
Advocacy Corner: The Value of Middle Grades Licensure on K-12 Mathematics Achievement

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Abstract: The authors provide an overview of teacher licensure with a focus on the importance of middle grades licensure. Given the recent trend in reorganizing schools to serve more grade bands, there is concern that Ohio will move to re-implement a K-8 teaching license. The authors address this issue and provide recommendations to policy makers, teacher preparation programs, and school administrators to help maintain mathematics achievement in Grades 4–12.

Keywords: Teacher preparation, licensure, middle grades teaching, student achievement

1 The Context

1.1 Teacher credentialing and licensure

Teacher credentialing and teacher licensing is a process that has evolved over the past century or more. In the early 1800's potential teachers simply needed to persuade school administrators of their good moral character. In the latter part of that century, states began to require teacher candidates to pass exams in history, geography, and spelling, as well as in basic skills (Ravitch, 2003). As the discussion regarding teacher credentialing continued through the twentieth century, several proponents emerged to support the concept of a specific teacher credential for teaching those upper elementary grades, better now known as the middle grades. Briggs (1920) and Koos (1920) called for the concept of the "junior high school." In the late 1960's and 1970's, Don Eichhorn, an educator in Upper St. Clair, Pennsylvania, Lewisburg, Pennsylvania is considered one of the first founders of a true middle school which grouped students based on developmental stages rather than chronological age (Merlens, et.al., 2016).

1.2 Middle Level Licensure

The Association for Middle Level Education was founded in 1973 as a professional organization to support teachers who teach in the middle grades. Its foundational position paper, *This We Believe: Keys to Educating Young Adolescents*, includes 16 characteristics of successful middle grade school. Five of the 16 are related to Curriculum, Instruction, and Assessment encouraging curriculum to be active and engaging. AMLE also lists four Essential Attributes of middle schools that include

providing an equitable education that provides challenging and relevant learning opportunities. The AMLE website lists the middle level licensure opportunities by state (<http://www.amle.org/AboutAMLE/ProfessionalPreparation/Certification-LicensurebyState.aspx>) and reports that 46 states (including the District of Columbia) have a separate middle level license enabling teachers to teach a range of grades starting at either grade 4 or 5 up to grade 8 or 9 and to teach specific content areas including mathematics. Arizona offers an endorsement in middle level teaching that is not subject-specific and Tennessee has a middle level generalist and license in STEM. Only five states (California, Colorado, Idaho, Montana, and Utah) do not offer a middle-level license.

1.3 Early Grades Licensure

The data on the website also indicates that beginning in the 2020-21 school year, all of the 41 states or districts that have a middle level license in the content areas also have an early grades license band that either begins at preschool, kindergarten, or grade 1 and spans to either grade 4, 5, 6, 8, or 9. Beginning with the 2020-21 school year, Ohio will move from a K-3 license that has been in place since 1998 to a K-5 teaching license. With Ohio's change, it will join six other states (Kentucky, Louisiana, Missouri, North Carolina, Pennsylvania, and South Carolina) where the middle level license is necessary to provide a teacher placement in all grades K-12. While the remaining 34 states could eliminate the middle level licensure and still staff all grade levels from K to 12, they still maintain the middle level license. (See Table 1 for a summary of the data.) AMLE eloquently presents the rationale for maintaining the middle level license, but this paper presents another rationale pertaining specifically to student success in mathematics.

Description	Number of US States
U.S States (including D.C.) that offer a middle grades teaching license in the four major content areas.	44
U.S. States offering generalist-type middle level endorsement.	2
U.S. States that do not offer middle level endorsement.	5
U.S. States offering middle grades teaching license that require a middle grades teaching license in order to place teachers in all K-12 grades (as of 2020-21).	7
U.S. States that offer a middle grades teaching license despite the ability to place teachers in all K-12 without it.	34

Table 1: *Summary of middle grades license data.*

1.4 NCTM Recommendations

NCTM's Catalyzing Change series of manuscripts emphasizes K-12 math curriculum that develops deep mathematical understanding at all grades and a diverse teacher workforce with deep content knowledge (NCTM 2020a; 2020b; 2019). Maintaining a middle grades licensure and avoiding an early grades licensure with a span more than six years is critical to achieving and maintaining mathematics achievement in U.S. schools.

2 A Potential Threat

2.1 Cutting Costs at the Expense of Mathematical Understanding

Even though the majority of states offer a middle grades teaching licensure and the majority of those states maintain the middle grades license despite the fact that they could eliminate it and still staff

all grades, demographic changes may present economic motivations to schools, districts, and states to widen and broaden teaching license bands and subject options. Demographic and population data show that the number of K-12 children is decreasing (Jaschick, 2018). School administrators, in an effort to be cost-effective, are condensing buildings and increasing the grade band in buildings. Buildings that were previously K-3, 4-8, and/or 6-8 are becoming less with more grade levels such as K-5 or 7-12.

From the superintendent's perspective, one has to wonder what the value of hiring a teacher who is licensed to teach grades 4-9 and, in some cases the teacher may only be able to teach two content areas, over hiring one a K-5 teacher who can be easily transferred as student numbers evolve. However, as a teaching license increases in grades bands in which the teacher can teach, it creates concern that the teacher does not have the mathematical content knowledge to be effective and, more importantly, to not create mathematical misconceptions in students' understandings or to not teach one procedure to find an answer.

2.2 Content Knowledge Concerns and the MET II Report

A K-8 license is problematic when thinking about the amount of content knowledge that is required. The amount of coursework needed to prepare teachers to teach broadly at K-8 effectively is overwhelming. In *The Mathematical Education of Teachers II* (MET II) (2010), the American Mathematical Society with cooperation from the Mathematical Association of America recommends twelve hours of mathematics-related coursework for elementary teachers. With regard to middle level math teachers, the board states:

Initial study of the mathematics for teaching middle grades requires at least 24 semester-hours. At least 15 of these semester hours should consist of mathematics courses designed specifically for future middle grades teachers that address the essential ideas described in the previous section and in [the section for elementary teachers (e.g., counting and cardinality, operations and algebraic thinking, number and operations in base ten, etc.)]. The remaining 9 semester-hours should include courses that will strengthen prospective teachers' knowledge of mathematics and broaden their understanding of mathematical connections between one grade band and the next, connections between elementary and middle grades as well as between middle grades and high school. This second type of coursework should be carefully selected from mathematics and statistics department offerings. In no case should a course at or below the level of precalculus be considered part of these 24 semester-hours. (p. 46)

Since early elementary grades teachers are typically generalists and need to teach all subject areas, that amount of coursework recommended by the MET II would be unrealistic for those preparing to teach early grades to take because of the coursework that needs to be taken in the other subject areas, as well. The development of mathematical knowledge from kindergarten to eighth grade is immense, encompassing eleven different domains over all the standards. Besides basic operations on whole numbers in the early grades, knowledge of fractions, which are addressed at a conceptual level in third grade and then procedurally at a deep level in fourth and fifth grade, and deep, conceptual knowledge of division are major factors affecting success in high school math. (Siegler, et. al, 2012). Sixth, seventh, and eighth grade standards focus on rate of change and how this leads to concepts underlying slope and linear equations. Most elementary teacher education preparation programs limit the mathematics credit hours to twelve credits. Addressing all these topics at a deep level in three classes is difficult to do at a quality level. On the other hand, middle level teacher education programs often require a minimum of twenty credit hours of coursework. Focusing on those math topics related to grades fourth through eighth grade across six to seven courses allows for more deep investigation and better-prepared middle grades math teachers.

2.3 Content Knowledge for Teaching

Mathematics content knowledge for teaching consists of multiple domains of knowledge (Ball, Thames, & Phelps, 2008). Common content knowledge is understanding the mathematics that teachers are expected to teach, including definitions, proper notation, and computation strategies (Ball, Thames, & Phelps, 2008). Knowing the content is not sufficient, however. A degree in mathematics does not lead to better teaching (Thames & Ball, 2010). Thus, teachers must also possess specialized content knowledge which “demand unique mathematical understanding and reasoning” (Ball, Thames, & Phelps, 2008, p. 400). Specialized content knowledge requires teachers to explain why the content works, choosing the best example for a specific topic, connecting content, asking precise mathematical thinking, connecting multiple representations, and evaluating student thinking and student errors in a short amount of time.

2.4 Teacher Preparation and Student Achievement

Teachers are the most important school-based factor for student achievement (Stronge & Tucker, 2000). Although there is an abundance of research on teaching, Cohen (2011) suggested very little research has actually attempted to answer the question: “What sort of an endeavor is teaching?” (p. 3). Mathematics education researchers have been working to better understand the knowledge, conceptions, and pedagogical practices needed to effectively teach mathematics. In mathematics, we know to be effective at teaching mathematics, teachers must understand mathematics content, how students learn mathematics, and effective pedagogy for teaching mathematics (Ball, Thames, & Phelps, 2008; National Council of Teachers of Mathematics (NCTM), 2014).

3 Recommendations

Teacher candidates with a desire to teach early elementary grades as well as some who wish to teach upper grades often do not begin their teaching studies possessing deep conceptual understanding of many mathematics concepts and procedures. In order for teachers to understand mathematics content, they need the time in terms of pre-professional development at the college setting and professional development throughout their teaching career. Limiting the age bands of teacher licensure will help teachers who teach mathematics to continue to develop in their own understandings, discern misconceptions exhibited by their students, and create the tasks and the discourse in their classrooms that will create the mathematical agency, understanding, and achievement needed in math classrooms. Therefore, we contend that in order to maintain 4-12 math achievement:

1. States must maintain a middle grades licensure band where initial teacher candidates can focus either on the mathematics of grades 1-5 or that of grades 4-9.
2. Schools and districts must recognize the value of a teacher that has focused on the development of mathematical concepts to a level that they can discern the source of the misconception.
3. Schools and districts must continue to staff math teachers in grades where they have the mathematical preparation of progressions and deep conceptual understanding.
4. Colleges and universities must require a minimum of eight to nine credit hours of mathematics with a focus on deep conceptual understanding for teacher candidates preparing to teach grades K-5 and require a minimum of 24 credit hours of mathematics with a focus on deep conceptual understanding for teacher candidates preparing to teach mathematics in grades 4-9.

Maintaining and promoting a middle grades licensure, specifically in the mathematics content is critical to ensure math mathematical success of teachers and students. As K-12 mathematics

education moves into the next decade with an emphasis on students having a sense of joy and agency for mathematics and deep understanding of mathematical concepts, schools need math teachers that also possess the same joy and agency in mathematics as well as a deep understanding of topics. As districts are encouraged to eliminate tracking in mathematics in the middle grades, those math teachers will be required to know more about and delve deeper in rich, mathematical tasks and discussions with their students that only a firm preparation in the content will enable.

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This article was written as the result of a Ohio Mathematics Education Leadership Council (OMELC) initiative as part of a research-based advocacy series. The *Ohio Journal of School Mathematics* Advocacy Corner is meant to provide voice to math educators, math teacher educators, math educational researchers, or other math teaching policy-based advocates regarding trending topics that, through state and national policy and initiatives, can advance the math education of K-12 children if implemented or eliminated.

- Authors should provide the context of the position and support it with data. Authors should include enough external resources
- Manuscripts are generally 3-5 pages, (1000-2500 words)
- Manuscript will be reviewed by at least two reviewers with one from OMELC board.

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