work of numerous groups (i.e., Mathematical Association of America - [MAA]) and individuals, such as Bransford et al., (2000) who, in his National Research Council commissioned book, How People Learn, provided recommendations based on extensive work addressing learning and teaching in mathematics. Guiding their discussions were a series of questions such as (a) does the course outline reflect the desired level of conceptual coherence to support meaningful, in-depth student learning, (b) is sufficient instructional time allocated for students to achieve the desired level of concept understanding and mastery for the key core ideas, (c) what procedural knowledge and skills must be mastered in support of thinking mathematically in the problem solving process, (d) what is the identifiable pre-requisite prior knowledge students need to be successful in the course, and (e) what in-class tasks and take home assignments best support the desired course learning outcomes for students?

Across each learning session, faculty begin and end with whole group discussions of core concepts and sub-concepts within and across the courses. Collectively, the group has acknowledged that College Algebra serves as the primary barrier for student success across all four courses. It was this collective finding that guided faculty to re-think about the role and conceptual basis of College Algebra in terms of student success in subsequent courses and their decision to address it as a whole group after their own gateway courses are finalized.

What faculty perceived as an easy task has changed as they recognize the importance of linking curricular coherence to deepening student conceptual understanding in mathematics rather than thinking about their course syllabus as a list of topics to be covered based upon some agreed upon standard. Faculty discussion led to their agreement to use the project's curricular framework guide for completing their curricular analysis and refinement of Pre-Calculus/ Algebra, Trigonometry, and Calculus I. This will be followed by faculty directing their attention to College Algebra in an effort to identify core curricular concepts, sub-concepts and specific procedural knowledge/skills which, of necessity, must be achieved at mastery level in order to maximize student conceptual understanding and skill proficiency in learning more complex mathematics as they move across the sequence of math courses leading to Calculus I and II.

Figure 1 shows the project course refinement model. As Figure 1 suggest, course refinement is difficult because of the multiple perspectives that must be applied whenever the courses being refined are arranged in an interdependent course sequence. The present model focuses the refinement process on three ordered emphases: (a) refinement focusing on a single course, (b) refinement addressing the sequential order of the courses (i.e., the degree to which the outcomes of one course provide the entry skills for the following course, and (c) the degree to which the outcomes of the course focus on the preparation students need for computer science, computer engineering, and/or electrical engineering.

Project Mentor Component

The intervention requires mentors to attend the math classes being taught by the designated math faculty, to obtain their course syllabus, to engage faculty in conversation about general observations of student learning issues that they have noted, and to solicit input from faculty as to areas where their academic mentoring support would be most critical to participants.

Mentoring The Mentors - A Multi-Faceted Approach

In building an effective mentor model, the project addresses mentoring from the perspective that they (a) serve in an academic support role in which they will provide one-to-one or very small group learning sessions focused on helping students learn-how-to-learn by thinking mathematically rather then to be problem-solvers or assist students in doing their homework as

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COURSE REFINEMENT MODEL

Course refinement is difficult because of the multiple perspectives that must be applied whenever the courses being refined are arranged in an interdependent course sequence. The present model focuses the refinement process on three ordered emphases: (a) refinement focusing on a single course, (b) refinement addressing the sequential order of the courses (i.e., the degree to which the outcomes of one course provide the entry skills for the following course, and (c) the degree to which the outcomes of the course focus on the preparation students need for computer science, computer engineering, and/or electrical engineering.

Recommended Criteria for Faculty Conducting Course Analysis

1) Regular Faculty or Instructor
2) Must Be Teaching Course (or very recent course experience)
3) Will Teach Course in Project

Gateway Course Refinement- Phase 1 (Individual Course Focus)

Refinement Focus: 1) Specify desired course student academic outcomes
2) Identify course prerequisites, including deficiencies students' exhibit
3) Identify course assignments students must engage in for course mastery, including problems students' exhibit in course
4) Identify major course teaching emphases- including:
   a) focus on core concepts,
   b) course conceptual coherence,
   c) linkage of student assignments to course core concepts,
   d) cumulative review.

Refinement Actions: State and University faculty would work collaboratively to address 1), 2), and 3) above.

Refinement Result: Courses should have increased coherence and effectiveness in support of student learning success.

Gateway Course Refinement- Phase 2 (Sequential (Cumulative) Course Focus)

Refinement Focus: 1) Identify Gateway course sequential dependencies. In math, Algebra – Trigonometry, Pre-Calculus, Calculus 1. In computer science, Programming in C, Logic Design (Note- computer science courses may be involved in sequence with math.

2) Analyze outcomes of prerequisite courses to determine whether they are sufficient to provide students with the prior knowledge needed for following course(s). Identify course prerequisites, including deficiencies students' exhibit

Refinement Actions: State and University faculty would work collaboratively to address 1) and 2) above.
Refinement Result: Gateway courses should fit together by linking outcomes of preceding courses with prior knowledge needed for success in following courses.

Gateway Course Refinement- Phase 3 (Relevance of Course Outcomes to Overall Program)

Refinement Focus: 1) Review Gateway course outcomes to insure that they provide the appropriate academic focus for advanced computer science courses. This phase is essential to insure that the set of Gateway courses is maximally relevant to the overall computer science program.

Refinement Actions: State and FAU faculty would work collaboratively to address 1) above. This may involve application of the Phase 1 process as necessary.

Refinement Result: Gateway courses should be optimal in building student academic preparation for advanced program courses (e.g., Calculus II, Discrete Mathematics).

Figure 1. Project Course Refinement Model for Gateway Courses

the main outcomes, (b) establish a supportive relationship in which to progressively guide the participants in becoming more effective and independent learners through the application of self-regulated learning strategies (Zimmerman, 1990, 1995, 2002) integrated into the mentoring sessions, and (c) serving as student role models who can highlight how they addressed academic and social issues they encounter, identify what's really necessary to complete a degree in a rigorous domain such as engineering (e.g., persistence, autonomy, active learning), along with the career potential in terms of what computer scientists and engineers really do, and some of the supportive benefits offered by the university (See Figures 2-3-4). Our project plan uses evidenced-based mathematics learning initiatives (Bressoud, 2014; Klingbeil, et al., 2006) to support the mentor-led teams.

Mentor Selection And Development For Student Support

Mentors are selected from a highly-qualified applicant pool of upper division College of Engineering and Computer Science honors students who have maintained at least a 3.5 GPA in all course work and who have participated in specialized mentor training prior to and during each month that they are mentors. Mentors are selected also on the basis of their availability for at least three-four semesters to insure continuity and stability with the mentees (DuBois, et al., 2002). In addition to professional development, the mentors also are required to acquaint themselves with the designated mathematics faculty at each state college, observe in their classrooms, be familiar with the course syllabi and class requirements (e.g., test and homework schedule), and as time permits, engage in collegial conversation with the math faculty. The mentor schedule aligns with the participants' schedule and the designated math sections.

Mentor Professional Development

The mentors receive training in how to effectively support students in the development of their mathematical understanding, that is, how to guide the learning process rather than doing the homework for the participants or in solving problems.

Figures 2, 3, and 4 outline the overall framework for mentor assistance. As these figures show, the mentor assistance project component is highly structured while being feasible to implement. Figure 2 shows the overall mentor assistance model. Figure 3 shows the mentor analysis of student problems, and figure 4 details the specific guidelines followed for mentor assistance.

As Figures 2, 3, and 4 show, the project mentor model employs an analytical and purposeful approach in detailing their observations and perceptions. However, mentors have found the structure easy to follow as a result of our work with them. An important feature is that in addition to providing assistance in furthering student mathematics understanding, mentors are trained in how to develop participant self-regulated learning skills as a well-established form of student support (Bjork, et al., 2013; Karoly, 1993; Lopez, et al., 2013; Lord, et al., 2010). Mentors are guided in the use of verbal reinforcement statement patterns for recognizing academic progress and motivation/challenge statement patterns for guiding student self-study skills and self-motivation strategies. This strategy also supports the mentors own growth and development.

The project has developed a Mentor Student Assistance Log Form (See Figure 5) which is designed as a guide for mentors reflectively addressing student advising sessions their perceptions of the mentee challenges, preparedness, self-confidence and mathematical difficulties. In addition, this form provides important tracking information for the project regarding numbers of student contacts per mentor and the problem topics addressed.

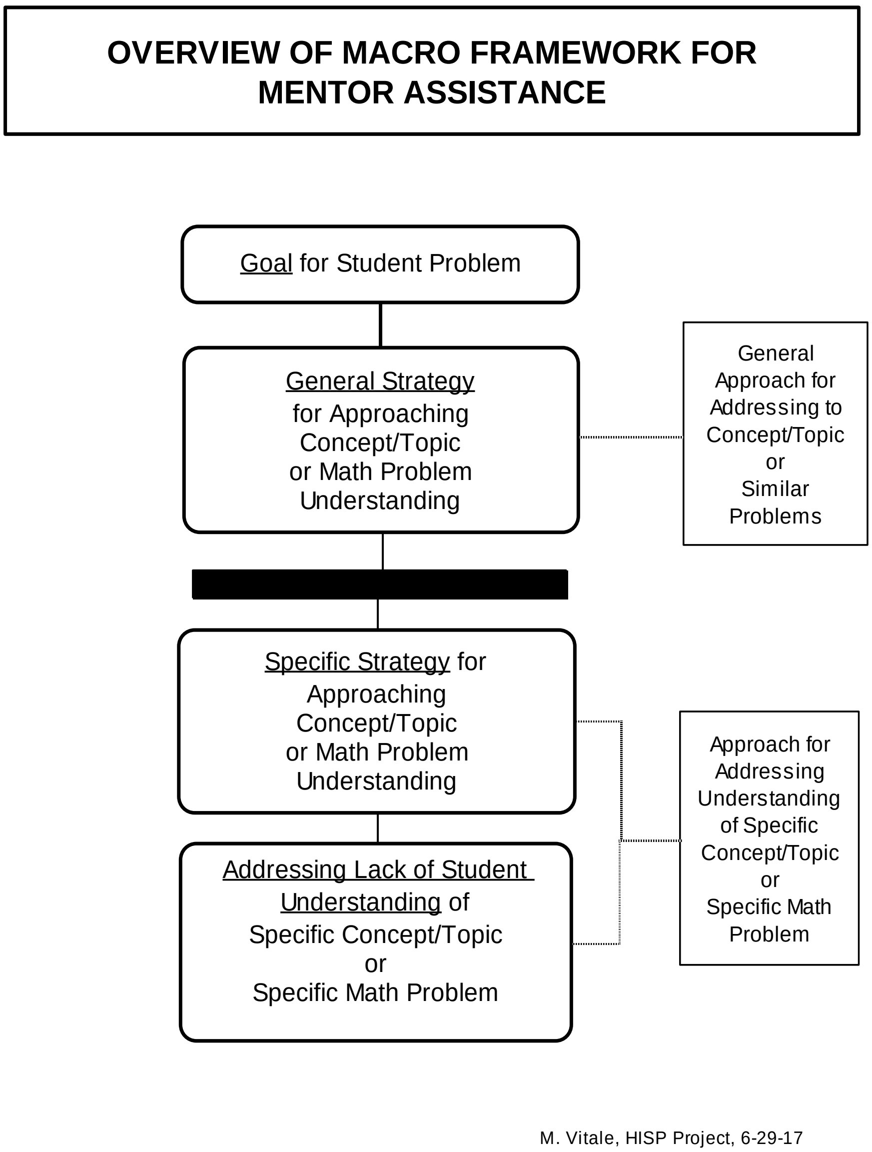

Figure 2. Project mentor model for analysis of student problems.

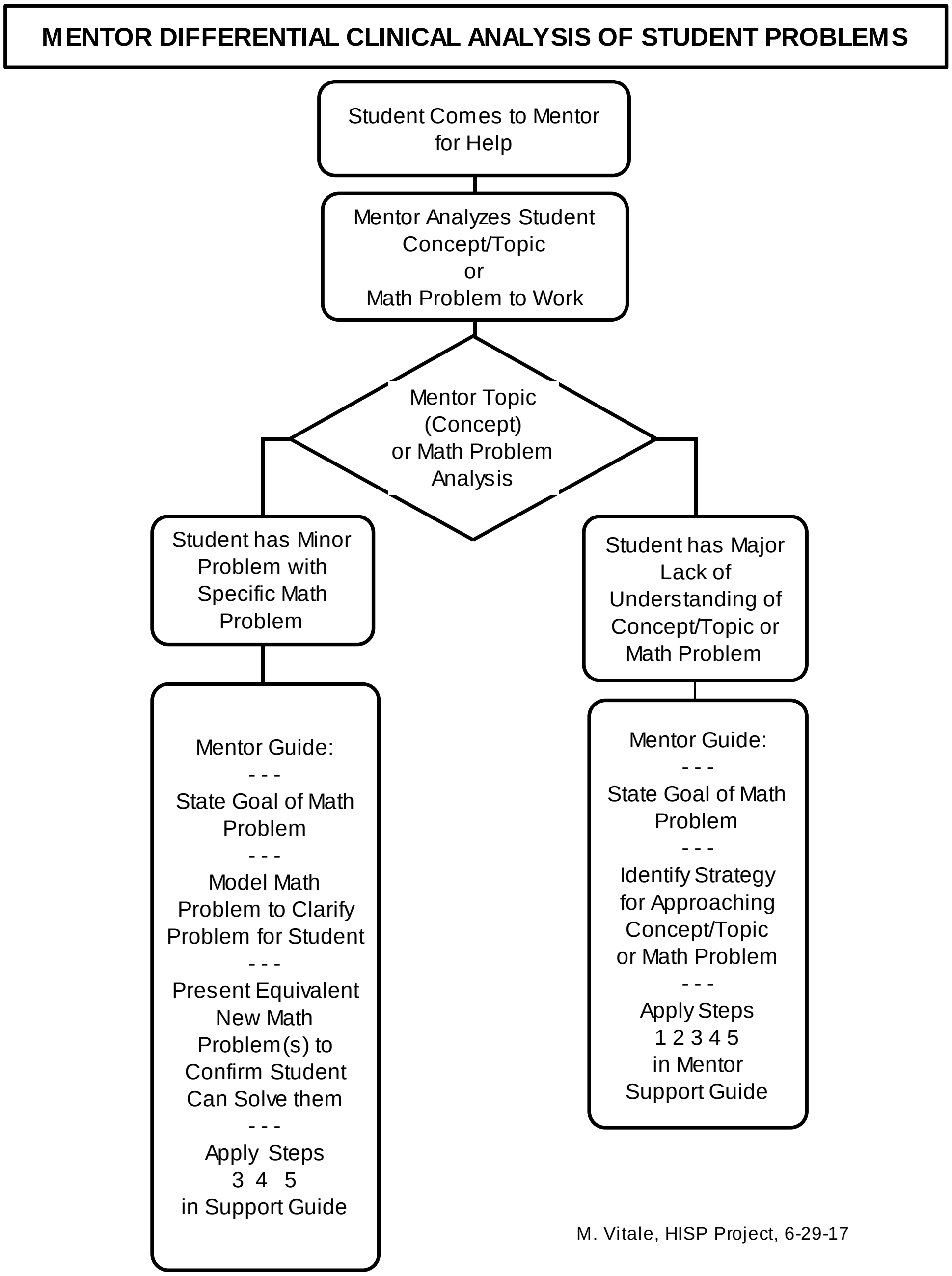

Figure 3. Project Mentor Framework for providing mentor assistance.

Guidelines for Course-Specific Support Provided by Undergraduate Mentors

1. **<u>Mentor Preparation</u>**
    a. General Preparation (Need class syllabus, class textbook(s))
    b. Class Specific Assistance Preparation (Need schedule of class topics/problems addressed)
2. **<u>Mentor Assistance Framework for Assisting with In-Class Problem/Topic Raised by Students</u>**
    a. Identify student problem/topic
    b. Conduct informal review - to identify relevant prior knowledge re: problem/topic
    c. Present information re: Briefly explain problem/topic
    d. Self-model mentor approach/solution to student/problem/topic
    e. Based on mentor self-model, guide student on solving problem/explaining topic
    f. Have student independently work problem(s) and have student explain topic/work
3. **<u>Follow-Up Activities for Students After Mentor Assistance</u>**
    a. Review problems/topics in (2) above
    b. Address new problems/explore new aspects of topic (get help as needed)
    c. Maintain journal re: Class topics/problems addressed
4. **<u>Moving Student toward Independent/Self-Regulated Learning- What Students Need to do…</u>**
    a. Pre-Study next class topics (i.e., look ahead in the course)
    b. Take class notes of topics covered in real time and identify areas in which understanding is weak
        i. Ask questions of Instructors
        ii. Consult with Mentor as needed
    c. Conduct/maintain/study self-oriented cumulative review for course
5. **<u>Building Student Motivation for Learning Progress</u>**
    a. Mentor motivation/challenge statement "Patterns" for building student self-study
    b. Mentor verbal reinforcement statement "Patterns" for recognizing academic progress

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Phases of Instruction: Overall Mentor Guide for Addressing Student Learning Problems

Cumulative Prior –Know. Review	Present Information / Explain	Self-Model Problem Application	Guide Student Application	Student Independent Practice	Student Independent Test

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Mentor Guide for Statements that Build Student Motivation for Self-Regulated Behavior

1. **<u>Motivation/Challenge Statement Format</u>**:

    <Student Name> <Desired Future Academic Outcome> <Future Positive Consequence> <Challenge to Student>

2. **<u>Reinforcement Statement Format</u>**:

    <Student Name> <Observed Academic Outcome> <Recognition of Improvement or Sustainability> <Resulting Positive Consequence>

Figure 4. Project mentor model components.

Mentor Student Assistance Log Form

Mentor ______________________ Location: ______________ Date: ___/___/____

Instructions: Please complete this form for each mentor consultation with a student.

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Student Name: ________________________ Student ID: ____________ Course: _______________

==College:

__ PB ___ BROW Course:_________ Section: ______ Instructor: ___________

==Math

Problem/Topic Addressed:

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Mentor Checklist (Mark Yes or No)

1. Mentor Preparation

__Yes __No a. General Preparation (Have class syllabus/outline, class textbook)

__Yes __No b. Class Specific Assistance Preparation (Have schedule of class topics/problems addressed)

2. Mentor Assistance Framework for Assisting with In-Class Problem/Topic Raised by Students

__Yes __No a. Identify student problem topic

__Yes __No b. Conduct informal review - to identify relevant prior knowledge re: problem/topic

__Yes __No c. Present information re: Briefly explain problem/topic

__Yes __No d. Self-model mentor approach/solution to student/topic problem

__Yes __No e. Based on mentor self-model, guide student on solving problem/explaining topic

__Yes __No f. Have student independently work problem(s) and have student explain topic/work

3. Specify Follow-Up Activities for Students After Mentor Assistance

__Yes __No a. Review problems/topics in (2) above

__Yes __No b. Address new problems/explore new aspects of topic (get help as needed)

__Yes __No c. Maintain journal re: Class topics/problems addressed

4. Moving Students Toward Independent/Self-Regulated Learning

__Yes __No a. Pre-Study next class topics (i.e., look ahead in the course)

__Yes __No b. Take class notes of topics covered in real time and identify areas in which understanding is weak

__Yes __No c. Ask questions of Instructors

__Yes __No d. Consult with Mentor as needed

__Yes __No e. Conduct/maintain/study self-oriented cumulative review for course

5. Building Student Motivation for Learning Progress

__Yes __No a. Mentor motivation/challenge statement "Patterns" for building student self-study

__Yes __No b. Mentor verbal reinforcement statement "Patterns" for recognizing academic progress

Mentor Comments/Thoughts (Continue on Back if Necessary)

Figure 5. Mentor Assistance Log Form

The project recognizes the large body of research that suggests the many positive results of using mentors to support learning of URMs (Coles, 2011; Crisp & Cruz, 2009). In our project, mentors serve as more experienced peers in engineering while also being learners themselves. Our field-test observations have been that mentors are developing essential critical thinking and reflective skills while also becoming more articulate in using the practices of mathematics when working with and/or guiding the learning of their mentees. Clearly, the mentors are also benefitting from the experience, a finding that is supported in the literature (Schlosser, et al., 2003). And, during their training, mentors have ample opportunity to share and discuss their experiences as well as challenges they faced when providing guidance to mentees across conceptual topics in mathematics. Essentially, the mentor training in the project has helped mentors evolve in terms guiding them to step back, think about and reflect on the big ideas in mathematics and engage the mentee in applying these big ideas toward problem solving.

Project Participants

Hispanic and low-income students (URMs) comprise both a substantial and growing percentage of the population served by the three academic institutions whose project is being described. Across the region, Hispanic students make up about 27% of the population and when low-income students are added, the percentage approximates 49%. Yet, despite their growing numbers, they are underrepresented in engineering career fields within the region (i.e., 8 of the top 15 advertised STEM occupations in our state are computer related).

Locally, URMs have fairly high failure rates (DFW) in the gateway mathematics and computer science courses (39 % to 45%) across all three institutions. And lack of success has been cited as a major reason why so many students change from a STEM-degree program to a non-STEM major. And, even with an AA degree, many URMs struggle with the rigor of university level courses within the college of engineering. For the period ranging from 2012-2015, the percentage of university degrees awarded to Hispanic students in computer science was 28%, a number far lower than the number who originally entered the program.

Objectives

The 5-year project objectives include (a) investigating the impact of the intervention (i.e., providing course-specific mentoring for participants) in terms of student completion and academic success in designated gateway mathematics courses, (b) investigating the impact of professional development model on mentor skills in working collaboratively in supporting mentee success and self-efficacy in learning mathematics, and in their own personal growth and development as upper division computer science students, and (3) investigating the impact of the course-refinement model in terms of numbers of students passing with a grade of ‘C’ or higher. In year 2 of the 5-year project, it will investigate the impact of the intervention on the number of URMs who satisfactorily complete the four gateway mathematics courses and two computer science courses, and, subsequently, receive their AA degree, transfer to the university, and complete the BS degree in computer science. This last objective is long-term for the project which is just in year two of implementation.

Project Research Design

The project cohort for year 2 consisted of N=50 participants at the BC and PBSC 2-year sites. The N=50 cohort group along with an N=50 cohort control group were selected randomly from the overall pool of applicants at each site. Once selected, each cohort will be tracked for the duration of the project. The total number of participants over the 5-year project is N= 500.

The project developed and tested a mentor log form in years 1-2 of the project shown in Figure 3.This instrument will complement the different forms of institutional outcome data that the project will begin collecting at the end of year 2. Overall, the mentor reported data will track participants served by mentors on: (a) topics addressed, (b) self-regulated learning proficiency, and, through mentor judgment, (c) motivation to continue CS enrollment. Beginning with year 3, survey reliabilities will be obtained and reported on a yearly basis.

The year 2 evaluation design focuses on two project components: (a) The effectiveness of the revised gateway courses and (b) the data monitoring mentor support activities (Figure 3). As a complement to the year 2 data, beginning with the end of year 2, project evaluation will compare the performance of project participant cohorts with demographically-comparable control student cohorts (e.g., GPA, Pass-Fail). Beginning with year 3, this analysis would use a two-level hierarchical model (HLM 7) with student outcomes and student demographics) at Level 1 and, the cohorts at Level 2 (USDOE-IES, 2011). In the analysis, treatment (participant vs. control) would be assigned to Cohort (Level 2), while student demographics along with scores on a mathematics placement test (ALEK) administered at both Colleges to all students at the start and the end of each semester in college will be assigned to Level 1.

Evaluation Results

The year 2 evaluation results found that the state college and university faculty are still engaged in and completing the refinement of the gateway mathematics courses to emphasize core concepts and to insure that earlier courses in the sequence provide the prerequisites for following courses. Samples of their curricular products will be available during the presentation as well as on the project's website which will also be highlighted. Clinical evaluation of mentor support activities confirmed- with few exceptions- that the emphasis in mentor training workshops (see Figures 2, 3, 4) were applied effectively in student support. Specific data will be presented at the conference given that data collection will be finalized at the end of the Spring, 2018 semester. The mentor tracking (Figure 5) was confirmed as feasible to implement effectively. Overall, the major project objectives focusing on gateway course refinement and prototype mentor training program and the process for providing student support were able to be implemented in a workable and successful fashion.

Discussion

The progress of Years 1 and 2 of this project are supportive of the feasibility of addressing major barriers faced by students in two-year state colleges in successfully pursuing the completion of undergraduate degrees in CS in the College of Engineering and Computer Science at the university level. Focusing initially at the state college level, the project is near completion of the refinement of the gateway mathematics courses (Pre-Calculus, Trigonometry, Calculus) to develop student understanding of core concepts in mathematics. With the course refinement process and the faculty learning community serving as context for mentor support, the project is on track to accomplish its long term goal of facilitating the graduation of state college students with the bachelors degree in engineering/computer science at the local university. Together, these two project components along with others not the focus of this paper promise to provide evidence that the issues in degree completion of Hispanic and/or low SES students in CS can be addressed effectively.

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