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A Glimpse into the Effectiveness of Mentoring and Enrichment Activities for Scholarship Recipients in a Teacher Preparation Program

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Abstract:
The extent and nature of mentoring determines the effectiveness and success of any educational program [1]. A multi-faceted mentoring scheme has been designed for the TAMIU Robert Noyce Mathematics Teacher Scholarship Program (TAMIU-NMTSP) at Texas A&M International University (TAMIU), Laredo, Texas. The TAMIU-NMTSP provides funding for up to $10,000 per year for students who are planning on becoming secondary mathematics teachers. Students who receive the scholarship will graduate from TAMIU with a mathematics degree and 7-12 mathematics certification In exchange for receiving the TAMIU-NMTSP Scholarship, the recipients agree to teach as highly-qualified, full-time teachers in a high-need subject area for at least four years at a school serving low-income students. As part of the scholarship students receive additional mentoring from university faculty and other professionals in the field. This paper will outline this mentoring scheme as well as examine its preliminary effectiveness.

Introduction

There is a critical need to increase participation in STEM fields by underrepresented minorities, as they were over a quarter of the national population (29%) in 2006 but only 9% of college-educated STEM occupations [2]. This National Research Council report further details this alarming trend, showing that in 2007, underrepresented minorities made up of 39% of K-12, 33% of college age population, 26% of undergraduates, 18% of science and engineering (S&E) bachelor's degrees, 18% in graduate school - but only 15% of S&E master's degrees and a miniscule 5% of S&E doctorates. Retention of minorities in STEM programs is increased when there are intensive mentoring programs in place [3 & 4]. Independent School Districts (ISDs) have not consciously adopted and worked toward the broad goals for STEM education in terms of setting intermediate goals for student success, increased enrollment in STEM courses, test scores, high school

graduation rates, college or career readiness, and advancing to postsecondary institutions. In the k-12 setting, students need to have highly qualified STEM teachers who are able to provide quality mentoring. Teacher preparation programs and undergraduate mathematics programs play a significant role in ensuring highly qualified teachers are in the k-12 classroom. The TAMIU Robert Noyce Mathematics Teacher Scholarship Program (TAMIU-NMTSP) at Texas A&M International University (TAMIU), Laredo, Texas provides funding up to $10,000 per year for students to graduate as certified secondary mathematics educators who will in return agree to teach as highly-qualified, full-time teachers in a high-need subject area for at least four years at a school serving low-income students. This paper seeks to examine the preliminary effectiveness of the mentoring component of the TAMIU-NMTSP.

Literature Review

The benefits of mentoring have emerged as an important finding in the literature from the structured analysis of more than 300 research-based articles across the areas of education, business, and medicine [5]. This analysis finds that mentoring has enormous potential to bring about learning, personal growth, and development for professionals [6]. The characteristics of any mentoring program require developing a strong mentor-mentee relationship in an educational program, as well as activities associated with building a strong foundation of skills and an assessment method to see if the program objectives are achieved. The following examples illustrate that desired outcomes can be developed when highly regarded and experienced teachers collaborate to design and implement mentoring programs in their schools. Feiman-Nemser at al. (1992) examined how the contexts of mentoring shape the perspectives and practices of mentors [7]. A similar TAMIU NSF-Funded CSEMS Scholarship Program includes dedication to mentoring and academic atmosphere, selection of mentors, characteristics of effective mentoring relationships, and mentor training/professional learning. The benefits of mentoring are also seen through student accounts of what helps them most from a strong and effective mentoring program. Additionally, the benefits of mentoring as seen from the student perception are very useful tools in developing the "best" practices and standards in dealing with mentoring. For example, the programs with qualified staff working along with experts and sufficient staffing so they are not stretched between too many duties and other job responsibilities. Jones (2001) undertook a comparison and evaluation of procedures in mentoring with reference to the cultural and structural framework determined in each setting. Protégés of mentors participating in the mentoring program could more effectively organize and manage instruction at the beginning of the year and establish for more functional classroom routines [8]. Another component of mentoring includes carefully constructed activities for the students to participate in throughout the year [9]. The literature also describes the “Situational Mentoring Framework” which must be in place for developing a successful mentoring program. This set-up follows a systemic approach in addressing four major components of the mentoring process to achieve overwhelming results: 1) mentor selection, 2) mentor and novice teacher

preparation, 3) support team, and 4) accountability through assessment [10]. In addition, another study examines the impact of intensive mentoring as an inductive program component aimed at improving teacher quality in ways that link teaching to student engagement, and the effects of best teaching practice. This helps beginning teachers develop balanced instruction as the fiscal situation in school districts created challenges to studying the long-term effects on quality and retention [11].

There is no argument that the face-to-face interactions between advisors/mentors and mentees are a key component in the development of successful self-directed learning habits [12 & 13]. Recognizing the differences between students' learning strategies and seeking to create an environment that embraces elements of critical and reflective thinking, self-direction, autonomy, creativity, and practice for both the mentor and mentee candidates is what effective mentors must do [13 & 14]. One necessary aspect of mentoring teacher candidate students is the preparation for the realities of dealing with teaching standards and statewide assessments. Despite the development of standards-based reforms and statewide assessments, new teachers were found to have received little or no guidance about what to teach or how to teach it [15]. Left to their own devices, they struggle day to day to prepare much needed content and materials. As such, there is an urgent need to reconsider the curricula and support provided to new teachers beyond what they receive from ISDs [15]. Throughout their own perceptions and from dealing with the school cultures, students' views reveal the interplay between contextual, cultural and biographical factors affects their teaching practices [16]. The relative stability of professional identities which teachers develop in the early years of teaching make them stronger, thus the kinds of teachers they will become and their effectiveness can be strongly influenced by early teaching experiences [16]. Therefore, providing as much mentoring support as possible for new teachers, both through face-to-face interaction is critical to their success.

TAMIU-NMTSP Mentoring Program

The TAMIU-NMTSP is a multi-faceted system in preparing undergraduate mathematics educators for their profession. As first year mathematics teachers are dealing with the inherent difficulties of making the transition from college student to becoming an educator [17 & 18] increasing the mentoring resources to help them adjust and deal with mathematics and teaching issues is very beneficial [19 & 20]. Therefore, there are several levels of mentoring integrated into this system.

First, to ensure that beginning mathematics teachers have the level of support they need to effectively deliver mathematics instruction each scholar is assigned a mentor from the College of Arts and Sciences as well as from the College of Education. Each scholar has the opportunity seek out his mentors in order to receive feedback on issues of pedagogy as well as assistance on issues and concerns that are content-specific. The mentors meet

with their scholars at least three times a semester during the program of study. During these meetings, they are encourage to advise students on academic needs, field experiences, balancing of workloads as well as other topics. The goal is for the scholar to develop a long-term relationship with the mentor. The second level of support is through the form of scholarship. The students are encouraged to attend and present at national conferences, professional development workshops, and obtain journal memberships. This component of mentoring provides the scholars with authentic learning experiences as well as provides possible networking opportunities for the scholars. The third level of support is through authentic learning experiences. Accordingly, four scholars and an administrator in the program had an opportunity to present at the Western Regional Noyce Conference (WRNC) in San Francisco, CA in November 2014. This provided an enormous opportunity for them to see what other enrichment activities programs undertake to achieve these programs goals. The scholars are required to attend the TAMIU-Summer Mathematics Boot Camp (TAMIU-SMBC) and the TAMIU-Mathematics Internship Program (TAMIU-MIP). The TAMIU-SMBC, a week-long program, has a wide range of mentoring experiences from experts in the field with regard to content and technology and experience in secondary education teaching. There is a session specially designed to exchange ideas about classroom experience and a panel discussion is focused on "What do Mathematicians do?" The TAMIU-MIP is a summer internship experience tailored towards learning how to effective delivery of classroom instructions and developing classroom management skills. Both programs provide ample opportunities for prospective student teachers to develop their educational skills under the supervision and advising of mentors specializing in mathematics education. The final component of the TAMIU-NMTSP mentoring program will occur upon the scholar's graduation. Each scholar will be mentored by the classroom teacher who will guide them to success in their teaching profession. In addition, their TAMIU mentor will continue to mentor the scholar, now alumni, and will visit their classroom twice a semester to monitor the teacher's instruction, classroom management, and discipline techniques to provide constructive and supportive feedback. Resource sharing and cohort support between Noyce scholars and alumni will be added to the proposed mentoring relationship for the new teachers during their first year. A detailed written reflection on participants' experiences during the beginners' first year of teaching in the classrooms is needed when the participants step into classrooms after the program of study. Using their responses as data, the nature and value of the buddy-mentoring relationship can be analyzed in relation to the needs, concerns, and professional development of the new teachers as they progress throughout the year [21]. Table 1 provides the expected number of students per cohort, a schedule of the Noyce activities for each type of student and the mentoring activities planned.

Table 1. Schedule of Completion of Program Components and Student Cohorts

Academic Year: Student number,	**Summer** (Conference Travel	**Fall and Spring Semesters for juniors and seniors**

type, cohort group	is for juniors or seniors)	(all activities will happen each semester, except the integrated course which will be spring semester only)
Year 1: 2013-2014 9 rising Juniors (1)	TAMIU-SMBC† (juniors) Conference Travel	Mentoring, Professional Development Workshops, Journal membership; TExES Review; TExES Exam (seniors); integrated mathematics and education course
Year 2: 2014-2015 9 graduating Seniors (1) 9 rising Juniors (2)	TAMIU-SMBC† (juniors) TAMIU-MIP± (seniors) Conference Travel	Mentoring, Professional Development Workshops, Journal membership; TExES Review; TExES Exam (seniors); integrated mathematics and education course
Year 3: 2015-2016 9 graduating Seniors (2) 9 rising Juniors (3)	TAMIU-SMBC† (juniors) TAMIU-MIP± (seniors) Conference Travel	Mentoring, Professional Development Workshops, Journal membership; TExES Review; TExES Exam (seniors); integrated mathematics and education course
Year 4: 2016-2017 9 graduating Seniors (3) 9 rising Juniors (4)	TAMIU-SMBC† (juniors) TAMIU-MIP± (seniors) Conference Travel	Mentoring, Professional Development Workshops, Journal membership; TExES Review; TExES Exam (seniors); integrated mathematics and education course
Year 5: 2017-2018 9 graduating Seniors (4)	TAMIU-MIP± Conference Travel	Mentoring, Professional Development Workshops, Journal membership; TExES Review; TExES Exam (seniors); integrated mathematics and education course

† TAMIU-SMBC: TAMIU-Summer Mathematics Boot Camp
± TAMIU-MIP: TAMIU-Mathematics Internship Program

Data, Analysis, and Results

Feedback received from both mentors and mentees of the first cohort of scholars were collected and analyzed for all ten Noyce scholars currently in the program. Figure 1 depicts the scholars' general assessment of the TAMIU Noyce mentoring program. Almost everyone expressed the opinion of this program to be either very successful or successful.

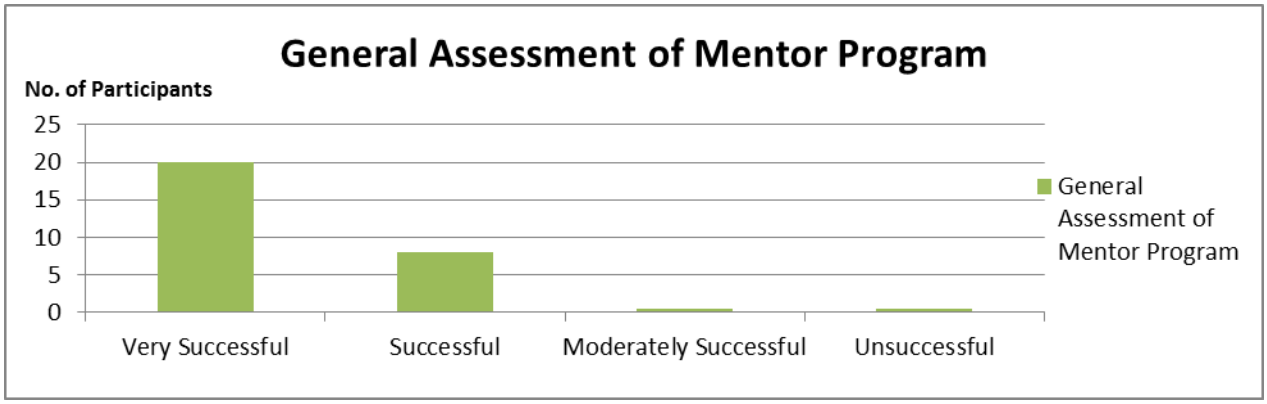

Figure 1. General Assessment of Mentor Program

Everyone, as anticipated, expressed that they have received adequate feedback from these mentor-mentee meetings according to Figure 2. Furthermore, it can be noted from Figure 3 that the satisfaction towards the mentor-mentee match is overwhelming as responded by the participants.

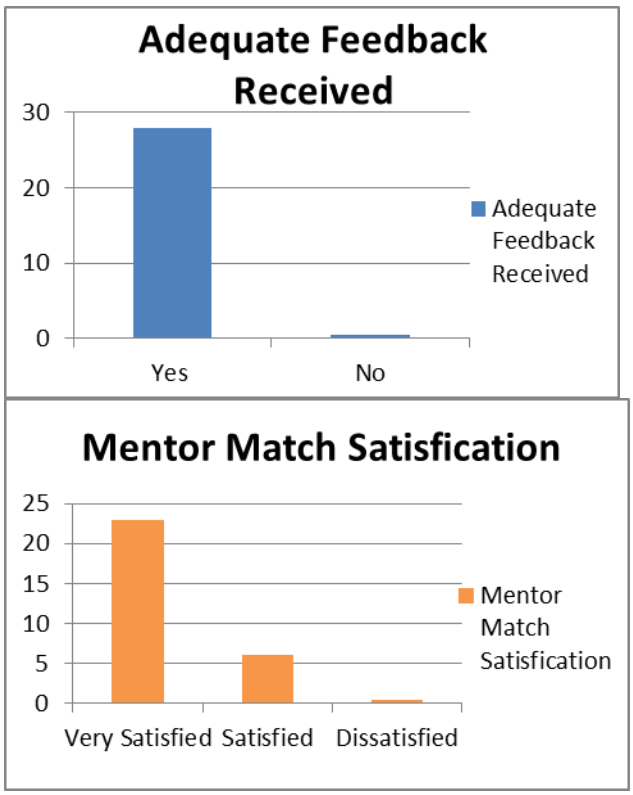

Figure 2 & 3. Adequacy of Feedback from Mentor-Mentee Meetings & Satisfaction towards Mentor and Mentee Match

Assessment on the program components in the mentor-mentee survey by Noyce scholars has been aggregated. The summary of these components appears in Figure 4. Accordingly, the Noyce scholars expressed that the extent of these components is just about right as previously expected.

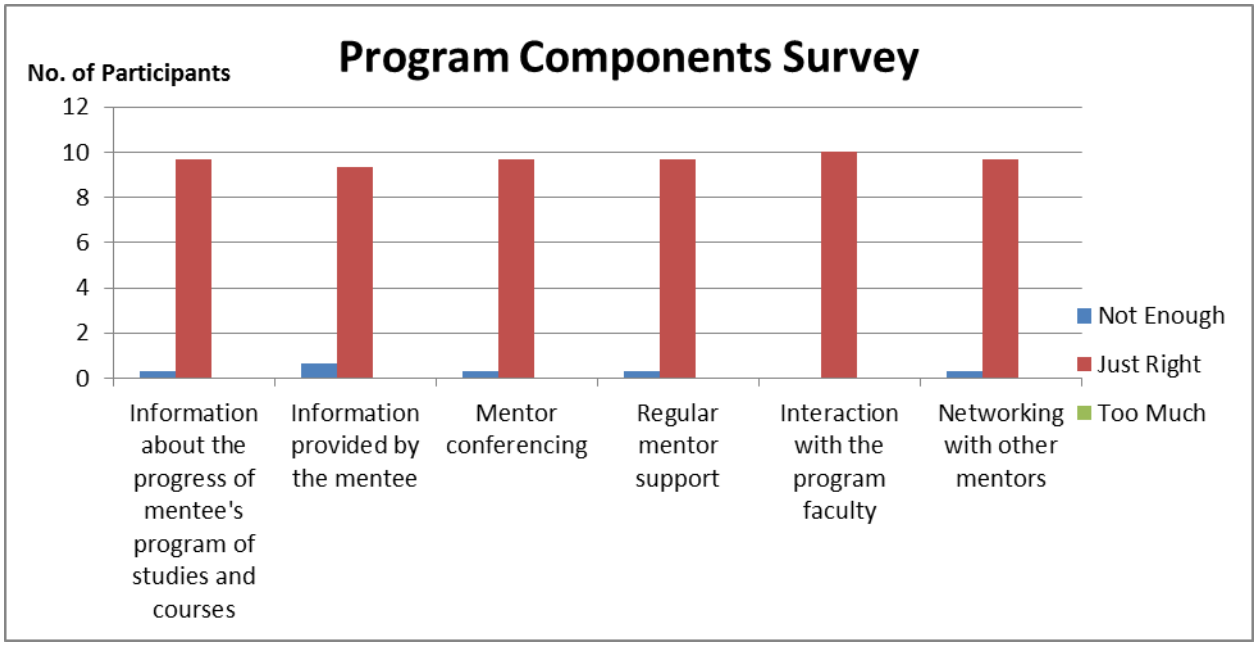

Figure 4. Assessment on Program Components Found in the Survey

Conclusions

This is an ongoing effort and it provides a glimpse of implementation in an early stage. Complete implementation, its success, and its usefulness are yet to be examined in the determination of the effectiveness of the program. However, at this initial stage of the program, all indications are that the mentoring program is solid and will have a positive impact on the preparation of the teacher candidates. As the scholarship program is underway, further analysis is being planned.

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