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**IOWA MATHEMATICS EDUCATION NEEDS ASSESSMENT REPORT  
ANALYSIS OF K-12 TEACHER SURVEY  
2018**

**EXECUTIVE SUMMARY**

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**Prepared for**

**Jacobson Institute for Innovation in Education  
Grand View University**

**Prepared by**

**Mari Kemis, James Schiltz, and Roz Hirsch  
Research Institute for Studies in Education  
E005 Lagomarcino Hall  
Iowa State University  
Ames, Iowa 50011**

**Edited by**

**Robert Keller, Eric Hart, Judith Spitzli  
Jacobson Institute for Innovation in Education  
Grand View University  
1200 Grandview Ave  
Des Moines, IA 50316**

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**JACOBSON INSTITUTE FOR  
INNOVATION IN EDUCATION**

# IOWA MATHEMATICS EDUCATION NEEDS ASSESSMENT REPORT

## ANALYSIS OF K-12 TEACHER SURVEY

### 2018

## Executive Summary

The Jacobson Institute for Innovation in Education at Grand View University designed an Iowa mathematics education needs assessment in 2018. The purpose of the assessment was to gather data to help inform decisions about how to improve the teaching and learning of mathematics in Iowa's schools. The assessment was carried out through a survey of K-12 teachers. The resulting data and analysis are summarized in this report and provide information about the following questions:

- What are teachers' beliefs about teaching and learning mathematics?
- What are their teaching practices?
- What are their perceived strengths and weaknesses in mathematics and teaching?
- How confident are they in teaching Iowa Core Mathematics?
- What are their preferences for professional development?
- How and how much do they collaborate with their peers?
- And how do the answers to these questions differ for teachers with more or less experience, with different levels of education, with or without a mathematics endorsement, at different school levels, in districts of different sizes, in buildings where they do or do not have mathematics colleagues, and for different genders?

It has been many years since the last Iowa needs assessment. More recent data are needed to assess the current situation. The Jacobson Institute for Innovation in Education at Grand View University, in conjunction with the Research Institute for Studies in Education at Iowa State University, has endeavored to meet this need by conducting the present needs assessment, carried out with teachers in four Iowa AEAs spread across the state including urban, suburban, and rural schools.

The needs assessment survey first gathered demographic data on teachers, including years' teaching experience, grade level, whether or not they have a math endorsement and/or advanced degree, how many mathematics teaching colleagues they have in their building, and their participation in professional development activities.

Then data were gathered through a series of Likert-scale items related to six themes:

- (1) mathematics teaching practices,
- (2) teacher beliefs about teaching and learning mathematics,
- (3) perceived abilities and knowledge related to teaching mathematics,
- (4) preferences regarding professional development in mathematics,
- (5) amount and type of peer collaboration, and
- (6) confidence in teaching Iowa Core Mathematics.

These themes were further analyzed across four teacher profiles, defined by four key teacher characteristics:

- (1) years' experience teaching mathematics,
- (2) number of same-building peer teachers,
- (3) school level taught, and
- (4) having a mathematics endorsement.

Data were also analyzed with respect to other teacher characteristics: gender, district size, education level, and overall years' K-12 teaching experience (which includes teaching mathematics but may also include teaching other subjects).

Frequency analysis was used to provide descriptive statistics for the quantitative questions. Linear regression was used to examine relationships between the teacher characteristics and themes described above. Due to statistical limitations related to the large number of questions analyzed (60), these analyses are meant to uncover potential relationships between variables rather than make predictions or establish causality. Finally, the results from a few open-ended questions were summarized by grade level.

Many interesting results emerged from this needs assessment. These are presented in the full report. A few notable results are highlighted here, along with brief comments regarding possible implications for Iowa mathematics education.

1. *Strong positive results for teachers with a mathematics endorsement:*  
There are statistically and educationally significant positive results related to having a mathematics endorsement.  
⇒ Recommendation: Identify concrete steps that will help recruit, train, and utilize more teachers with a mathematics endorsement.
2. *Positive results for teachers with more experience teaching mathematics:*  
Furthermore, results indicate demonstrably greater impact from years teaching mathematics than from general teaching experience.  
Recommendation: Utilize, support, and promote teachers with more experience teaching mathematics, and find effective ways to connect them with their less experienced colleagues. Provide leadership opportunities and ongoing professional development in mathematics. Develop mentors and coaches with more years' experience teaching mathematics, not just general teaching experience.
3. *Some positive results regarding teaching practices:*  
Teachers report frequently using student collaboration when teaching mathematics; about 40% state they often or very often use rich tasks in their teaching; and a majority of teachers say they help their students achieve the Standards for Mathematical Practice daily or a few times weekly.

- ⇒ Recommendation: Build on and extend these positive results through ongoing professional development. But also carry out deeper analyses that find out how authentic and pervasive these practices are. For example, when teachers report teaching with "rich tasks," what does that really mean in terms of the actual tasks and how they are used, and when teachers report that they help students achieve the Standards for Mathematical Practice, how are they doing so and how are they determining that their students are achieving the standards.
4. *Some concerning results regarding teaching practices:*  
 Data indicate that the higher the school level the less often students work on rich tasks, talk to each other about mathematics, and explain solutions and reasoning to each other, and the less often teachers believe their lessons help their students achieve the standards of mathematical practice. A majority of less experienced teachers report poor or fair ability to provide both access and challenge in their lessons, and this result is only somewhat better for teachers with more experience.  
 ⇒ Recommendation: Find out more about these school level discrepancies and find strategies for reducing them. Design more effective professional development for promoting inquiry through "low floor, high ceiling" tasks.
5. *Indications of some disconnect between different descriptions of teaching practices and between practices and beliefs:*  
 While the data suggest that teachers are unlikely to give lectures when teaching mathematics often or very often, a large majority explain solutions to problems step by step and do worked out examples on the board often or very often. Similarly, while over 80% of teachers state that they "do more asking than telling" in their teaching, 80% also say that "an effective way to teach is to carefully explain mathematical ideas and methods to students," and they often do worked out examples on the board.  
 ⇒ Recommendation: Professional development programs should include analysis of teaching practices in classrooms, along with activities that move teachers from learning about evidence-based methods for improving mathematics education to learning how to implement those methods to owning those methods as habits of mind and habits of practice.
6. *Less than full confidence in many content areas of Iowa Core Mathematics:*  
 Large percentages of teachers, at all grade levels except Kindergarten, rate themselves as at most "moderately confident" to teach many mathematics topics in the Iowa Core Mathematics standards. And teacher confidence in teaching mathematics declines with grade level taught.  
 ⇒ Recommendation: Provide more mathematically rich, as well as pedagogically relevant, pre-service and in-service programs for teachers at all grade levels.

7. *Strong preference for face-to-face professional development:*  
This preference is strongest for face-to-face in combination with other modalities. Very few reported that professional development delivered solely online resulted in the most valuable experience.  
⇒ Recommendation: Continue to design and deliver face-to-face professional development programs, augmented with other modalities.
  
8. *Positive results for teachers working in buildings with greater numbers of same-building peer teachers:*  
With few exceptions, teachers working in buildings with greater numbers of same-building peer teachers implement more effective teaching practices, benefit from increased levels of collaboration, and have stronger perceived abilities and knowledge related to teaching mathematics.  
⇒ Recommendation: Increase support for teachers who have few, if any, colleagues teaching mathematics in the same building. Implement mechanisms to facilitate collaboration, especially at grade level and among a diverse population of teachers. Ensure that sufficient time is consistently afforded to allow for collaborative planning of mathematics instruction and review of student assessment data. The next point amplifies the need for this recommendation.
  
9. *Scarce peer collaboration among teachers:*  
Over half of teachers reported that they were never or rarely given regularly scheduled time during the school day to work collaboratively. One-third of teachers do not collaborate with teachers at their grade level and fewer than half collaborate more than a few times monthly with teachers at their grade level. About 60% do not collaborate with teachers at different grade levels and only 1 in 10 teachers collaborate more than a few times monthly with teachers at different grade levels.  
⇒ Recommendation: Peer collaboration and collegial support are important factors in teacher effectiveness and teacher retention. More mechanisms should be designed and put in place to provide this.

It is hoped that the information provided by this needs assessment will be helpful to mathematics education leaders in Iowa in their ongoing work to improve mathematics teaching and learning for all students.