

**MICRON Innovation Grant
STEM Education Innovations
Final Report**

**Technology to Teach Mathematical Practices to Parents
Julie Amador**

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Award Amount: \$8,000

Budget Number: KRK001, AMADKB

Project Name: Technology to Teach Mathematical Practices to Parents

1. SUMMARY OF INNOVATION.

1.1 Purpose

The main goal of the project was to provide support to parents of students in grades K-6 through familiarization with the *Standards of Mathematical Practice* in the Common Core State Standards for Mathematics. The intent was that with increased knowledge about the Standards for Mathematical Practice, parents would increase their confidence to help their children with mathematics homework. Specifically, the project focused on two mathematical practices: 1) Problem Solving: "Make sense of problems and persevere in solving them," and 2) Models in Mathematics: "Model with mathematics" (CCSSM, 2010, p. 7). Both mathematical practices are pertinent for helping students in grades K-6 succeed.

1.2 Implementation

To implement the project, a video tutorial focused on the aforementioned Standards for Mathematical Practice was created with the intent of providing a link for parents between the Common Core State Standards and methods for assisting their children at home. There are two versions of the video tutorial. Version one is approximately twenty-one minutes long and includes increased dialogue about the context of the Standards for Mathematical Practice. Version two is a streamlined version designed to provide the most intense methods for parents to help their children in a reduced tutorial timeframe. Version two was used for all data collection purposes; version one was not distributed. This tutorial was created with the assistance of the Video Production Center at the University of Idaho and launched via the internet through a link using the Qualtrics survey site. Parents participating in the tutorial watched the tutorial and completed survey questions about their experience with the Common Core State Standards, their ability to help their child with mathematics homework, the knowledge gained from the tutorial, and the ease of the tutorial. In total, 77 parents took part in both the tutorial and the survey (this was the research component of the project), with 41 of the 77 completing all survey questions and the tutorial. It should be noted that the tutorial and survey questions were designed so that participants could not complete survey questions past the tutorial without playing the entire video tutorial. Following data collection, another 151 viewed the video and did not take part in the survey (the video was released following the data collection to a public audience).

2. PERSONNEL AND COMMUNITY PARTNERS/PARTICIPANTS.

2.1. University Partners

Dave Tong, Video Production Center

Dave was essential in assisting with the design and creation of the video tutorial. He assisted with creation of the slides for the tutorial and was the director of the filming project.

Dan Campbell, College of Education

Dan assisted with the design and implementation of the survey delivery via Qualtrics. Specifically, he assisted with embedding the video tutorial within the larger survey structure.

2.2 Community Partners

Post Falls School District

The Post Falls School District distributed flyers to parents about the video tutorial.

2.3 Participants

Research participants were defined as those who viewed the video tutorial and took part in the entire survey process. Forty-one research participants took part in the entire study. An additional fifty-one parents viewed the video as a component of the survey, but did not finish all survey questions. Outside of the survey and tutorial link, the video was posted on YouTube. One hundred fifty-one viewers watched the tutorial from that site. All numbers are based on data collected through November 25, 2013.

3. BUDGET SUMMARY

The majority of the budget was spent on the creation of the video tutorial and stipends for participants.

Items	Budget	Actual	Balance
Hardware/Camera Tripod/Memory Cards	1200.00	745.42	454.58
Creation of Video Tutorial	3510.50	3545.90	-35.40
Travel for Video Production	300.00	65.73	234.27
Stipends for Participants	1250.00	1250.00	0
NVivo Training	370.00	370.00	0
NVivo Qualitative Analysis	569.50	569.50	0
Conference Travel-Dissemination	800.00	1371.25	-571.25
	8000.00	7756.80	82.20

4. EVALUATION OF PROGRAM OBJECTIVES AND GOALS.

4.1 Video Tutorial

The video tutorial may be accessed at the following site: http://youtu.be/uQ_4bO4SN58

The survey, including the video tutorial, may be accessed at the following site:
https://uidahoed.qualtrics.com/SE/?SID=SV_d9UNOD4vOKQCCG1

The survey questions without the tutorial are located in Appendix A.

4.2 Overview of Findings

Research findings indicate that the video tutorial supported parents in understanding how to assist their children with learning mathematics. Additionally, parents found the online video format to be advantageous, as compared with attending an in-person class. Ninety-five percent of parents who viewed the video tutorial indicated that they now have at least one new idea for helping their child learn mathematics. Similarly, 89% of respondents indicated that from watching the video they are now more equipped to help their child learn the Common Core State Standards. Specifically, parents found value in learning how to help their children problem solve, by considering the different conceptual components within problems. One parent commented, "It showed me how to work through a problem with my child, rather than jumping right to the end to figure out the answer. I realized that the process is just as, if not more important than arriving at a right answer." In addition to finding value with the content of the tutorial, parents found the online video tutorial delivery method to be advantageous, with over 90% of respondents indicating that the video format was a helpful way for them to learn to support their child. Findings indicate that parents would value similar resources focused on specific grade levels and content areas.

4.3 Research Question 1 & 2: Standards for Mathematical Practice

The following research questions were written in the proposal for funding: 1) Does participation in an online video tutorial improve parent knowledge about the *Standards for Mathematical Practice*?, 2) Does participation in an online video tutorial about the *Standards for Mathematical Practice* increase parents' perceptions of their ability to support their children with mathematics homework?

The following results are based on data from those who completed the video tutorial (n=41). 77 respondents began the video tutorial, but did not complete every question; the tutorial was viewed 154 times on YouTube, outside of the data collection process.

Table 1 provides data from survey questions focused on the Standards for Mathematical Practice as well as the Common Core State Standards because the Standards for Mathematical Practice are a component of the larger initiative.

Statistic	This video helped me learn about the Common Core State Standards for Mathematics	I now have at least one new idea for helping my child learn mathematics	I have a better understanding of the Standards for Mathematical Practice
Min Value	2	2	1
Max Value	5	5	5
Mean	4.07	4.37	4.00
Variance	0.52	0.44	0.75
Standard Deviation	0.72	0.66	0.87
Total Responses	41	41	41

Table 1. Survey responses on a scale of 1-5, ranging from strongly disagree (1), to neither agree nor disagree (3), to strongly agree (5).

For the statement, “This video helped me learn about the Common Core State Standards for Mathematics”, the mean value was 4.07, with 83% of respondents indicating they agreed or strongly agreed that the video helped them learn about the Common Core State Standards for Mathematics.

For the statement, “I now have at least one new idea for helping my child learn mathematics”, the mean value was 4.37 with 95% of respondents agreeing or strongly agreeing that they now have at least one new idea. This relates to the Standards for Mathematical Practice because the ideas presented in the tutorial were focused on the Standards for Mathematical Practice.

For the statement, “I have a better understanding of the Standards for Mathematical Practice,” the mean value was 4.00, with 80% of respondents agreeing or strongly agreeing to this statement.

It should be noted that some participants who took the survey are practicing teachers and administrators, so they may have begun the tutorial with some knowledge about the Standards for Mathematical Practice. Likewise, of those who started the tutorial (n=77), 20% of respondents assessed their knowledge of the Standards for Mathematical Practice in the Common Core State Standards as good or very good at the onset of taking part in the tutorial. As a result, the finding that 95% of the participants agreed or strongly agreed that the tutorial gave them at least one new idea for helping a child learn mathematics is important for understanding the impact of the tutorial. Likewise, greater than 80% of the respondents indicated that the tutorial increased their knowledge of the Standards for Mathematical Practice.

The first Standard for Mathematical Practice states, “1. Make sense of problems and persevere in solving them.” Participants were asked about the most helpful portion of the tutorial. The following responses related to this Standard for Mathematical Practice:

- “Using examples and showing ways that kids might work out each problem.”
- “How the instructor ‘broke down’ the problems.”
- “Example real life problems.”
- “The examples. Showing me how many mathematical problems are all around us in the community.”

“Tips on making everyday math problems.”

“The breakdowns on how to explain math problems to your child. It helps them think of it in different ways.”

“Knowing the questions to ask to help develop problem solving skills.”

“Problem solving portion; breaking it down and giving examples.”

“Explaining step by step how to help child with math problems.”

Two main themes are evident in these data: 1) Parents valued the examples of problem solving, 2) Parents valued knowing how to work through each part of problems to encourage problem solving.

The fourth Standard for Mathematical Practice states, “4. Model with mathematics.” Participants were asked about the most helpful portion of the tutorial. The following responses related to this Standard for Mathematical Practice:

“Modeling of math explanation.”

“How to Model a problem.”

“The modeling mathematics examples.”

“The concept of modeling.”

“Definitions of modeling.”

“Giving examples of models.”

“The explanation of math modeling. My son has been doing it for a while, but I did not know why. Thank you.”

One main theme is evident in these data: 1) Parents valued understanding the meaning, concept, and examples of mathematical modeling.

Additional data analysis will take place during the spring 2014 semester for dissemination next year.

4.4 Research Question 3: Online Video Tutorial Format

The following research question was suggested by proposal reviewers and was added to the original research questions: 3) Is an on-line tutorial an effective delivery method with this demographic of parents?

The following results are based on data from those who completed the video tutorial (n=41). 77 respondents began the video tutorial, but did not complete every question and the tutorial was viewed 154 times on YouTube, outside of the data collection process.

Table 2 provides data from survey questions focused on the Online Tutorial Format.

Statistic	Learning how to help my child through an online format is helpful	I would prefer to go to a class to learn to help my child	Watching a video is a helpful method for learning to support my child	Video tutorials are convenient
Min Value	2	1	2	3
Max Value	5	5	5	5
Mean	4.12	2.51	4.12	4.46
Variance	0.51	1.56	0.36	0.35
Standard Deviation	0.71	1.25	0.60	0.60
Total Responses	41	41	41	41

Table 2. Survey responses on a scale of 1-5, ranging from strongly disagree (1), to neither agree nor disagree (3), to strongly agree (5).

For the statement, “Learning how to help my child through an online format is helpful”, the mean value was 4.12, with 90% of respondents indicating they agreed or strongly agreed that an online format was helpful.

For the statement, “I would prefer to go to a class to learn to help my child,” the mean value was 2.51, with 59% of respondents disagreeing, 20% of respondents neither agreeing nor disagreeing, and 21% of respondents agreeing.

For the statement, “Watching a video is a helpful method for learning to support my child,” the mean value was 4.12, with 93% of respondents indicating they agreed or strongly agreed that an online format was helpful.

For the statement, “Video tutorials are convenient,” the mean value was 4.46, with 95% of respondents indicating they agreed or strongly agreed about the convenience of video tutorials.

To further investigate this question, parents were asked, “What would be your preferred delivery method for learning how to help your child?” Figure 1 provides data describing preferences;

#	Answer	Response	%
1	Online Tutorial	28	68%
2	In person class or workshop	3	7%
3	Letter from school	6	15%
4	Other	4	10%
	Total	41	100%

Figure 1. Responses to question, “What would be your preferred delivery method for learning how to help your child?” (n=41)

Those who indicated “other” (n=4) indicated a (1) website, (2) online tutorial with follow-up workshop, (3) handout, and (4) all of the mentioned categories.

Findings indicate that parents valued the online format and found the video tutorial to be a convenient method. Likewise, they found the tutorial helpful for learning to support their children. Of all delivery methods mentioned, including the option to suggest other methods, online tutorial was the most preferred by parents.

5. RELATED EXTERNAL PROSPOALS SUBMITTED/FUTURE EXTENSIONS.

5.1 External Proposals

Recognizing the need to further support parents with assisting their children with learning mathematics, the Idaho Regional Mathematics Center 1, funded by the Idaho State Department of Education, is working to provide continued resources and materials to parents. Data from the present Micron study further provided evidence of the needs of parents in northern Idaho, and specifically in Post Falls. By January 1, a new website will be launched containing support materials for parents who plan to work with their children on learning the *Standards for Mathematical Practice* and the *Content Standards* within the Common Core State Standards. The grant for the Idaho Regional Mathematics Center 1 was written prior to the implementation and results of the present Micron project; however, these findings are influencing how the funds are spent and will be considered when writing the next annual grant through the Idaho State Department of Education.

5.2 Dissemination

Findings from this research will be presented at the annual meeting of the National Council of Teachers of Mathematics:

Amador, J. (2014 April). *Helping parents help children: Teaching mathematical practices through technology*. To be presented at the Annual Meeting of the National Council of Teachers of Mathematics, New Orleans, LA.

An article reporting these findings is under review in *Teaching Children Mathematics*.

Amador, J. (under review). Parents Press Play for Practices. *Teaching Children Mathematics*, National Council of Teachers of Mathematics.

An article reporting these findings will be submitted to a Call for Proposals in *School Science and Mathematics Journal* for the special issue titled: Parent Engagement in Science and Mathematics Learning (appendix B).

5.3 Press

An article focused on describing the work associated with the tutorial for parents was published in the *Idaho Statesman*: <http://www.idahostatesman.com/2013/10/07/2804009/putting-parents-in-the-stem-equation.html>

APPENDIX A

Please note: The survey was never given in paper form and was branded with the University of Idaho logo when administered online. The formatting in this document does not represent the formatting of the actual survey.

Thank you for taking part in this online tutorial, focused on helping you know how to support your child with mathematics. You will be asked to answer a few short questions. After doing so, you will be asked to watch a video tutorial that is approximately sixteen minutes long. After viewing the tutorial, you will be asked to answer a few additional questions. This tutorial is intended for parents of elementary aged children who live in Post Falls, Idaho. The first 25 people who meet this criteria and complete the questionnaire with viewing the tutorial will be mailed a \$50.00 gift card.

September 5, 2013

Dear Parent, Recently, the state of Idaho has adopted new K-12 standards in mathematics, known as the Common Core State Standards. The purpose of this project is share with you about these standards and help you learn to support your child as he or she learns these new standards. The second purpose is to understand the role of technology help you learn about these standards. The University of Idaho Institutional Review Board has certified this project as Non-Exempt. You will be asked to take a short pre survey, watch a video tutorial about the mathematical standards, and take a post survey. You will complete this process on your own time electronically through the internet. You may be asked to participate in an interview to learn about the process and whether or not it helped you know more about the standards. Although there are no or minimal risks associated with the project, you may be unfamiliar with the new standards or the mathematics content discussed. You may benefit from this project by learning how to support you child as he or she learns mathematics and you will receive a gift card for your participation. All information collected will be placed in a locked file cabinet with access only available by me. If you have questions about the study, you are welcome to contact me at any time.

Investigator
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University of Idaho
Department of Curriculum and Instruction
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Ph. 208-664-7010

You are able to remove yourself from the study at any point and there will be no repercussions. Photos or videos of this process may be taken for communication and publicity purposes.

Sincerely,
Julie Amador

The video tutorial begins with a few short questions about your understanding of helping your child learn mathematics.

Rate your knowledge about the following:

	Very Poor (1)	Poor (2)	Fair (3)	Good (4)	Very Good (5)
The mathematics your child learns in school (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The mathematics your child needs to know (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Common Core State Standards for Mathematics (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The Mathematical Practices in the Common Core State Standards for Mathematics (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How often do you engage in the following:

	Never (1)	Less than Once a Month (2)	Once a Month (3)	2-3 Times a Month (4)	Once a Week (5)	2-3 Times a Week (6)	Daily (7)
incorporate mathematics into your child's everyday life (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
talk with your child about mathematics (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
engage in mathematics yourself (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

If the following video does not automatically start, please press the play button. You will be able to advance to the next part of the survey once you have finished watching the entire video. The video is approximately 16 minutes long.

[insert video here]

Now that you have viewed the tutorial, please answer the following questions to help us know how to better provide support to parents in the future.

The following questions are designed to get your feedback on the content of this video.

What was the most helpful portion of the video?

What would have been helpful to include in the video?

What was the least helpful portion of the video?

Please consider the following and indicate the extent to which you agree or disagree.

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
This video helped me learn about the Common Core State Standards for Mathematics (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>I now have at least one new idea for helping my child learn mathematics (2)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I would like to know more about how to help my child learn mathematics (3)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I would like to know more about the Common Core State Standards for Mathematics (4)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>From watching the video, I am able to help my child with mathematics (5)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>I have a better understanding of the Standards for Mathematical Practice (6)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<p>After watching the video, I am now more equipped to help my child learn the Common Core State Standards (7)</p>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What else would you like to know to support your child with the new Common Core State Standards?

To what extent did watching this video help you understand how to help your child with mathematics?

The following questions are designed to get your feedback on the format of this tutorial.

Please consider the format of watching a video for a tutorial. Rate the following:

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
Learning how to help my child through an online format is helpful (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would prefer to go to a class to learn to help my child (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Watching a video is a helpful method for learning to support my child (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Video tutorials are convenient (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What would be your preferred delivery method for learning how to help your child?

- Online Tutorial (1)
- In person class or workshop (2)
- Letter from school (3)
- Other (4) _____

The following demographic questions are to help us understand more about you.

What school does your child(ren) attend?

How often do you visit your child's school during school hours?

- Never (1)
- Less than Once a Month (2)
- Once a Month (3)
- 2-3 Times a Month (4)
- Once a Week (5)
- 2-3 Times a Week (6)
- Daily (7)

How often do you talk with you child's teacher?

- Never (1)
- Less than Once a Month (2)
- Once a Month (3)
- 2-3 Times a Month (4)
- Once a Week (5)
- 2-3 Times a Week (6)
- Daily (7)

How many hours a week do you work outside of the home?

- 0-10 (1)
- 11-20 (2)
- 21-30 (3)
- 31-40 (4)
- 40+ (5)

How many hours a week are you on the internet, using any device? (computer, phone, tablet, etc.)

- 0-5 (1)
- 6-10 (2)
- 11-15 (3)
- 16-20 (4)
- 21-25 (5)
- 26-30 (6)
- 31-35 (7)
- 36-40 (8)
- 40+ (9)

How many children do you have in each of the following grades?

- K-2 (1) _____
- 3-5 (2) _____
- 6-8 (3) _____
- 9-12 (4) _____

What is your highest level of education?

- less than high school diploma (1)
- high school diploma or equivalent (2)
- some college (3)
- college degree (4)
- graduate degree (5)

Thank you for participating in the survey. The first 25 respondents will receive a \$50.00 gift card. If you would like to receive this gift card, please enter your name and address below. Each household is limited to one gift card. You may also decline to remain anonymous. We will mail the gift card to the address listed, but are not responsible for delivery and will not be able to replace gift cards that do not make it to their destination. If you have any questions about this process, please contact Julie Amador at the University of Idaho at jamador@uidaho.edu, or at (208) 664-7010.

Name (1)

Address (2)

Address 2 (3)

City (4)

State (5)

Postal Code (6)

Email address (7)

Telephone Number (Optional) (8)

9 (9)

Check here if you would be willing to meet with someone from from the university to talk more about your experiences helping your child learn mathematics. There would be additional compensation for these meetings and they would last no more than twenty minutes.

- Yes (1)
- No (2)

APPENDIX B



Parent Engagement in Science and Mathematics Learning Special Focus Issue of *School Science and Mathematics Journal*

Guest Editors: Julie Thomas and Sandi Cooper

Reforming math and science education – bringing new understandings about learning and cognition into line with a knowledge explosion in the Information Age seems a formidable challenge. Teachers need the support of parents who desire the best possible learning experiences all children. Parents need to understand how teaching and learning in math and science has changed in recent years. New national standards (Common Core and Next Generation Science Standards) for mathematics and science teaching propose a different kind of learning environment where students are more actively involved, building understanding through active, learning processes and real-world experiences.

Parents are imperative partners in this ongoing, systemic reform. They can make or break the reform-oriented attempts of new-beginning teachers and district administrators. Though there are many professional development materials on the market, the parent audience is the most overlooked and perhaps the most important. We expect that parents who understand reform efforts can positively influence children's elementary science and mathematics learning. Parents may prove important allies in engaging females and other, traditionally underserved populations, improving student engagement and achievement, and guiding otherwise promising practices that help broaden participation in the STEM workforce.

In this special focus issue of SSM, the editors will highlight important issues, current research, and successful programs related to partnerships with parents and families. In particular, the editors seek manuscripts that address the following:

- How might parent engagement improve science and mathematics learning?
- What are some effective models of engaging parents in science and mathematics learning?
- How do parents' attitudes and beliefs about science and mathematics impact student achievement?
- What are some effective models of preparing preservice teachers to engage parents in science and mathematics learning?
- What program or resources support or encourage parent involvement in science and mathematics?
- What guides parents and teachers understanding about technology as a useful tool in science and mathematics learning?

Manuscripts need to be submitted by April 1, 2014 through Scholar One website (see the journal website for details: <http://onlinelibrary.wiley.com/journal/10.1111/%28ISSN%291949-8594>). Please indicate in your cover letter that your manuscript is to be considered for the *Parent Engagement* special issue. This special issue will be published in January, 2015. Inquiries are welcome and may be sent to Dr. Julie Thomas (julie.thomas@unl.edu) or Dr. Sandi Cooper (sandra_cooper@baylor.edu).