Mercy College

NSF Robert Noyce Master Teacher Fellows Program

External Evaluation Report
Project Year 2

July 1, 2019 – June 30, 2020

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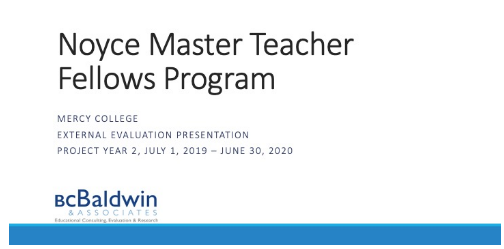
Project Overview

The Mercy College Master Teacher Fellowship (MTF) is to recruit and retain veteran teachers from local high needs districts to complete an advanced certificate in STEM Education, as well as demonstrate leadership capabilities in terms of leadership and mentorship of other teachers in their districts as well as increased student test scores and high evaluation marks by peers and administrators. This program is a 5-year, Robert Noyce Teacher Scholarship program, Track 3 (Master Teacher Fellowship). This evaluation report measures and reflects on the effectiveness and efficacy of different programmatic strategies to achieve these ends.

Year 2 Evaluation overview



This evaluation covers the second year of the project, between July 2019 through June 2020. An overview, synopsis style video presentation was made of this evaluation report, and can be viewed at: *http://www.bcbaldwin.com/home/mercy-teaching-fellows/mtf-year-2-evaluation.* This video provides on overview of the main elements contained within this written evaluation report, as well as providing some contextual analysis of the project. Please be aware that this video is "unlisted", therefore not searchable within the YouTube platform and the Evaluation website link. However, anyone with the URL link can view the video and read the evaluation report, so please share sparingly and accordingly.

Below in Table 1 is a Conceptual Model, showing the different inputs, activities and anticipated outcomes of the project.

Table 1: Conceptual Model

Inputs	Activities	Short-Term Outcomes	Long-Term Outcomes

Mercy College inputs	· Recruitment and selection of master teachers · Development of Advanced Certificate program · Instruction of coursework in program · Professional Development and management of vPLC	· increased number of teachers from partner districts interested in further education in advanced STEM · increased number of teachers from non-partner districts to pursue Advanced Cert in STEM · teachers participate in school-based and college-based PD activities within their PLC	· sustained teacher attitudes toward PD in advanced STEM pedagogies · sustained, elevated student achievement scores in science and mathematics · teacher self-development and leadership of school-based PD activities in STEM
District partners inputs	· willingness to partner · Providing safe class environments for PLC and leadership opportunities · Aggregation of student test scores	· increased student achievement scores in science and mathematics · district willingness to develop their own advanced STEM academies for master teachers	· sustained higher student achievement scores in science and mathematics · district maintenance of their own advanced STEM academies for master teachers

Evaluation and Assessment	· data collection via surveys, interviews · formative assessment feedback · summative assessment reporting	· initial and intense data collection at commencement of project · ongoing feedback provided to project management team · development of yearly annual external evaluation reports	· data collection throughout project · data collection at end of each project year to determine yearly progress · feedback to both project personnel as well as NSF regarding project evaluation, suggestions for improvement and recommendations for future implementation strategies
NSF Noyce	· funding for all inputs from Mercy and district partners		

Recruitment Strategies

Because this project focuses on recruiting master teachers to participate in the project, ultimately leading to a total of 14 teachers were recruited from the following partner districts to round out the composition of the first two cohorts of teaching fellows:

Yonkers (44%)
Port Chester (19%)
Elmsford (13%)
New Rochelle (25%)

All of the teachers possess qualifications that describe a typical master teacher. Namely, all teachers are certified, possess content degrees in their field of instruction, and have been nominated by their supervisor or building principal as being a leader in their school. Applicants had to complete an online application—including transcript submission, supervisor observation reports, recommendations, written essay questions and then followed by an interview and classroom walkthrough. This process will ensure that the most qualified applicants are selected based on merit and leadership capability, with consideration given to increasing underrepresented minority participation.

To this end, a total of 14 teachers were selected to participate in the first two cohorts of fellows (7 teachers in each cohort). These fellows will participate in the project for the duration, engaged in school-based and university-mentored leadership roles.

Program Coursework and Structure

Throughout the duration of the program, the fellows enroll in three grant-funded Mercy College graduate courses (nine credits) in STEM pedagogy:

Enhancing Science / Mathematics with STEM
Engineering for the Classroom
Leadership in STEM Education

These three courses are required for the fellows to complete. If the fellows are interested in pursuing an Advanced STEM certificate, there are three more required courses to complete (two STEM content courses as well as one course in programming and robotics).

During the summer, the Center for the Urban River at Beczak (CURB) – a collaboration with Sarah Lawrence College and the former Beczak Environmental Education Center have designed a course entitled *Teaching the Environment*, which all fellows have the opportunity to attend for a full week in the summer. This professional development opportunity provides hands-on experiences in both science learning and science teaching in a real-life environment on the banks of the Hudson River. Fellows spend time in research labs, classrooms and in the outdoors to explore different aspects of environmental science and how they can develop their knowledge and skills necessary to become successful environmental stewards and advocates for their students.

The grant supplements teachers' salaries by $10,000 per year, increasing to $13,000 per year after coursework is completed. Because this is a five-year grant, and because there is a five-year requirement that the fellows teach in high-needs schools, there is an ongoing opportunity that fellows continue to participate in and lead professional learning opportunities both in their home schools as well as at Mercy College in upcoming years – thereby increasing the fellows' leadership skills through the aid of their participation in the program.

Data Sources and Collection

Empirical Data was collected from the candidates using five different instruments:

1. Science / Math Teaching Efficacy and Beliefs Instrument (STEBI / MTEBI)
2. Questionnaire on Teacher Interaction (QTI) instrument
3. PLCs and emphasis on video-PLCs and faculty PLCs (via TCAR rubric)
4. Danielson observation framework for teacher leadership
5. Teaching Engineering Self-Efficacy Scale (TESS)

Focus group interviews were also conducted with the project administration and personnel which focused on the development and implementation of the new courses for the teaching fellows. An in-depth interview was also conducting with project PI Amanda Gunning for additional insight and analysis. Empirical and qualitative data will be expanded below.

Empirical Data

STEBI / MTEBI

The Science (or Math) Teaching Efficacy and Beliefs Instrument (STEBI / MTEBI) are survey instruments designed to measure two subscales: Personal Science (or Math) Teaching Efficacy and Science (or Mathematics) Teaching Outcome Expectancy. Namely, this instrument measures how well candidates think how professionally successful they will be in terms of both their teaching, as well as how their students learn science / mathematics concepts and material. The candidates self-reported ratings to a number of items that aimed to measure candidates' values on these two subscales. Table 2 below shows the candidates' self-reported means for each of these subscales. Any sub-scale rating substantially lower than a "4" rating warrants discussion and consideration as a factor to address by other means. These data shown in Table 2 were collected during Years 1 and 2 of the project.

Table 2: STEBI / MTEBI sub-scale values for Years 1 and 2

Sub-scale	Rating (1-5), Year 1	Year 2
PSTE	4.03 (n=5)	4.40 (n=11)
STOE	4.58 (n=5)	3.84 (n=11)
PMTE	3.72 (n=12)	4.43 (n=9)
MTOE	4.14 (n=12)	4.07 (n=9)

The data over the two years show a couple of areas of interest. The first item to consider is that the STEBI/MTEBI is an instrument that is used to measure self-efficacy of teachers, but it is frequently used to measure self-efficacy in teacher candidates or teachers very new teachers. The difference in this population is that all of the teachers have experience – they all have tenure in their districts, and have been identified by their home districts and the project personnel at Mercy College to possess leadership qualities. To this end, we might not expect to see significant drops (or gains) over time as compared to teacher candidates or early-career teachers.

The data indicate that in terms of teaching efficacy, the fellows indicated markedly higher values from one year to the next. This might indicate that the fellows have grown much more confident in their teaching ability of math and science in particular. When analyzing the STOE sub-scale values, we see a similar marked drop in outcome expectancy for science teaching. This is an item of interest from a program standpoint. There are possibly a couple of explanations for this. First, it could be that, taken at face value, the fellows felt less comfortable in how their students would perform (the outcomes) in science as a result of the fellows' increased knowledge of what works and what doesn't in science pedagogy – and the additional measures that the fellows would need to undertake in order for their students to perform better. A second explanation could be that in the second cohort of fellows, there were just more math teachers, who might tend to exhibit lower self-efficacy levels for a teaching a subject that they are not as comfortable with from a content and pedagogy standpoint.

The values from this instrument over time will be closely analyzed as a potential indicator of a measurement of fellows' growth in terms of their professional abilities as STEM teachers.

QTI

The Questionnaire on Teacher Interaction instrument is used predominantly to categorize teachers' behavior from two sub-scales: Leadership and Helpfulness. Table 3 below shows these sub-scale values over the first two years of the project.

Table 3: QTI sub-scale values for Years 1 and 2

Sub-scale	Rating (0-4 scale), Year 1	Year 2
Leadership	1.94 (n=14)	1.94 (n=13)
Helpfulness	1.57 (n=14)	1.62 (n=13)

The QTI was a self-scored survey (the fellows were predicting how their students would rate the teacher him/herself). The leadership and helpfulness sub-scale values indicated that the fellows believed that their students would rate them about "middling" in terms of both of these values. Because these fellows have been nominated by their supervisors as leaders within their schools, it was surprising to see that the fellows believed that their students would not rate their leadership or helpfulness skills as extraordinary – since these skills are hallmarks of teachers' success.

Comparing the results between the first two years shows minimal differences. Follow-up with these teachers in the future will hopefully shed more light on these measures. This instrument will be used again in the upcoming years as another data point in painting a clearer picture of the development of the leadership skills in the fellows.

TCAR

The Teacher Collaboration Assessment Rubric (TCAR) is designed to measure teacher's reported experiences as a part of a professional learning community. Namely, this instrument measures how well the project management and instructional team felt that their own PLCs were performing based on four subscales: Dialogue, Decision-making, Action and Evaluation. Table 3 below shows the staff members' (n=4) self-reported means for each of these subscales.

Table 3: TCAR sub-scale values for Years 1 and 2

Sub-scale	Rating (0-2), Year 1	Year 2
Dialogue	1.46 (n=4)	1.60 (n=5)
Decision-making	1.68 (n=4)	1.83 (n=5)
Action	1.63 (n=4)	1.87 (n=5)
Evaluation	1.33 (n=4)	1.67 (n=5)

A cursory analysis of this data indicates that the program staff highly rates the function of the PLC, with highest marks going to the processes of decision-making and taking action, with lower marks for evaluation and dialogue. This trend also continues into year 2, but with higher marks across the board for each of the sub-scales. The program staff have told me independently and as a group that this particular PLC has been their favorite group to work with in their entire professional careers!

A bit of qualitative data was also collected from this survey. A few respondents noted that the team has been highly functioning and that "*I feel that we all contributed to the program and course development*."

Danielson framework

Data from the Danielson framework for Professional Responsibilities (Rubric 4) was collected from classroom observations and video-recording experiences in the fellows' classrooms during the school year. Data is shown in Table 4 below. In a disappointing note of the times, much of the video and classroom observations during the second year was scheduled to take place just after schools closed in response to the pandemic, so not nearly as much in-classroom data and analysis was able to be recorded as was anticipated.

Table 4: Danielson sub-scale values for Years 1 and 2

Sub-scale	Rating (1-4), Year 1	Year 2
Participation	3.50 (n=13)	3.38 (n=4)
Growth	3.56 (n=13)	3.41 (n=4)
Professionalism	3.63 (n=13)	3.80 (n=4)
Overall	*3.57 (n=13)*	*3.56 (n=4)*

The fellows were rated quite high in terms of their professional responsibilities through observations and videos. Comparing the first year with the second year, there was little change from their already-high sub-scale values. This will be watched as the program moves into its third year and in-class observations and videos will be much easier to obtain as students and teachers are back in schools.

TESS

For the first time in Year 2, the Teaching Engineering Self-Efficacy Scale (TESS) was administered to the fellows. For the first time, the fellows were enrolled in a STEM course that was comprised of a number of units in engineering education. This instrument was administered to the fellows during the semester that they were enrolled in the course. There was no data collected or reported in Year 1 because the engineering content units were not taught in the normal course sequence in Year 1.

Because engineering is often the under-represented STEM discipline in terms of prior formal learning experiences and coursework in STEM by the teachers, this was a crucial piece to capture – namely, the comfort level of math and science teachers to teach principles of engineering to their students. The TESS measures six subscales:

1. Engineering Content Knowledge Self-Efficacy (ECKSE) (measuring teachers' personal belief in their knowledge of engineering that will be useful in a teaching context),
2. Motivational Self-Efficacy (MSE) (measuring teachers' personal belief in their ability to motivate students to learn engineering concepts),
3. Instructional Self-Efficacy (ISE) (measuring teachers' personal belief in their ability to teach engineering to facilitate learning),
4. Engagement Self-Efficacy (ESE) (measuring teachers' personal belief in their ability to engage students while teaching engineering),
5. Disciplinary Self-Efficacy (DSE) (measuring teachers' personal belief in their ability to cope with a wide range of student behaviors during engineering activities), and
6. Outcome Expectancy (OE) (measuring teachers' personal belief in the effect of teaching on students' learning of engineering).

The data are presented in Table 5 below.

Table 5: The Teaching Engineering Self-Efficacy Scale (TESS) for Year 2

Sub-scale	Rating (1-6), Year 2 (n=14)
ECKSE	4.68
MSE	4.88
ISE	4.49
ESE	5.20
DSE	5.43
OE	5.01
Overall	*4.95*

From the trends in the sub-scale data, it is interesting to note that while overall, the teachers rated their overall self-efficacy for teaching engineering to be relatively high (4.95/6), there were pieces of interest within the data. For example, the lowest ratings are on teachers' content knowledge and instructional self-efficacy. These bits of data follow the logic that lower perceived content knowledge from formal coursework drives lower self-efficacy values in the instruction of students in engineering content knowledge that the teachers are not comfortable in. Higher ratings persist in engagement and disciplinary self-efficacy ratings. This could be due to the teachers having a general overall high ability to make STEM material engaging as well as possessing the ability to effectively manage a classroom because of their experience and expertise as building leaders.

Qualitative Data: Observations, Focus Groups and Interviews with Stakeholders

Qualitative data were collected in terms of both observations with the project PLC as well as interviews with selected stakeholders. Virtual and face-to-face meetings were held approximately every two weeks during the fall and spring semesters throughout the first two years of the project when the courses were being developed and taught. The focus of the qualitative data analysis was on the development of the coursework along with feedback and reflections of implementing the course with the teaching fellows.

During the first two years, the courses that were developed were Enhancing Science / Mathematics with STEM and Engineering for the Classroom. These courses were collaboratively planned by the entire PLC. Guest speakers (from the PLC) were brought in to teach sections and portions of each course depending on the expertise of the group. The course was taught during Spring semesters 2019 and 2020 to a class that consisted of all of the fellows, plus a few other graduate students in the School of Education. The instructor noted that a major advantage to the course was that having the fellows mixed in with the non-fellows was that the fellows could immediately go back to their classrooms and "try out" some new methods with their students because they had the experience and confidence to do so.

The Engineering for the Classroom course was taught during Fall semester 2019 for the first time. The process of designing this course has been the same as the previous course – with all members of the PLC taking part in developing different sections within the course syllabus, according to their specific expertise. These developers will also be called upon to guest-teach a lesson or two during the semester. Co-PI Vikram Kapila (an Engineering Professor at NYU-Tandon) contributed greatly to the course, providing guest lectures and hosting a class session at his research laboratory with some of his engineering students.

Feedback from the PLC on the Enhancing Science / Mathematics with STEM course was overwhelmingly positive. The faculty overwhelmingly stated that they loved the experience of collaboratively planning the course in the frequent meetings and guest speaking opportunities.

Other faculty described their experiences in teaching the course to be very different than normal teaching experiences because of the fact that the students in the course (the teaching fellows) were already so experienced in their own classrooms and, while not content experts in everything, they were very willing to try things out in their own classrooms and report back results with the class during the next meeting time.

The experience at CURB had an additional positive outcome –that there were ample professional connections that were made between the center and teachers from Westchester County – which is an area that often does not take advantage of the offerings of the center. The teachers also gained a valuable resource for further collaborative opportunities with environmental organizations interested in protecting wildlife and wetlands in the urban environment surrounding New York City.

Analysis and Summary

In summary, the data collected indicates that recruitment and participation by the fellows in the project is high. This is noted by the willingness for the teachers to self-select and learn more about STEM and leadership within their schools. The quantitative data indicates that the teachers feel are comfortable with their professional abilities, but that they predict that their students might not find their leadership and helpfulness skills at high levels. The data from the Danielson model indicated that the fellows were proficient and distinguished in their teaching skills, as noted by others. The TESS data indicate that the teachers are still learning about engineering content and pedagogical practices, but have a solid foundation in some basics of teaching that might enable this new skillset to develop over time.

There is ample room for professional growth on the part of the fellows that are participating in this project. In the coming school year – regardless of the modality (in-person, online, hybrid), it will be a telling year in documenting the continued growth of these STEM master teaching fellows.