Elementary Mathematics Specialists in Illinois

A Landscape Study of Statewide Interest and Need

BRIEF

Elementary Mathematics Specialists IN ILLINOIS

By Gudelia López, PhD, and Martin Gartzman

July 2020

CME GROUP FOUNDATION

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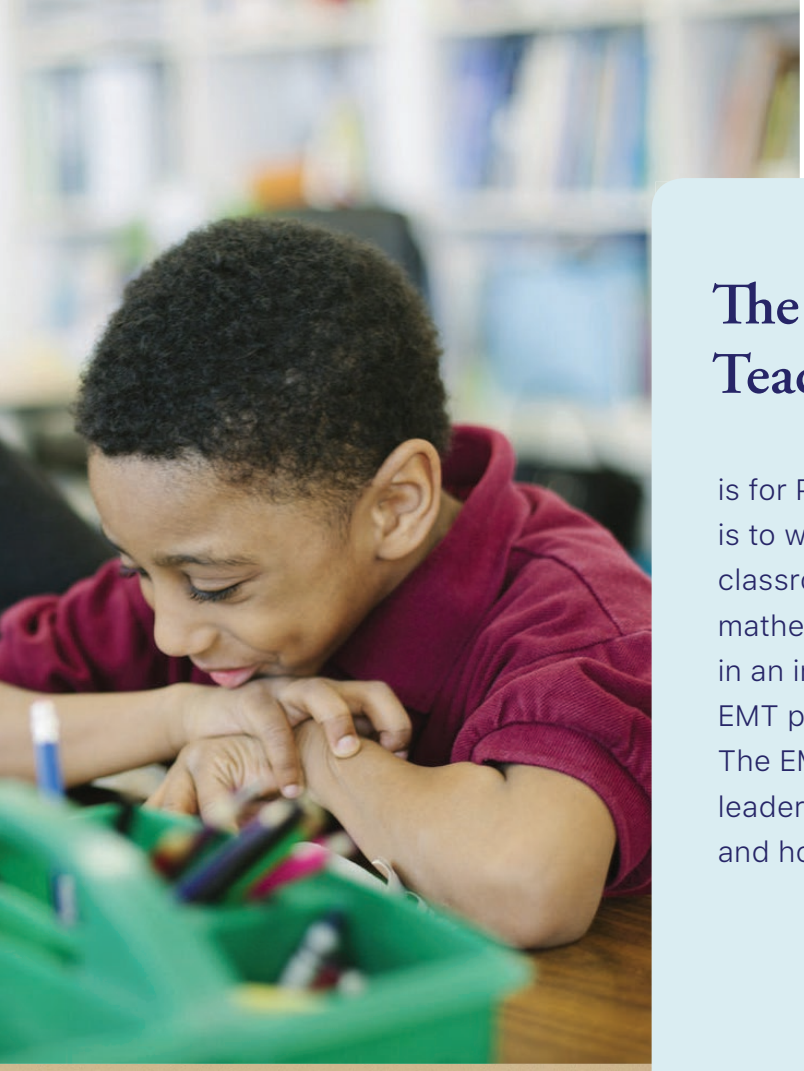
The full version of this report is available on the Elementary Mathematics Specialists in Illinois website https://emsforil.uchicago.edu/.

Introduction

Districts and Educator Leaders Support the Elementary Mathematics Teacher (EMT) and Elementary Mathematics Specialist (EMS) Endorsements in Illinois

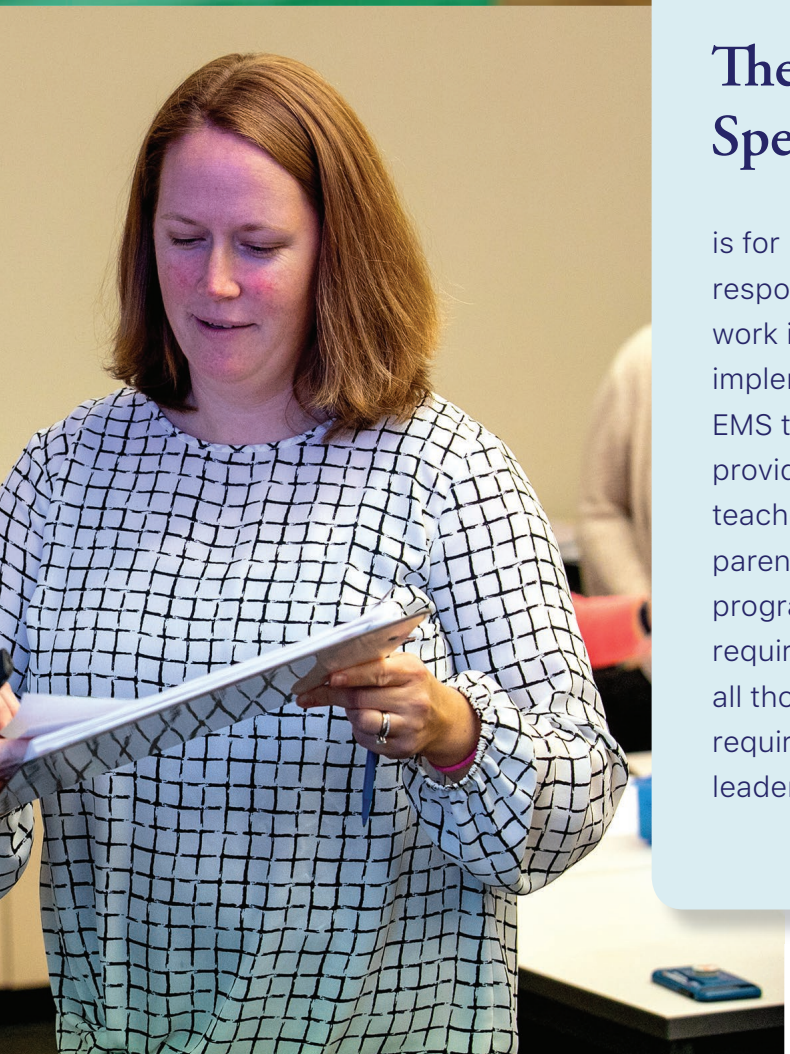
In November 2018, in conjunction with stakeholders, personnel from the University of Chicago, DePaul University, the University of Illinois at Chicago (UIC), and the Chicago Public Schools submitted proposals to the Illinois State Board of Education (ISBE) to establish two new elementary mathematics teaching endorsements: an Elementary Mathematics Teacher (EMT) endorsement and an Elementary Mathematics Specialist (EMS) endorsement.

These two new endorsements are intended for teachers who already hold a Professional Educator's License but are not intended to add new requirements for hiring. Rather they are intended to provide pathways to help elementary teachers deepen their knowledge of mathematics teaching and learning, and for districts and schools to strengthen their mathematics leadership (EMS Steering Committee, 2018).



The Elementary Mathematics Teacher (EMT) Endorsement

is for PreK–6 teachers whose primary responsibility is to work directly with students, either in a regular classroom setting, where the EMT is the principal mathematics teacher for groups of students, or in an intervention or support setting, where the EMT provides instruction for designated students. The EMT can also support school and district leadership with mathematics program development and home connections.



The Elementary Mathematics Specialist (EMS) Endorsement

is for PreK–6 teachers who may have some responsibilities working with students but whose major work is supporting teachers and administrators as they implement their school's mathematics program. The EMS typically coaches other teachers, designs and provides mathematics professional development for teachers and administrators, develops programs for parents, and provides leadership for the mathematics program at the school or district level. Proposed requirements for the EMS endorsement include all those for the EMT endorsement and additional requirements related to mathematics content, leadership, and working with adults.

Following their review of the proposals, ISBE staff requested additional information, including a request for a "landscape scan" of Illinois school districts and higher education institutions, to further document the need for and interest in the proposed credentials.

The landscape scan was conducted during Spring and Summer 2019. The study utilized a mixed-methods approach:

153 DISTRICTS

153 districts in 44 counties completed the district survey, including small, medium, and large districts from all areas of the state. These districts educate 40% of Illinois' students.

51% of the respondents were superintendents.

110 SCHOOLS

A total of 110 schools across the state (5% of Illinois schools) responded to the school survey. Eighty-six percent of the respondents were principals. Thus, the school survey provides insights into the beliefs of principals.

86% of the respondents were principals.

A survey of teacher participants in a pilot EMS program at three universities, DePaul University, University of Illinois at Chicago, and the University of Chicago was conducted. Seventy-four percent of the first cohort completed the survey.

Semi-structured interviews were conducted with EMS leaders in California, Maryland, Oregon, and Pennsylvania, states that have existing credentials similar to those proposed in Illinois.

Semi-structured interviews with key Illinois stakeholders included Illinois educator organizations (the Illinois Federation of Teachers, the Illinois Principals Association, the Illinois Education Association, and the Illinois Council of Teachers of Mathematics); Regional Offices of Education (five offices); and Illinois universities (four universities).

All survey items were analyzed and percentages were calculated based on the number of respondents. In some cases, these summed to more than 100%, as respondents could select more than one answer. Descriptive statistics are reported and chi-squared tests of independence were run to compare results of different groups. The relation between groups was significant when $p < 0.05$. Results are described when noteworthy. Thematic categories were developed after reading the interviews. Verbatim responses are provided, although spelling and grammar errors have been corrected to ensure clarity of content.

EMS Background and Research

In elementary schools, mathematics is typically taught in self-contained classrooms by teachers who have limited mathematical content knowledge and mathematical knowledge for teaching (Hill et al., 2008; CBMS, 2012; Hill & Ball, 2004; Banilower et al., 2018). However, mathematics teaching at the elementary level requires specialized content knowledge (CBMS, 2012; Ball et al., 2008; Ball et al., 2005).

In response to the need for specialized expertise for teaching mathematics in elementary school, major mathematics professional organizations encourage the use of elementary mathematics specialists. For the past 40 years, mathematics education leaders and professional organizations have made such recommendations (Fennell, 2006; NMAP, 2008; Lott, 2003; NCTM, 2000; NRC, 1989; NRC, 2001). The National Mathematics Advisory Panel (2008) called for the development of elementary mathematics specialists to help improve mathematics teaching and learning:

> *The use of teachers who have specialized knowledge in elementary mathematics teaching could be a practical alternative to increasing all elementary teachers' content knowledge (a problem of huge scale) by focusing the need for expertise on fewer teachers. (NMAP, 2008, p. xxii)*

The research on elementary mathematics specialists serving as mathematics teachers is limited (McGatha et al., 2017; Markworth, 2017). However, researchers find that elementary mathematics specialists serving as mathematics teachers have more time to effectively plan their lessons and can focus their professional learning (Gerretson et al., 2008; Markworth, 2017). In terms of student achievement, results are mixed.

One study found no significant differences in student achievement gains between students in self-contained and departmentalized classes (McGrath & Rust, 2002) while another study revealed significant gains in student achievement for students taught by teachers who had completed elementary mathematics specialist coursework (Lewis et al., 2017).

More research has been conducted on elementary mathematics specialists serving as mathematics coaches. Studies have documented the positive impact of elementary mathematics specialists who serve in coaching positions on teacher practice (McGatha, 2008; Polly, 2012; Balfanz et al., 2006; Krupa & Confrey, 2010; Rudd et al., 2009). Research studies have also documented the impact of coaches on improved student outcomes, including student achievement (Campbell & Malkus, 2010; Conaim, 2010; Zollinger et al., 2010; Balfanz et al., 2006; Brosnan & Erchick, 2010).

Twenty states have established certification endorsements or similar credentials for specialized elementary mathematics teachers, with eight additional states, including Illinois, currently considering adding such certification endorsements (Elementary Mathematics Specialists & Teacher Leaders Project, 2019).

Illinois does not have elementary mathematics endorsements but does have a middle school mathematics endorsement (ISBE, 2018). Illinois does not currently have specific requirements for individuals who are responsible for coaching teachers.

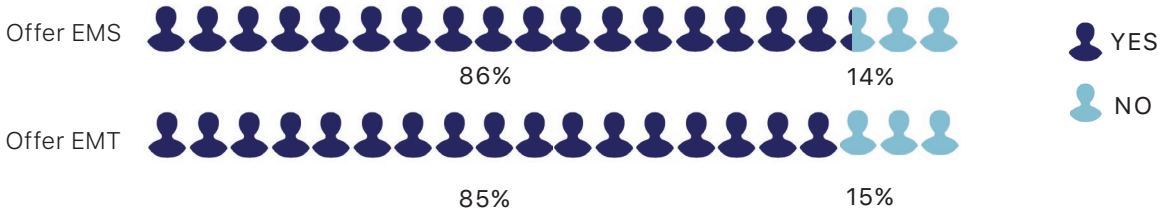
Landscape Study Results

Considerable support exists for the creation of the EMS endorsements from districts, schools, educator leaders, Regional Offices of Education leaders, and university leaders.

EMS DISTRICT SURVEY

A majority of districts indicated support for the proposed EMS and EMT endorsements (Figure 1).

FIGURE 1 | Overwhelming Majority of District Leaders Indicated Illinois Should Offer Both Endorsements



n = 150, missing = 3, on each question

Across all groups, there was strong support for the proposed EMS endorsement. Similar results were observed for the EMT endorsement (see the full report for these results).

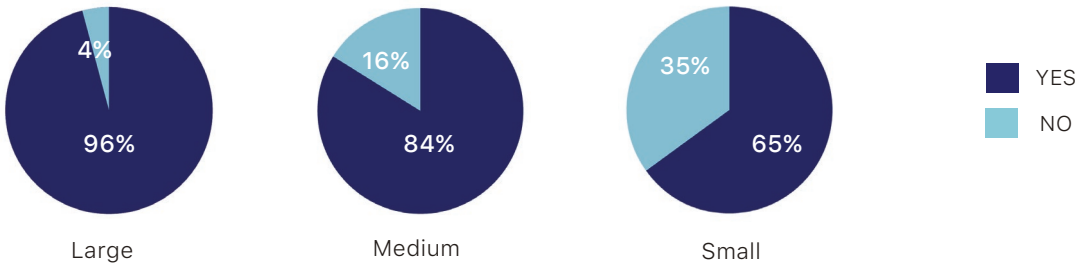
- School districts overwhelmingly indicated that Illinois should offer the EMS endorsement, with a greater percentage in Northeast and East Central Illinois (Figure 2).
- Large and medium school districts were more likely to agree with the creation of the EMS endorsement than small districts, though even among small districts, 65% support the proposed EMS endorsement (Figure 3).
- A greater percentage of respondents with district roles in curriculum and instruction support the creation of the EMS endorsement, though support is high among all groups. Superintendents were the individuals most often completing the district survey and almost 80% of them support the EMS endorsement (Figure 4).
- Over 80% of districts agreed or strongly agreed that they would encourage educators to take courses toward the elementary mathematics endorsements; 90% would encourage math or instructional coaches to take courses toward the EMS endorsement.
- Over 70% of districts offer tuition support for teachers to enroll in university courses.
- While support for the new endorsements is strong, a few stakeholders who were interviewed and a few district leaders who left comments in an open-ended section of the survey expressed concerns and indicated that their support is contingent on the endorsements not being a requirement for hiring and placement.

FIGURE 2 | Strong Support Across All Regions for Elementary Mathematics Specialist Endorsement

	Yes	No
Northeast	96%	4%
Northwest	77%	23%
West Central	71%	29%
East Central	89%	11%
Southeast	76%	24%
Southwest	73%	27%

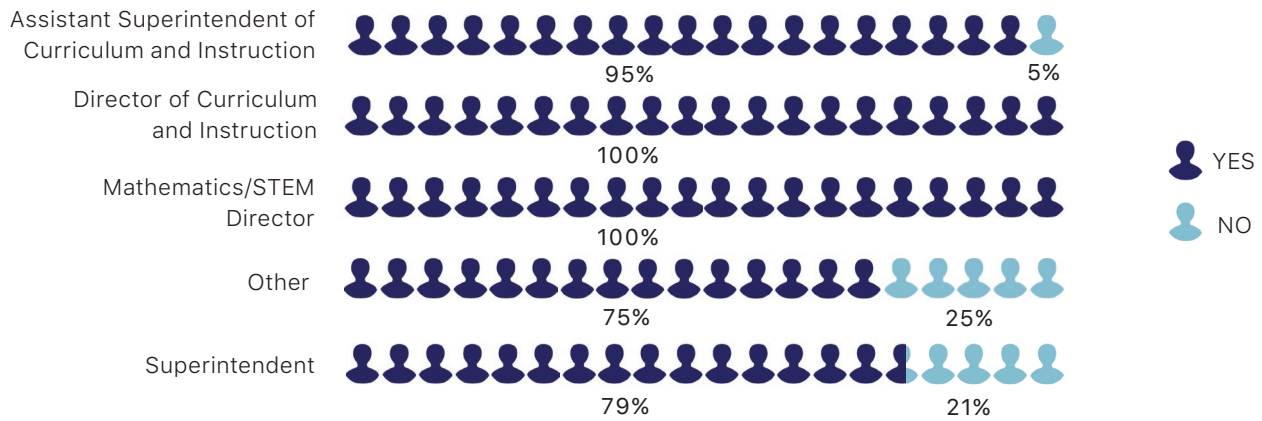
n = 150, missing = 3

FIGURE 3 | Strong Support for Elementary Mathematics Specialist Endorsement Across All Districts of All Sizes



n = 150, missing = 3, X^2 (2) = 12.686, *p* = 0.002, Cramer's V = 0.291, indicating a small relationship between support for the EMS endorsement and district size

FIGURE 4 | Across Roles Strong Support for the Elementary Mathematics Specialist Endorsement



n = 150, missing = 3

At the end of the survey, respondents were asked if they had any questions or comments they wished to share about the endorsements. Just over a quarter of district leaders wrote in comments, suggestions, or questions. Forty-seven percent of these comments provided explicit support for the endorsements and 19% expressed a lack of support for the endorsements. Almost 20% of the comments indicated a concern that requiring the endorsements could complicate already difficult staffing problems. A few of the comments were questions about the proposed endorsements, clarifications of how district leaders responded to prior survey items, or recommendations for providing flexibility to meet the endorsement requirements or for improving preservice training in mathematics. Below are a few sample responses to this open-ended item.

Please provide/encourage flexible coursework credentialing. Many educators are looking for intensive/digital programs more than the traditional 16–18 weeks model.
(Assistant Superintendent of Curriculum and Instruction, Southeast)

Adding more endorsements only complicates licensure and is overkill. We are already pursuing professional development, instructional coaching, and opportunities for our math teachers to continue to improve. This is absolutely unnecessary.
(Superintendent, West Central)

I have indicated that the state should offer the endorsements. I admit that I was hesitant, because although it is stated that the endorsement would not be required to teach mathematics, I've seen the state change course many times, and if the endorsement were required, I would not support the creation of the endorsement.
(Superintendent, Northeast)

For self-contained elementary teachers, increasing pedagogical knowledge and understanding of how students best learn mathematics is essential. Too many of them are teaching the way they were taught, which provides a very limited scope of mathematics. "Traditional" math instruction is too procedural [and] lacks reasoning and flexibility. An endorsement would be very welcome.
(Assistant Superintendent of Curriculum and Instruction, Northeast)

This is a terrific idea.
(Superintendent, Northeast)

This has to remain as an option or we, once again, create an issue for ourselves. I love the idea, because it encourages getting better as an educator. Please never make it a requirement at any grade level K–6.
(Superintendent, East Central)

EMS SCHOOL SURVEY

School leaders support the endorsements. As Figure 5 reveals, 90% of school survey respondents support the creation of the EMT and EMS endorsements.

FIGURE 5 | Overwhelming Support Among School Leaders for Both Endorsements

n = 105, missing = 5

- Ninety percent agreed or strongly agreed that they would encourage teachers to take courses towards the EMT endorsement; over 80% would encourage teachers to take courses towards the EMS endorsement.
- School survey respondents also noted that increasing mathematics-related professional development opportunities, coaching support, and teachers' pedagogical content knowledge would contribute the most to improving mathematics instruction.

About a fifth of school leaders wrote comments or questions in an open-ended item at the end of the survey. Almost half of the comments from school leaders indicated support for the endorsements and about a third of these leaders raised the issue of teachers paying for the endorsements. Below are a few sample comments.

I believe one of the strongest barriers to successful math instruction at the intermediate grades is a lack of content knowledge in general [education] teachers. This lack of content knowledge results in less confidence and less differentiated instruction. Any effort to build the content knowledge of elementary teachers is welcomed. Furthermore, I believe this graduate school coursework/path is a much better use of teacher time than some of the online coursework taken to advance teacher "lane change" (e.g., MA + 15 + 30).
(Principal, Northeast)

I feel strongly that this would benefit our math program [similarly] to [how] the reading specialist endorsement [assisted] with our ELA teachers and instructional opportunities.
(Principal, Southeast)

If this is something that [is to continue] with momentum, the state [will need] to find a way to offer stipends to pay for the coursework for teachers and specialists. The state of our state and taxes is making it increasingly difficult to have teachers continuously expected to pay out of pocket.
(Principal, Northwest)

STAKEHOLDER PERSPECTIVES

Similar to the results in the district and school surveys, there is overwhelming support for the endorsements among the Illinois stakeholders interviewed.

- Nearly all felt that the proposed endorsements address a need in Illinois districts and schools, and that the endorsements have the potential to improve mathematics teaching and learning.
- All recognized the value and importance of teachers deepening their knowledge base in mathematics and teaching mathematics.
- The Illinois stakeholders also acknowledged the value of coaching.
- About half of the leaders from Illinois educator organizations and Regional Offices of Education (ROEs) cautioned that these must not be required for hiring.
- Some stakeholders expressed concerns about the cost of coursework for teachers and mathematics coaches for districts.
- Representatives from ROEs felt that districts in their respective areas would value the proposed endorsements, and that they would encourage and support teachers to complete them.
- There was interest among universities to establish programs that align with the proposed endorsements.

Below are some key stakeholder comments.

I think we can always benefit from people with additional expertise and thoughtfulness when it comes to teaching and coaching math instruction, especially at the elementary level.
(Faculty, public university)

I love the idea of anybody who's kind of working in intervention, working with students, or working to be a math coach, getting more content, getting more training, [and] getting more information.
(Education leader)

I think what [the universities are] proposing in terms of [math]..., I think the teachers would be excited by that, because I think we have teachers out there... They don't want to go back to get a master's degree in administration. They don't want to get a degree in counseling. They are very, very happy and love what they're doing, and they want to be a math teacher all their life. So the opportunity to take classes that will strengthen [their teaching], I think is really going to be a positive [thing] for them.
(ROE leader)

EMS PILOT PROGRAM COHORT SURVEY

Teams from DePaul University, the University of Chicago, and the University of Illinois at Chicago (UIC) developed a pilot two-year course sequence focused on strengthening the mathematics content, pedagogical content, and leadership knowledge and skills of teachers in elementary schools. The teachers in the first cohort were Chicago Public School (CPS) teachers and the majority, 62% of them, had been teaching for less than 15 years. This cohort was supported by a grant from the CME Group Foundation.

- Many teachers who participated in the prototype programs saw a shift in their teaching assignments from self-contained classrooms to more departmentalized settings, where they taught more than one class of mathematics.
- Teachers who participated in the prototype programs were far more likely than before to engage in mathematics leadership activities within their buildings and more likely to engage in collaborative mathematics activities with colleagues, such as jointly examining and analyzing student work or participating in peer observations of mathematics classes.
- Teachers who participated in the prototype programs expressed more confidence about their knowledge and ability to teach mathematics effectively.

The current EMS pilot programs offer evidence of interest in the proposed endorsements. What began with one cohort of CPS teachers has grown. In the second cohort, also supported by the CME Group Foundation, there are nine partner districts and about 80 teachers taking the courses with some districts contributing tuition support.

EMS Programs in Other States

The EMS Landscape Study included interviews with leaders from four of the states (California, Maryland, Oregon, and Pennsylvania) that have current elementary mathematics certification credentials. The leaders are higher education faculty and state leaders who were involved in the establishment of elementary mathematics specialist credentials in their respective states.

- While each of the states adopted slightly different approaches, each state developed the certification credentials with a goal of improving mathematics teaching and strengthening mathematics leadership.
- A limited number of universities in each of the states have developed programs that fulfill the requirements of the credentials.
- Grant subsidies, including grant-supported cohort programs, have been helpful in increasing the number of teachers who earn the credentials.
- Teachers who earned the credentials often assumed mathematics leadership roles in their schools and districts.

District leaders were asked to what extent a series of strategies would contribute to improving mathematics instruction in their districts. About 65% responded that increasing coaching support for teachers in mathematics and increasing teachers' pedagogical content knowledge would contribute significantly to improving mathematics instruction.

COACHING

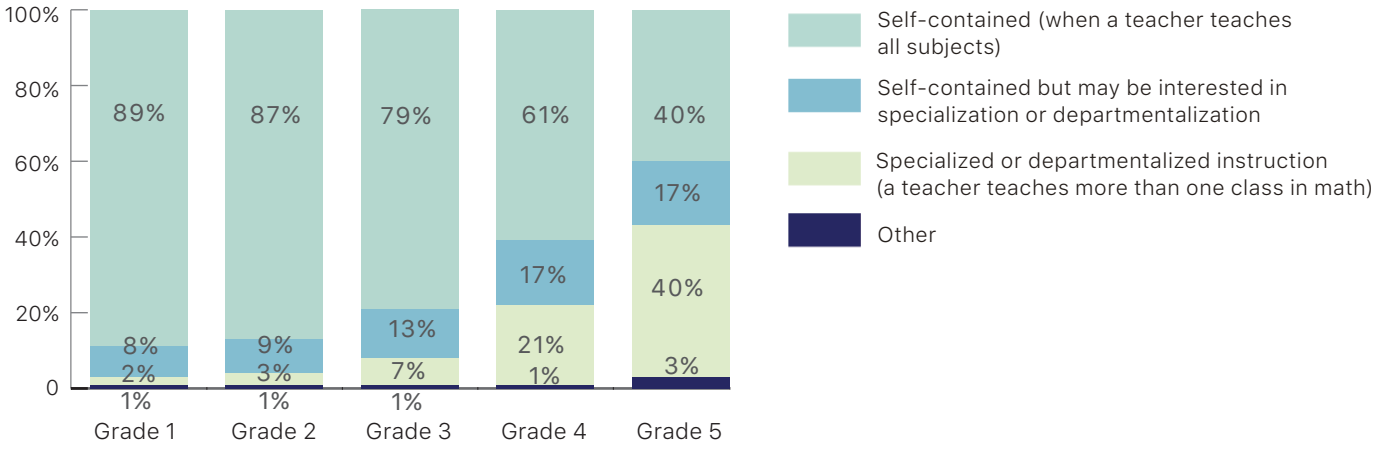
EMS District Survey results indicated that 40% of responding districts offer coaching in mathematics.

- Coaching support is provided most often by full-time coaches, followed by district administrators.
- Twenty-seven percent of respondents indicated that a full-time coach provides coaching only in mathematics and 61% indicated that a full-time coach provides coaching in mathematics and other subjects.
- Differences among districts exists across regions, with the Northeast and East Central portion of the state offering coaching most; a much lower percentage of districts in Southeast and Southwest Illinois offer coaching.

CONTENT SPECIALIZATION

Figure 6 shows that 40% of Illinois districts use a specialized structure to teach mathematics and another 17% are interested in specialization in fifth grade. In fourth grade, these figures are 21% and 17%, respectively.

FIGURE 6 | Departmentalized Mathematics Classes Occur Most Often in Upper Elementary Grades



n = 150, missing = 3 for Grades 1-4; *n* = 149, missing = 4 for Grade 5

Conclusion

Teaching is a complex endeavor that requires considerable knowledge and skills. Across the country, elementary teachers are tasked with a sizeable job but not always prepared or supported sufficiently. Many elementary teachers recognize the need for additional knowledge in teaching different disciplines and are willing to address this gap in their teacher preparation. Elementary teachers in Illinois currently have the option to earn additional certification credentials in reading, special education, gifted education, and English as a Second Language but do not have the opportunity to earn a formal credential in teaching elementary mathematics.

The proposed endorsements can help address the concern that many elementary teachers' mathematical content knowledge and knowledge for teaching mathematics is limited (Hill et al., 2008; CBMS, 2012; Hill & Ball, 2004) and this limited knowledge can impact teachers' attitudes about and confidence in teaching mathematics (Sarama & DiBiase, 2004; Maloney & Beilock, 2012).

As the results from this landscape study reveal, about 85% of district leaders and about 90% of school leaders who responded to the surveys indicated that the state of Illinois should offer the elementary mathematics teacher and specialist endorsements. Support for these endorsements extend to key education leaders in Regional Offices of Education, professional educator organizations, as well as university faculty and administration. While there is extensive support from responding districts and schools across the state, a few district leaders noted in an optional comment section that they would not support the endorsements if they were made a requirement. Some ROE leaders and educator organization leaders also caution requiring the endorsements. However, as optional opportunities to gain mathematics content and pedagogical content knowledge, there is strong support for these endorsements.

The proposed EMT and EMS endorsements can increase opportunities for teachers who want to pursue additional formal preparation in teaching mathematics in the elementary grades. The endorsements also provide opportunities for districts to incentivize additional training in mathematics to address an area of district need.

Addendum

In February 2020, a team from the Illinois State Board of Education received an extended presentation of the landscape study findings. With the evidence from the study in hand, they agreed to move forward with creating credentials for teachers to become elementary mathematics teachers and specialists. By that time, however, ISBE was undergoing a significant restructuring of its teacher credentialing system. The changes include a revamping of the existing certification endorsements and a movement toward a new category of credentials: microcredentials. As a result, they recommended that the proposed EMS and EMT endorsements be reconfigured as microcredentials. Currently, as of June 2020, representatives from the EMS Working Group are collaborating with ISBE on the development of requirements for EMS and EMT microcredentials.

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