

# A Comparison of Barriers to Teaching and Learning of Mathematics and Science Across a Three Year Study of the Misconceptions Management Professional Development

Crystal Stein

College of Education and Human Development, Department of Educational Leadership, Research and Technology

## Introduction

**Science and Mathematics Misconceptions Management (SaM<sup>3</sup>)** is a statewide collaborative effort between the Michigan Mathematics and Science Centers Network and the Michigan Department of Education to provide middle and high school science and mathematics teachers with professional development opportunities.

The research questions include: 1) What are some barriers to teaching and learning mathematics and science? 2) What are the similarities and differences of barriers to teaching and learning mathematics and science in different parts of Michigan?

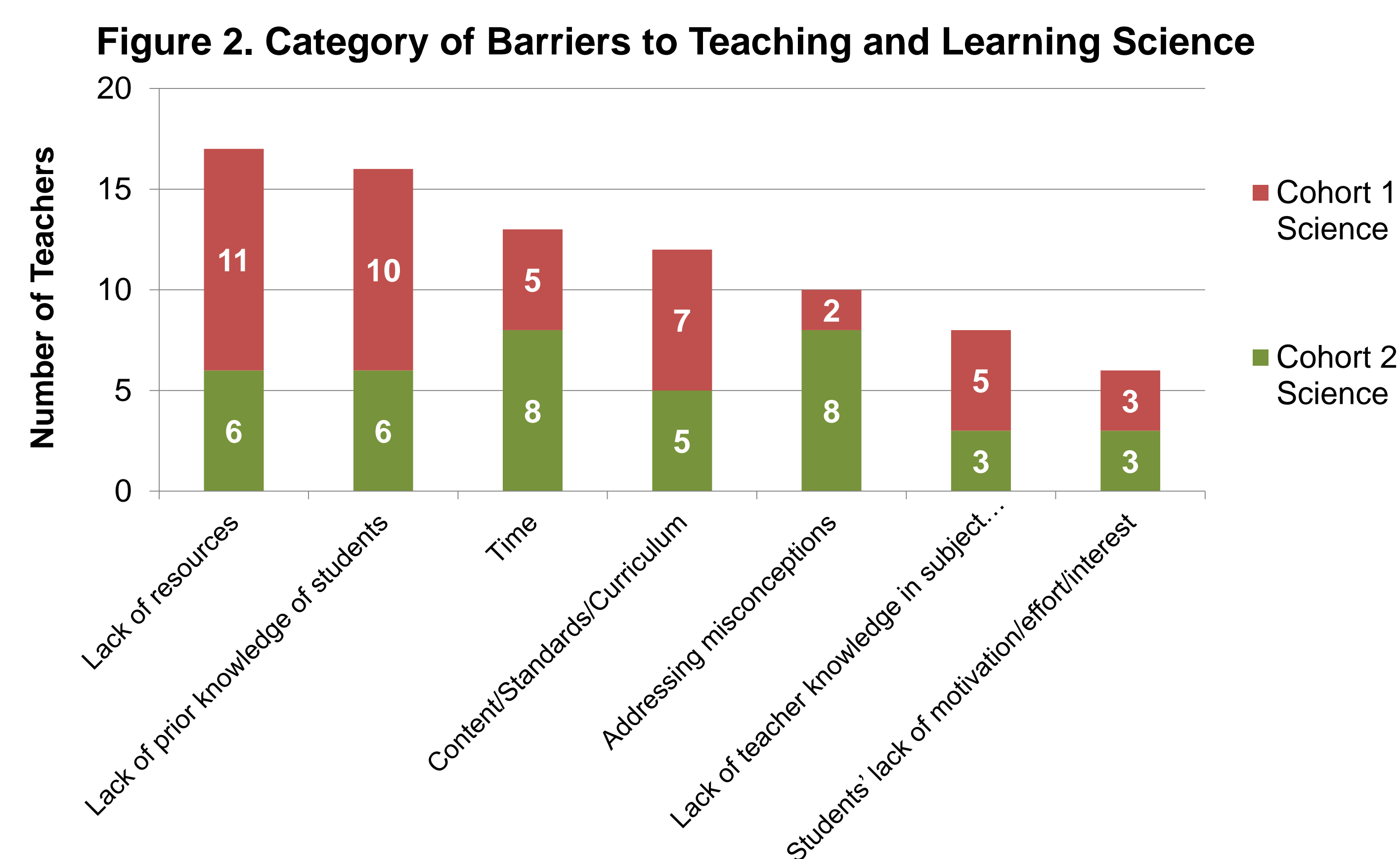
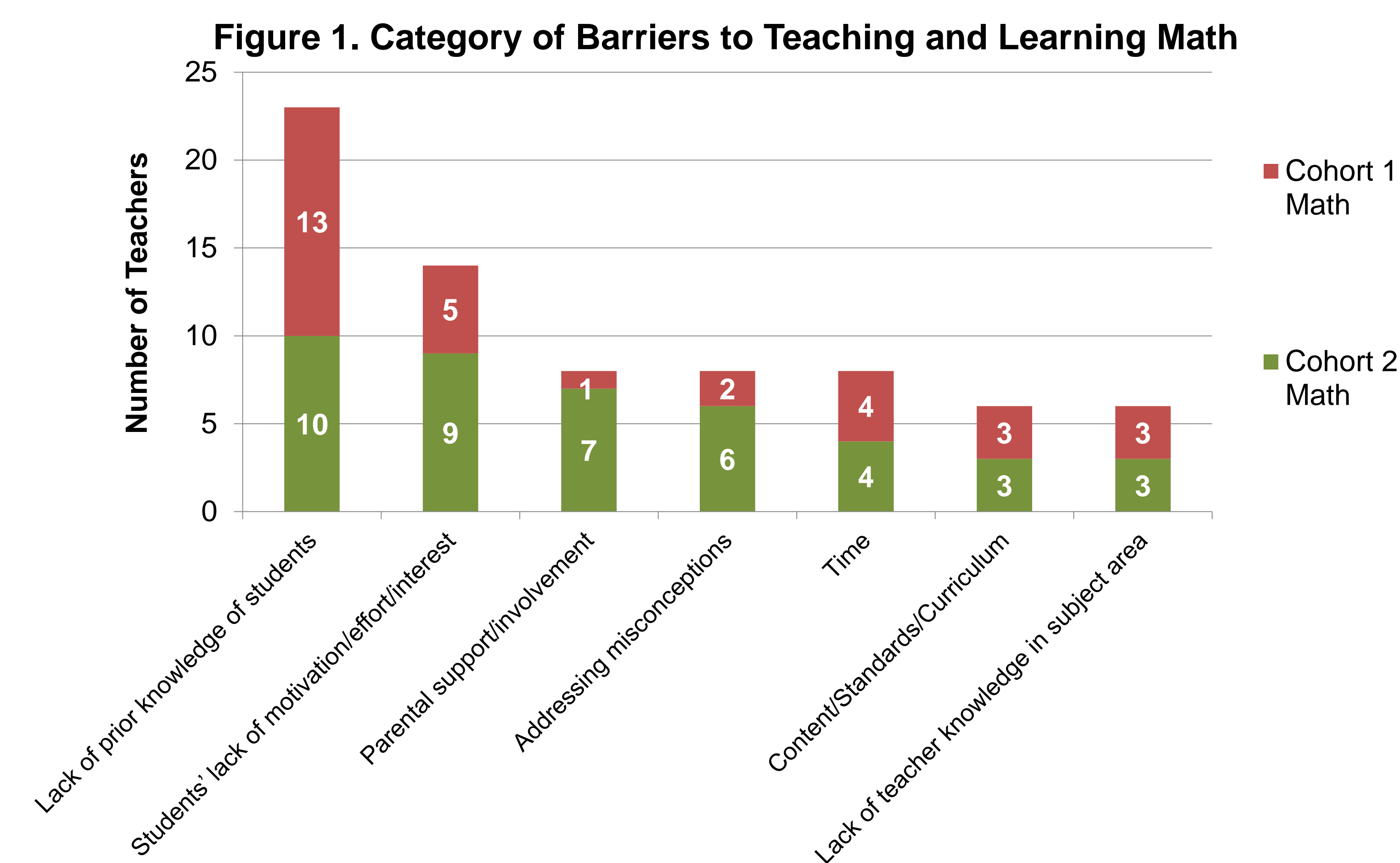
Answers to these questions will 1) inform stakeholders about the barriers to implementing mathematics and science educational improvement programming, 2) show changes to educational environment and standards effects teachers and students, 3) provide information to project directors and staff designing professional development.

## Methods

- Teacher surveys collected at the beginning of the 2011 and 2012 Summer Institutes.
- 28 mathematics and 31 science teachers completed the survey in 2011 (Cohort 1), and 38 mathematics and 32 science teachers completed the survey in 2012 (Cohort 2).
- Cohort 1 participants were primarily from urban areas in southern and eastern Michigan. Cohort 2 participants were primarily from rural areas in the Upper Peninsula and northwestern Michigan (see Figure 3, right).
- The survey was paper/pencil and prepared by a team of evaluators at Science and Mathematics Program Improvement (SAMPI), Western Michigan University.
- Data were entered into an Access® database.
- Survey contained a question on barriers to teaching and learning mathematics and science which has been used here for analysis.
- In this qualitative study, data were analyzed by categorizing the open-ended question of barriers.

## Results

**Barriers to Implementation:** Teacher participants were asked the following question on the pre-survey: *What are the major issues or concerns for you related to the teaching and learning of mathematics at your grade level?* The top seven responses from mathematics and science are shown in the figures below.



The top barriers for mathematics teachers were heavily student related: Lack of prior knowledge and Lack of motivation/effort/interest. In addition, Parental support/involvement and Addressing misconceptions were also high concerns. The top barriers for science teachers were Lack of resources, Lack of prior knowledge of students, Time, Content/Standards/Curriculum, and Addressing misconceptions.

## Discussions

The findings showed that teachers in urban areas in Michigan (Cohort 1) reported more barriers of student prior knowledge, lack of resources, and content/standards/curriculum. Teachers in rural areas in Michigan (Cohort 2) reported more barriers of student prior knowledge, student lack of motivation, and addressing misconceptions. This illustrates that not all teachers who completed the survey for the SaM<sup>3</sup> program are encountering the same barriers in urban and rural areas of Michigan.

Results of this survey help show stakeholders, project directors, and other educators the importance of addressing some of these barriers for programs like SaM<sup>3</sup>. Student prior knowledge could especially be a focus of professional development for K-8 teachers to help students obtain the necessary skills for advanced mathematics and science courses in high school and college.

## Conclusions

Several barriers to teaching and learning mathematics and science were reported for urban and rural Michigan teachers. Future professional development could utilize this information to help address barriers of student prior knowledge, student lack of motivation, and lack of resources.

Professional development for teachers in these areas could potentially help increase student achievement, graduation rates, matriculation to college, etc.

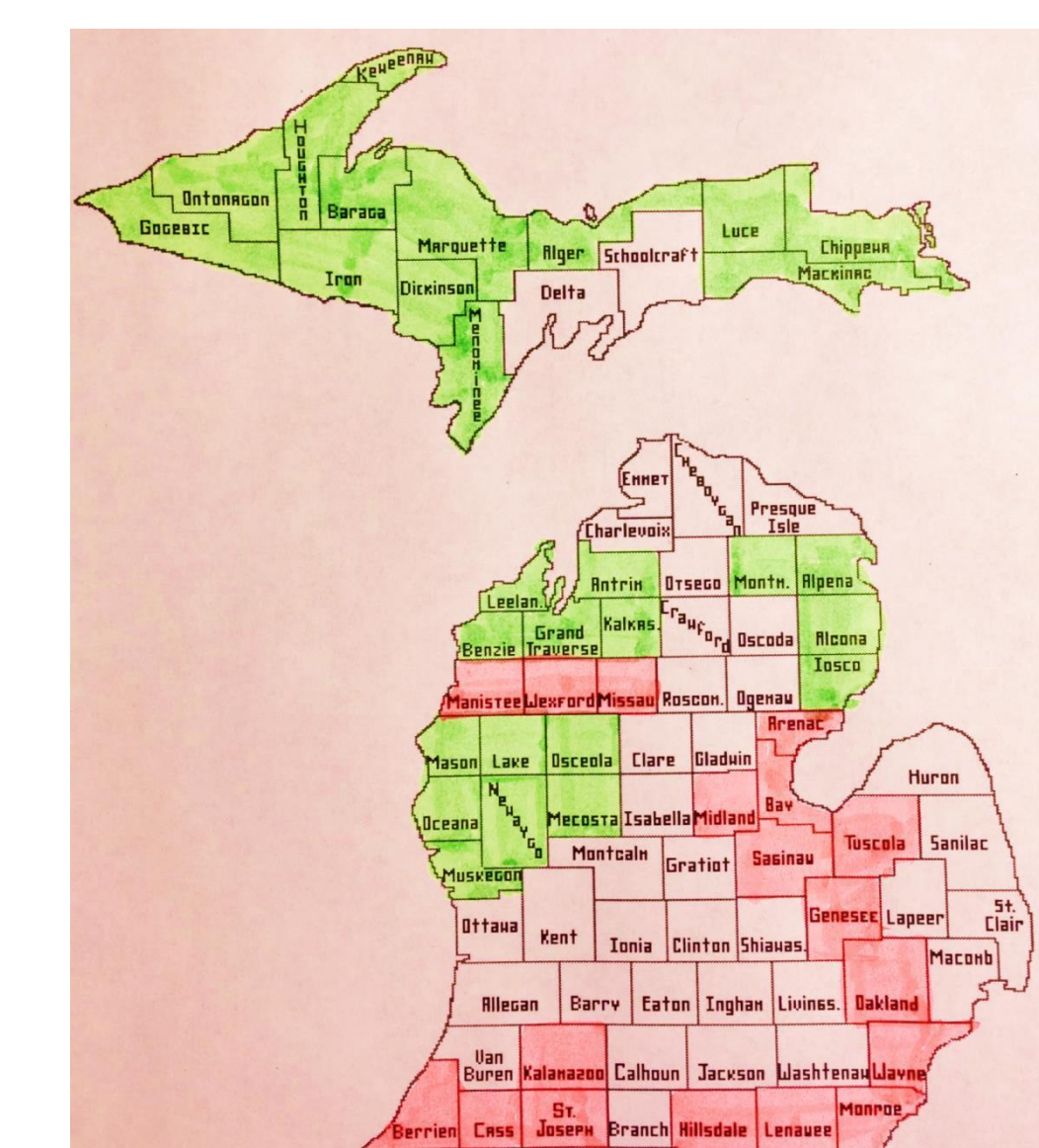


Figure 3.