

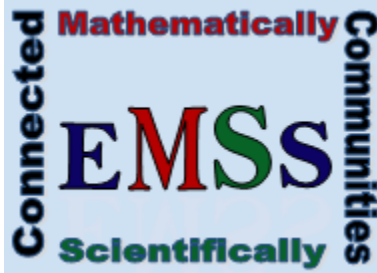


SOAR: Southwest Outreach Academic Research Evaluation and Policy Center

Master of Arts in Education:

Elementary Mathematics and Science Specialist (EMSS)

End of Year One Report: Spring 2020



Date Prepared:

August 27, 2020

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Introduction

The new Master of Arts in Education: Elementary Mathematics and Science Specialist (EMSS) program established by Mathematically Connected Communities (MC²) at New Mexico State University integrates mathematical, scientific, and instructional competencies which are organized into three critical areas of professional growth for teachers: (1) Content knowledge for teaching and understanding elementary mathematics and science; (2) Pedagogical knowledge for teaching students mathematics and science; and (3) Leadership skills and knowledge. This report presents the midpoint evaluation findings for the 29 teachers who participated in the pilot cohort, focusing on the impact of this experience on their pedagogy, self-efficacy, and attitudes about inquiry-based instruction after the first of two years in this program.

Executive Summary

This report offers an overview of teachers' changes in self-efficacy, pedagogy, and inquiry-based practices from the start of the program to the end of the first year. Looking at self-efficacy and pedagogy, teachers had the largest increases on the following items from the start of the year to the end of the first year:

- *I can use a variety of assessment strategies in mathematics.*
- *I can motivate students who show low interest in mathematics.*
- *I can provide an alternative explanation or an example in mathematics when students are confused.*
- *Even if I try very hard, I will not teach mathematics as well as I will most subjects.*
- *The inadequacy of a student's mathematics background can be overcome by good teaching.*
- *I understand mathematics concepts well enough to be effective in teaching elementary mathematics.*
- *When teaching mathematics, I will usually welcome student questions.*

Additionally, teachers increased in their agreement with the following inquiry-based practice items:

- *During inquiry, I can manage my students' behavior.*
- *I can effectively assess my students' progress during inquiry.*
- *My school's administration is supportive of inquiry instruction.*
- *It is more important that I cover all mathematics course objectives than cover key concepts in depth.*

At this point in the program, teachers have made key gains in terms of their confidence in teaching mathematics and implementing inquiry-based practices. Teachers also appear to be more confident and capable of teaching mathematics in an efficient and evidence-based manner. Lastly, teachers reported positive feedback about the program's organization, structure, and the quality of the instructors and staff. This information could be helpful for others who are implementing programs with similar goals and target audiences.

Self-Efficacy and Pedagogy Assessment

This section of the report compares pre-survey results from the start of the year with the post-survey results at the end of year one, focusing on self-efficacy and pedagogy in particular. The tables presented below show the weighted average and total number of teachers who responded to each item in the surveys. For tables One, Two, and Three, the responses ranged from “Strongly Agree” (weighted 4 points) to “Strongly Disagree” (weighted 1 point). Table Four included an additional “Neither Agree nor Disagree” neutral category. Therefore, the responses for that table ranged from “Strongly Agree” (Weighted 5 points) to “Strongly Disagree” (weighted 1 point). For most of the items, the higher the weighted average, the higher the confidence or more “positive” attitudes. However, a few items are negatively worded; therefore, for those items, a lower weighted average means a more positive result.

Pre-Post Assessment Comparison

Table One below presents teachers’ pre- and post-weighted averages on items related to self-efficacy and pedagogy in math instruction. Teachers started off relatively high on some items, however, there are clear items where they improved from the pre to the post survey. During their first year in the EMSS program, teacher’s confidence increased the most in areas that focused on use of assessment strategies in math, their understanding of math being sufficient enough to be effective in teaching elementary math, and their ability to provide alternative explanations or examples in math when students are confused. All pre and post weighted averages for pedagogy and self-efficacy survey questions can be found in Table One below.

Table One. Self-Efficacy and Pedagogy Post-Assessment Teachers Responses

Questions	N	Pre weighted average	Post Weighted average
I can motivate students who show low interest in mathematics.	29	3.28	3.55
I can use a variety of assessment strategies in mathematics.	29	2.90	3.55
I can provide an alternative explanation or an example in mathematics when students are confused.	29	3.07	3.41
Even if I try very hard, I will not teach mathematics as well as I will most subjects.	29	1.72	1.41
The inadequacy of a student’s mathematics background can be overcome by good teaching.	29	3.17	3.38
I understand mathematics concepts well enough to be effective in teaching elementary mathematics.	29	2.76	3.28
The teacher is generally responsible for the achievement of students in mathematics.	29	2.97	2.97
When teaching mathematics, I will usually welcome student questions.	29	3.52	3.69
Effectiveness in mathematics teaching has little influence on the achievement of students with low motivation.	29	1.76	1.69
Even teachers with good mathematics teaching abilities cannot help some kids learn math.	29	1.66	1.59

Inquiry-Based Practices

The second section of the survey focused on teachers' perspectives on implementing inquiry-based practices as part of their math curriculum and pedagogy. The comparison between pre- and post-assessment results shows that teachers improved their perceived ability to assess students' progress and to manage student behavior while implementing inquiry-based pedagogy. In addition, teachers had stronger agreement and less disagreement that their school's administration is supportive of inquiry instruction at the end of year one in the program. All inquiry-based instruction questions and weighted averages can be found in Table Two below.

Questions	N	Pre-Weighted Average	Post Weighted average
During inquiry, I can manage my students' behavior.	29	3.17	3.55
I can effectively assess my students' progress during inquiry.	29	2.90	3.34
Motivating students is challenging when using inquiry strategies in mathematics.	29	1.86	1.86
My school's administration is supportive of inquiry instruction.	29	2.97	3.24
The faculty at my school is supportive of inquiry instruction in mathematics.	29	2.93	3.00
Teaching content is more important than teaching inquiry.	29	1.76	1.79
Using inquiry teaching methods increases most students' enjoyment of mathematics and science.	29	3.59	3.62
It is more important that I cover all mathematics course objectives than cover key concepts in depth.	29	1.93	1.59

The pre and post survey also asked teachers to indicate what percentage of time out of a typical math lesson they dedicate to inquiry-based pedagogy. At the end of year one of the EMSS, 23 out of 29 teachers responded they dedicated at least 60% of their math instructional time to inquiry during their math lessons, compared to 13 teachers who dedicated this much time at the start of the year. All pre and post responses about the percent of time teachers dedicate to inquiry-based math instruction can be found in Table Three below.

Percentages	Which value best represents the percent of the instructional time your students were engaged in inquiry during a typical math lesson?	
	Pre-Number of Teachers	Post-Number of Teachers
20%	10	1
40%	6	5
60%	6	16
80%	7	7
100%	0	0

Hybrid Versus Fully Online Model

Due to the pandemic in mid-March, the last month and a half of the EMSS program took place fully online as all schools went remote at that time. Given this change and the possible implications for future program delivery options and requirements, the end of year survey asked teachers for feedback about their preferred instructional delivery mode for the EMSS program, focusing on comparing hybrid and fully online models. Teachers were presented with a few statements to gauge these preferences, and response options were on a five-point Likert Scale ranging from “Strongly Disagree” (weighted 1 point) to “Strongly Agree” (weighted 5 points) with a neutral “Neither Agree or Disagree” option in the middle (weighted 3 points).

Overall, the majority of teachers valued the in-person meetings and face-to-face classes and preferred a hybrid EMSS program compared to a fully online model. Specifically, 24 teachers agreed that the program would not be as effective if it were fully online, 20 teachers agreed that the program expectations would be met more easily if it were fully online, and only four teachers agreed that more people would be interested in the program if it were fully online. More information about teachers’ perspectives on hybrid versus online program models can be found in Table Four below.

Question	N	Weighted Average
I think this is a program that could be just as effective if it was fully online (classes and meetings with staff).	29	1.83
It would be easier for me to meet program expectations if classes and the meetings were fully online.	28	2.11
I think more people would be interested in this program if it was fully online.	29	2.34

Open-ended Questions

Teachers were also given the opportunity to provide feedback about the program through three open-ended questions. Specifically, the questions asked whether teachers shared what they learned at their school, the type of additional support needed to succeed in the program, and about the most helpful components of the program.

Have you shared what you learned in the EMSS program with others at your school? If yes, how?

The first questions focused on whether teachers had the opportunity to share their newly acquired knowledge with anyone at their school. The majority of teachers (n= 24) responded that they have shared information with others, while four teachers indicated they have not shared what they have learned. Among those who have shared information, 21 teachers shared with other teachers, eight teachers shared their learning with their administration, and four with their instructional coaches. In order to increase their reach, four of these teachers also organized professional development sessions

about their new EMSS information, and two have shared their knowledge across grade levels. More information about how and with whom teachers shared their learning can be found in Table Five below.

Table Five. Have you shared what you learned in the EMSS program with others at your school? If yes, how?

Yes/No?	Themes	Number of teachers	Example quotes
Yes (n=24)	Teachers/Colleagues	21	<i>"Yes, Other teachers. I try to share what I learn in class, because I'm not the only teacher who wishes they could be better at teaching math."</i>
	Administration	8	<i>"Yes. As I have pulled students from their classes to work with me on my assignments, I have shared the results and suggestions from the class with them. I have also shared with my administration and Professional Development Teacher."</i>
	Educational Coaches	4	<i>"Yes! I have shared my learning with my team, including our instructional coach in more than on PLC. I have shared my excitement with my principal as well as other coworkers in other grade levels."</i>
	Organize PD	3	<i>"Yes, I have shared individually with colleagues and I presented a school-wide PD on number talks."</i>
	Across grade levels	2	<i>"Yes!! I have taken what I have learned back to my team as well as other grades."</i>
No (n=4)	Was planning on sharing	4	<i>"Not yet! I have mentioned to my colleagues that I have good math strategies, tools and assessments that I want to share with them soon"</i>

What additional support or skill development do you still need to succeed in this program?

The second open-ended question asked teachers about any additional support or skill development they still need to be successful in the EMSS program. The most important skill that teachers indicated they need is the ability to influence and to help their peer teachers in order to further spread their EMSS knowledge and learning among others. Along with the ability to influence colleagues, teachers want to build their leadership skills. Teachers would also like to have the ability to develop a deeper understanding of the content. Concerning skills and support in their classroom, teachers would like to get access to more teaching resources, to learn about more instructional practices, and to dive deeper into students' assessment methods. More information about additional support and skill development that teachers feel they still need can be found in Table Six below.

Table Six. What additional support or skill development do you still need to succeed in this program?		
Themes	Number of teachers	Example quotes
Influence and/or help peer teachers	5	<i>"I need to develop the skills needed to influence our entire teaching staff and open their eyes to all that I'm learning."</i>
Deeper content understanding	5	<i>"deeper understandings of all the content we have learned (we have not gone deep enough)."</i>
More teaching resources	4	<i>"I like to continue to receive resources, reading materials, and activities. Things that are easy to pass on to my colleagues is helpful. It's also helpful when the research to back it up is given."</i>
Leadership skills	3	<i>"More leadership training. I feel confident in my skills, but unsure and insecure as a leader."</i>
Students' assessments methods	3	<i>"A clear what to do after you test and identify student's levels and identify the area of need. "</i>
Instructional practices	2	<i>"What I feel I need is practice, practice, practice with students."</i>

What have been the most helpful components of the program for you up to this point?

The third open-ended question asked teachers to share what they believed were the most helpful parts of the EMSS program at this halfway point. Overall, teachers are extremely pleased with the program and listed many different helpful components. The most recurring ones were the study groups and the hands-on experience aspect of the program. Along with the hands-on experience, teachers enjoyed the challenging activities and problems performed in class. The teaching resources and the assessment methods that teachers learned and developed throughout the year were also helpful, especially the videotaping assessment techniques. Lastly, teachers also brought up the opportunities to meet with the rest of the cohort and instructors in the face-to-face sessions as helpful aspects of the program. More information about the most helpful components of the program can be found in Table Seven below.

Table Seven. What have been the most helpful components of the program for you up to this point?		
Themes	Number of teachers	Example quotes
Study group	11	<i>"I think my study group is the most helpful thing for me. I like being able to share struggles and bounce ideas off of each other to use in our classrooms. They really push me to do my best."</i>
Hands-on experience	11	<i>"I have absolutely enjoyed the hands-on experiences and getting to play and have fun with math again."</i>
Activities and Problems	5	<i>"All of it really, but I have especially enjoyed the time used to collaborate and work in small groups trying out activities and working through problems"</i>

Assessment methods	5	<i>"I would say assessment tools and opening my ideas to new ways of working with numbers have both been equally important. "</i>
Teaching resources	4	<i>"Reading materials, provided videos and resources, thoughtful math activities"</i>
Face-to-face classes	3	<i>"The face to face meetings because of all the hands-on activities we do in class."</i>
Video tape	3	<i>"Videoing myself for reflection and to assess student's learning."</i>

Final Summary and Recommendations

This report examined changes in key constructs over the course of the first year among teachers participating in the new Elementary Mathematics and Science Specialist Master's program and presents teacher feedback about their experiences up to this point.

Overall, we observed positive changes when comparing teachers' pre and post survey results. More specifically, teachers appeared to have gained confidence in:

- their mathematics teaching abilities.
- their capacity to reach out to students from diverse backgrounds.
- implementing inquiry-based practices.
- understanding the benefits of and value in inquiry-based practices.

Through the survey, teachers were able to share their enthusiasm and excitement about the EMSS program as well. Specifically, teachers indicated that:

- They are learning and developing deep instructional techniques that not only affect their mathematics teaching, but their pedagogy as a whole.
- The logistics and organization of the EMSS program are efficient and well structured.
- They are extremely grateful and excited to be part of this learning experience and consider themselves to be better teachers after one year in the program.

Therefore, the SOAR Center recommends that the EMSS program staff:

- Continue encouraging teachers to adopt inquiry-based practices in their classroom.
- Given the uncertain times caused by the COVID pandemic, continue collecting teachers' feedback about the EMSS structure and organization to better address their needs and challenges.
- Further explore instructional strategies that will effectively reach the diverse student populations that these teachers work with every day.