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## Understanding the Role of the Common Core State Standards for Mathematics in Mathematics Methods and Mathematics Content Courses for Prospective Teachers

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***Understanding the Role of the Common  
Core State Standards for Mathematics in Mathematics  
Methods and Mathematics Content Courses for  
Prospective Teachers***

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**Abstract**

The reform efforts brought about by the Common Core State Standards for Mathematics (CCSSM) necessitate inquiry into how these standards are (or are not) being addressed in teacher preparation courses. This study examines the extent that the CCSSM are emphasized in mathematics content and mathematics methods courses for prospective teachers. We implemented a web-based survey and follow-up interviews of faculty from institutions across the nation. Results indicate a moderate level of variability in opportunities that prospective teachers have to learn about the CCSSM. Additionally, results show that mathematics teacher educators have changed their courses to include discussions around the CCSSM and emphasize the standards for mathematical practice. More research studying how the CCSSM are being addressed is needed across the nation and across various teacher preparation programs.

**Understanding the Role of the Common  
Core State Standards for Mathematics  
in Mathematics Methods and  
Mathematics Content Courses for  
Prospective Teachers**

The Common Core State Standards (CCSS) in mathematics and English language arts (<http://www.corestandards.org/>) are being implemented in schools across the United States. Forty-three states, the District of Columbia, four territories, and the Department of Defense Education Activity had already adopted the Common Core State Standards (CCSS, 2010) at the time of this study. Through implementation of a web-based survey followed by semi-structured interviews of faculty from institutions across the nation, this study examined the extent that the Common Core State Standards for Mathematics (CCSSM) are emphasized in courses for

teacher preparation. Specifically, this study investigated the opportunities afforded to prospective teachers to learn about the CCSSM as reported by 78 professors of mathematics methods and/or mathematics content courses for prospective teachers. The purpose of this study is to understand the breadth and depth of opportunities afforded to prospective teachers to learn about the CCSSM in their coursework. The study examined the following question:

To what extent and in what ways are courses providing prospective teachers with opportunities to study the CCSSM in mathematics content and mathematics methods courses as reported by mathematics teacher educators?

## Relevant Literature

### Reform Efforts in Mathematics Education

Larson (2012) presented a historical perspective of reform efforts in mathematics education by describing influential documents leading up to the adoption of the CCSSM. The “new math” movement of the 1950s and 1960s was followed by the “back-to-basics” movement of the 70’s. Between 1980 and 2014 the National Council of Teachers of Mathematics (NCTM) produced a series of documents aimed at standardizing and improving mathematics education (An Agedna for Action, 1980; CESSM, 1989; PSSM, 1991; ASSM, 1995; PSSM, 2000; CFP, 2006; Principles to Actions, 2014). While such documents can be seen as representative of the mathematics education reform movement (Brown & Borko, 1992), little is known about the impact of these documents. The uncertainty of these reform efforts is clearly depicted by Larson (2012). “In another decade, will CCSSM still be the focus of mathematics education discussions and be positively influencing student learning, or will it have become just another historical footnote in the list of standards documents and evolutionary reform efforts that have come before it?” (p. 109).

Frykholm (1999) studied the standards-based reform effort in mathematics teacher education in the 1990s and concluded that despite reform efforts, typical mathematics classrooms look the way they did decades prior. He found that beginning teachers continued to model their practice after their cooperating teachers, many of whom continued to use a traditional, direct instructional approach

to teaching mathematics despite their beliefs about reform and their eagerness for finding new models of teaching. In a related study, Weiss (1995) reported only 56% of the in-service teachers were “well aware” (p. 4) of the primary objectives of the reform movement of the time. Furthermore, only a few teachers in the survey reported supporting key instructional shifts and strategies suggested by the reform movement.

### Common Core State Standards for Mathematics

The CCSSM are a national set of standards written by the National Governors Association and Council of Chief State School Officers. They are described as “a set of high-quality academic standards in mathematics and English language arts/literacy (ELA)” ([www.corestandards.org](http://www.corestandards.org)) and outline what all students should know and be able to do at the end of each grade level. Released in 2010, states were given an incentive to adopt the standards through federal *Race to the Top* grant funding. These standards were written with the goal of preparing all students to “graduate from high school with the skills and knowledge necessary to succeed in college, career, and life, regardless of where they live” ([www.corestandards.org](http://www.corestandards.org)). The CCSSM include content standards as well as eight Standards for Mathematical Practices (SMPs). Content standards define the mathematics that students should know and be able to do. Standards for Mathematical Practice describe the “processes and proficiencies” that teachers should work to develop with students in classrooms.

The CCSSM initiative also includes key instructional shifts that are

necessary to implementing the standards successfully. The three instructional shifts are focus, coherence, and rigor. Focus refers to the need for greater focus on fewer topics. Coherence refers to coherent progressions of topics and thinking throughout grade levels. Mathematical rigor includes the inclusion of conceptual understanding, procedural fluency, and application of mathematical knowledge. According to the CCSSM website, “Understanding how the standards differ from previous standards—and the necessary shifts they call for—is essential to implementing them.”

### **CCSSM and Teacher Preparation**

The *Mathematical Education of Teachers I and II* (MET I, MET II), reports by the Conference Board of Mathematical Sciences (CBMS, 2012), both call for a reconsidering of the mathematical education of teachers. The MET II report stresses that the nation’s mathematics teachers must have the knowledge, skills, and dispositions needed to provide students with a mathematics education that ensures high school graduates are college- and career-ready as envisioned by the CCSSM. MET II provides core recommendations for the mathematical preparation of prospective teachers to teach the rigorous and challenging mathematics content laid out in the CCSSM. The CBMS used the CCSSM as a framework for outlining the mathematical ideas that elementary teachers, both prospective and practicing, should study and know, calling them “essential ideas.” These “essential ideas” refer to both content and practice standards.

A study by Newton et al. (2013) examined the impact of the CCSSM on Mathematics Teacher Educators (MTE)

instruction and programs through an online survey. Two hundred sixty-two faculty completed the survey with some variation on the number of answers per question. In their study, researchers found that most MTEs had interacted with and had conversations about the CCSSM and reported that they were familiar with the standards. About half of the participants reported “some” need in changing their programs to respond to CCSSM. Furthermore, participants agreed or strongly agreed that the CCSSM was a “political document” and was an improvement on previous standards. Finally, their study found that most MTEs felt that their prospective teachers should have an awareness of the CCSSM, should use CCSSM in their lesson planning, and should be able to enact CCSSM in their field placements. In addition, the study explored MTEs use of specific CCSSM resources.

### **Complexity of CCSS Implementation**

The adoption and implementation of the CCSS has been complex. According to an online article published by Education Week in 2014, legislation to “pause”, “review”, or “repeal” some aspect of CCSS had been introduced in 26 states ([www.edweek.org](http://www.edweek.org)). Certainly, there are political implications associated with CCSS being tied to federal dollars, private funding (\$35 million in grants alone from the Bill and Melinda Gates Foundation), and high-stakes testing. There was no field test of the Standards prior to implementation (Ravitch, 2013). In addition, implementation of the CCSS has been rushed in many districts with a lack of support for the teachers who must use them. Some teachers and other experts have argued there are missing standards while others considered some standards as too high or low for the grade level. As

Russell (2012) pointed out, while the CCSS may show “promise,” some educators are concerned that the adoption and implementation of the standards will result in an even more focused effort on high-stakes testing and that the standards themselves could be seen as “a list of items to cover” (p. 50).

Multiple stakeholders in education are affected by the implementation of CCSS. In October 2012, Editorial Projects in Education (EPE) Research Center conducted an online survey of 599 teachers or other instructional specialist in K-12 schools to better understand the views of teachers on the CCSS (EPE, 2012). The survey examined a range of issues related to the CCSSM. Most teachers (78%) reported having at least a basic level of familiarity with the CCSS and only 18% reported they were very familiar with the CCSS. The respondents were most likely to get information about the CCSS from their administrators and state education departments. Most teachers reported having received some professional development related to the CCSS; respondents have typically spent less than four days in such training. Of the time spent in CCSS professional development training, only 57% of respondents reported having any training in mathematics specifically. Respondents are less confident about their readiness to teach CCSS to specific groups of students including ELLs and students with disabilities. While the survey was for practicing teachers, the question, “Please indicate the provider of your training for the CCSS” the answer choices did not include any reference to learning about CCSS in a teacher preparation program.

By studying the impact of CCSSM in mathematics teacher preparation,

findings from this study will shed light on the variation in course content and implementation, specifically within mathematics education. As Wilson et al. (2001) asserted, one way to help reduce the gap in our knowledge concerning teacher preparation is for research to focus on practices across institutions. The findings from this study will offer evidence of ways CCSSM are implemented in courses across various institutions.

## Methods

### Participants

Because courses for the preparation of elementary teachers are housed in both colleges of education and departments of mathematics, we sought to recruit both mathematics education and department of mathematics faculty who teach mathematics methods and mathematics content courses for prospective teachers. Seventy-Eight faculty participated in the online survey, and six faculty participated in a follow-up phone interview. We provide a breakdown of the faculty demographics in the table below.

Table 1

Demographic Data		
<u>Item</u>	<u>Response</u>	<u>Percentage</u>
<i>Institution</i>	4-year	35%
	2-year/community college	3%
	4-year/graduate	62%
<i>Type of Higher Education Institution</i>	Public	88%
	Private	12%
<i>Type of Department</i>	College/School of Education	47%
	Mathematics	41%
	Department	8%
	Joint appointment	4%
	Education/Mathematics	

Other		
<i>K-12 Focus</i>	Prospective elementary school teachers	53%
	Prospective middle school teachers	8%
	Prospective high school teachers	39%
<i>Load</i>	Primarily research	21%
	Primarily teaching	43%
	Equal research and teaching	36%
<i>Years of Experience teaching methods/content courses for PSTs</i>	0-3 years	22%
	4-6 years	44%
	7-10 years	17%
	More than 10 years	17%
<i>Status of CCSSM in their state</i>	State has adopted CCSSM	83%
	State has not adopted CCSSM	15%
	State has not adopted CCSSM	2%
	Unsure	

Note: Percentages are based on responses provided by respondents on each demographic data category.

### Data collection

The first level of participant recruitment utilized an internet-based survey sampling method. The sample was a convenience sample, we sent the survey through a list-serv and those who received the email could choose whether or not to participate. Additionally, judgment sampling was used as we selected the list-servs and professional groups on social media, email lists, etc. based on our judgment of appropriate internet-based resources. This group was a “list-based sample of a high-coverage population” (Couper, 2000, p. 485). In summary, we requested MTE participation through communication sent to several list-servs and emails, central to the field of mathematics education (Association of Mathematics Teacher Educators, National Council of Teachers of Mathematics,

Mathematics Association of America, etc.).

The second level of recruitment, for interview purposes, we obtained through a participant list generated from the final question of the survey which asked survey completers if they would be willing to participate in an interview. Twenty eight participants responded yes and populated an “interview pool” from which we identified six participants to interview. These six interviewees were chosen based on their identified department (either education, mathematics, or joint) as well as grade level focus (either elementary, middle, or secondary) and years in the field. We sought to have equal representation from different departments, grade levels, and various years of teaching.

*The survey.* We created a survey, based on findings from a pilot study, comprised of 16 questions including multiple choice and short answer questions (see Appendix A). We sent the survey during spring of 2015 and included demographic and background questions, as well as questions about faculty experience with, and beliefs about, the CCSSM. The survey was designed so that respondents were able to answer only the questions that they desired and thus the number of respondents for each question varied. The highest number of responses for a question was 72 and the lowest was 53. The average number of responses per question was 61.

*The interview.* To better understand the role of CCSSM in their instruction and course design, we conducted interviews with six participants. Interviews took place in fall of 2015. A semi-structured interview protocol (see Appendix B) was used and focused on highlighting the

experiences of faculty with the CCSSM. The questions asked of each faculty member were the same but the order of the questions, the exact wording, and the type of follow-up questions somewhat varied based on how each participant responded to the survey. These initial interviews ranged in duration from 25-40 minutes and were conducted over the phone. The interviews were audiotaped and transcribed.

### Analysis

Sequential transformative mixed-methods strategy (Creswell, 2003) was utilized in this study. That is, the collection and analysis of either quantitative or qualitative data occurred first followed by the integration of results in the interpretation phase. While both quantitative and qualitative data were collected at the same time in the study, the quantitative data were analyzed first followed by the qualitative data. Data from the multiple-choice questions was downloaded and analyzed using SPSS.

In this study, we were able to use quantitative data to reveal broad generalizable trends from participants' responses to selected survey questions. The quantitative data provided information regarding how the CCSSM was referenced in a syllabi and how much the participants agreed or disagreed with questions related to the importance of the CCSSM. Participants rated their responses on a scale from 1 to 5, with 1 indicating extremely disagree and 5 indicating extremely agree. Points 2 and 4 indicated somewhat disagree and somewhat agree, respectively. Participants were also asked how often they discussed CCSSM related content during their class sessions on a scale from 1 to 5 with 1 indicating never

and 5 indicating every class session. Point 3 indicated half of the class sessions. Interview data along with responses from extended response questions were analyzed qualitatively using a grounded theory approach (Strauss & Corbin, 1990). The qualitative data is underscored in this study by providing more detailed explanations and supporting evidence to the quantitative data analysis.

### Findings

Results include data on evidence of CCSSM in mathematics methods and content syllabi, instructional changes made because of CCSSM, impact of CCSSM on practice, and MTE beliefs about CCSSM.

### Quantitative Data

We first looked at the participants' responses on whether or not there was any reference to the CCSSM in their syllabi. Results are shown below (see Figure 1). Generally, those who were from the College/School of Education indicated referencing the CCSSM in their syllabi more than those from a mathematics department.

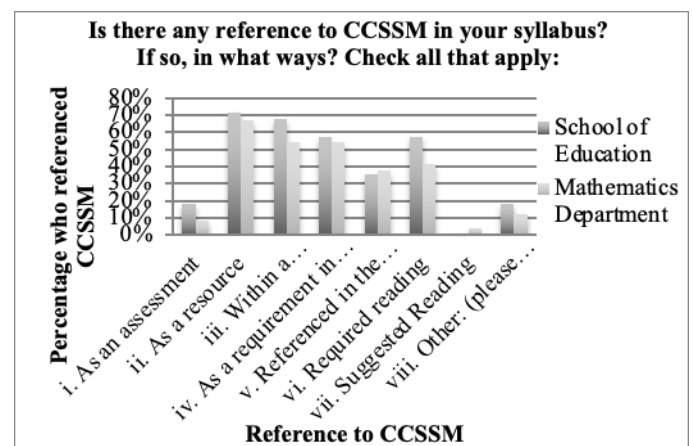


Figure 1. Percentage of participants who referenced CCSSM in their syllabi. (n = 27 College/School of Education, n = 24 Mathematics)

We then explored the participants' responses between department types of the faculty (whether they were part of the College/School of Education or Mathematics Department) on both the importance of CCSSM related questions and how often they discussed CCSSM related content in their course. Table 4 demonstrates the percentage of whether the faculty members from each department type agree or disagree with the importance of the CCSSM related questions and Table 5 demonstrates the percentage of time faculty members from each department type taught CCSSM related content in their class sessions (see Appendices C and D for Tables 4 and 5 respectfully). Table 2 below shows the percentage of all respondents on the importance of CCSSM related questions.

Table 2

All responses to questions related to the importance of CCSSM and effects on practice

Questions	Strongly Agree or Agree	Neutral	Strongly Disagree or Disagree
The CCSSM are necessary for the improvement of mathematics education.	65%	20%	15%
Opportunities to learn about the CCSSM should be included in mathematics content courses for future teachers.	73%	25%	2%
Opportunities to learn about the CCSSM should be included in mathematics methods courses	98%	2%	0%

for future teachers.

Prospective teachers do not need specific instruction on CCSSM, learning general good teaching practices and content conceptually is sufficient.	13%	13%	75%
Since the adoption of the CCSSM, I now include readings about the CCSSM in my course.	68%	16%	16%
Since the adoption of the CCSSM, I now include assignments that are about the CCSSM in my course.	71%	13%	16%
I spend time discussing the CCSSM in my course.	86%	11%	4%
I believe that teachers will receive training on the CCSSM from their schools and/or districts. Therefore, I do not focus much on the CCSSM in my courses.	5%	18%	77%
CCSSM has not changed how I teach.	38%	21%	41%
CCSSM has enhanced my ability to prepare future teachers.	48%	38%	14%
I am reluctant to teach prospective teachers about the CCSSM.	7%	7%	86%
Because of the CCSSM, experiences in field placements	21%	52%	27%



are more effective.

As one can see there is agreement (98%) across department types that “opportunities to learn about the CCSSM should be included in methods courses” and the majority (73%) agree there should be opportunities also in content courses. Also, most disagree or strongly disagree (77%) that prospective teachers will receive training from their schools and/or districts and the majority (86%) are not reluctant to teach prospective teachers about the CCSSM. Along with this, we can see that 86% reported they “spend time discussing the CCSSM” in their courses. There was more variation to the question “CCSSM has not changed how I teach.”

In addition to questions about their beliefs related to the CCSSM, we also inquired as to the time spent on the standards, practices, and instructional shifts. The following table shows how all MTEs (Math Department & School/College of Education) responded to the three questions:

Table 3  
All responses to  
time  
spent on aspects  
of CCSSM

	Never	Some	Half	Most	Every
When teaching your course, about how often do you discuss CCSSM content standards?	4%	47%	18%	18%	14%
When teaching your course, about how often do you discuss CCSSM Standards for Mathematical Practice (SMPs)?	4%	25%	33%	25%	14%
When teaching your course, about how often do you discuss CCSSM Instructional Shifts?	32%	41%	20%	5%	2%

Table 3 shows that the practice standards are emphasized more than the content standards, but the percentage of MTEs that spent at least half or more of their class sessions talking about content or practice is greater than 50%. For the instructional shifts notice that only 27% of MTEs reported they spend at least half or more talking about this topic. While it is encouraging to see the majority of MTEs spend time on aspects of the CCSSM, if little to no time is devoted to the instructional shifts, expecting mathematics teaching and learning to change becomes more challenging.

### Qualitative Data

There were four open-ended questions on the survey which were analyzed using open-coding to find common themes. Because there was substantial agreement between College of Education and Mathematics faculty, we did not code for differences across the participant groups. The number of respondents for the four open-ended questions varied – 54 of 72 responded to the first two questions and 53 responded to the second two questions. Follow-up interviews were conducted with six MTEs. In the phone interviews, we gathered additional data and asked MTEs to “say more about” each of their responses to open-ended questions on the survey. Below are some of the key themes yielded from the open-ended questions and interviews for each question (*italicized quotes are from phone interviews*):

Three themes emerged from the qualitative survey responses and interview data: 1) beliefs about the CCSSM, 2) role of CCSSM in courses, and 3) a focus on the Standards for Mathematical Practice.

## MTE Beliefs about the CCSSM

Most MTEs responded with having positive beliefs about the CCSSM, that the Standards are for the better but not a “panacea”, and that they believed their role was to make pre-service teachers (PSTs) aware of the Standards. As one MTE stated,

*“I think that the CCSSM are a very good way that we can have the potential to improve education if they are implemented properly and the teachers who are in the schools for 20 years have the right kind of support to help update some of their teaching practices in certain ways that would be better aligned with the standards.”*

One MTE reported, “I also believe that mathematics teaching and learning, as well as school are complex cultural phenomena, and that the CCSSM cannot, on their own change this culture.” Related to this perspective, some MTEs reported that they felt it was important to engage PSTs in critical dialogue around the CCSSM and/or discuss the political aspects of CCSSM. As one MTE stated, “We don't try to cover everything deeply because I need to be able to make sure that they also have some of this political knowledge we're teaching.” Another added, “I have worked to educate my students to be aware of policy and advocacy issues so they can protect the profession.” One MTE reported that they avoided these critical conversations stating,

*“I tip-toe around that often because I'm not sure, you know ... It was such a heated issue here, I mean, it still is... I don't want my*

*students to not be aware of Common Core because I feel like that's a detriment to them kind of as a math, you know, as part of the national profession.”*

Yet another perspective that emerged was one of MTEs being “Public Relations” for the Standards. One MTE reported,

*“I feel like it's our job to be PR for it because people are confused, and I think so much is blamed on Common Core that really has nothing to do with the Common Core. Like, assessments. Common Core is just the standards, and then assessments got tied up in it.”*

Some MTEs displayed skepticism in the longevity or effectiveness of the SSSM. One referred to the CCSSM as a “good set of aspirational documents” that have become, “a bit of a Rorschach test (psychological inkblot test)...what people say about them say more about their perspective than the standards themselves.” Another MTE displayed some skepticism by saying,

*“In theory, I think they [CCSSM] sound like a really great thing and... I feel like a lot of mathematics reform since the 70s, have been a lot of the same sort of ideas, same sort of things, and they just keep wrapping it up in a new package and trying to resell it. I think a lot of the ideas that are embodied in the Common Core are very important.”*

### Role of CCSSM in Courses

MTEs that reported that the CCSSM plays a key or major role said things such as, “I structure the course around CCSSM”, “the CCSSM play a dominant role in every class”, or “I use it to center our curriculum.” As one MTE stated, “*Yeah, I definitely look to the Common Core. I look at what is emphasized in the Common Core, what is it that these future teachers are going to be teaching according to the grade levels that they will be certified for*”. Another MTE reported that CCSSM was a critical component of their courses stating, “I believe the CCSSM are a central focus for a methods course and should be something that I am providing my students with opportunities to learn all about. The CCSSM should drive decisions I make in my elementary math content courses with respect to what to focus more and less time on during the course.” One MTE shared that everything she asks her PSTs to do, “has to be tied to a standard.”

Most MTEs reported that the CCSSM had a balanced or supplementary role in their courses. For example, MTEs reported using the standards as a framework for discussions or as components of assignments. One MTE used class time to “help pre-service teachers read and interpret the CCSSM content and practice standards in order to help them plan (short-term and long-term) for instruction.” Many MTEs reported the CCSSM were included in their course but stated, “they are not the main focus of the course”, “play a tangential role”, or “I believe standards should not define our courses”. One MTE reported, “I do not believe that CCSSM is the ONLY set of standards to be discussed but they should play a prominent role as most of my

students will end up teaching in schools that follow the CCSSM.” Another MTE reported on how students understanding of the standard at the beginning of the semester is often a result of information gleaned on social media and how the course worked to critically examine those understandings and evolve to a place where PSTs can become a “contributing member of the discussions about the standards (especially on social media)”. Only one MTE reported that they believed the CCSSM had no role in their courses.

Ways MTEs changed their courses, included adding a course goal “to explore the CCSSM and NCTM standards to inform teaching practices”. Several MTEs reported a general shift in their course structure from using the NCTM PSSM to now focusing on the CCSSM – both content and practice standards. Three MTEs specifically mentioned content changes in how they presented the teaching of fractions to PSTs including more emphasis on unit fractions and using the number line while a few MTEs mentioned they no longer teach statistics in elementary math courses. Others reported minor changes such as now using new terminology consistent with the CCSSM (replacing CGI terminology with CCSSM for problem situation/types). MTEs, who reported that they did not change their courses, provided reasons such as, “CCSSM has replaced NCTM but they’re similar enough there weren’t fundamental changes”, or simply gave no reason. The most common assignment mentioned was having PSTs create units, lesson plans, and/or activities and specify the CCSSM content and practice standards that are addressed. Readings included articles from NCTM journals – specifically *Teaching Children Mathematics* and *Mathematics Teaching*

in the Middle School – “Principles to Actions”, and chapters from “Connecting the NCTM Process Standards and the CCSSM Practices” by Koestler, Felton, Bieda, and Otten (2013). One MTE described a three-part module she/he co-created with other MTEs from different institutions: first, the prospective teachers discuss practices in current mathematics classrooms; second, they do an inquiry-based activity or task and watch a video of a classroom teacher teaching the same task; and third, each prospective teacher and his/her supervising teacher watch the video together and discuss what they see. One MTE described an assignment that required students to justify their position on CCSSM. The assignment is posed as the following:

*""You've gone to your family reunion or your family is getting together for the holidays and someone says, 'Hey, you're an education major. What's up with this crazy math that they're doing now? It's so wrong,' " "How would you respond to this family member to help them better understand what this (CCSSM) is about? I think that's a really real challenge that the students are going to face as they become teachers, both from administration and parents, and even some of their colleagues maybe."*

Lastly, in responses to this question, many MTEs mentioned specific resources that were helpful in their thinking about the CCSSM (See Appendix E).

### **Focus on the Standards for Mathematical Practice**

The Standards for Mathematical Practices (SMPs) were highlighted as an important aspect of the CCSSM in several responses. Many MTEs reported on helping PSTs understand the differences between the two types of standards as well as understanding their respective purposes and goals. Some MTEs provided examples of how their course assignments placed an emphasis on the SMPs. For example, one MTE shared an assignment that requires PSTs to choose an NCTM article to present to the class focused on the connecting to the SMPs. Another shared an assignment that requires students to look for and write about the SMPs during their field placements and/or video observations.

Several MTEs indicated the importance of teaching their courses in a way that models the mathematical practices: “show what the CC is supposed to look like in classroom instruction”, “to remind students that the mathematics they will be teaching will be different than the mathematics they learned themselves as students.” One MTE shared, “...I also always try to tie things to the Standards for Mathematical Practice, and help them see how what they're doing is related to those standards. I usually have a Standard for Mathematical Practice to focus on each week. As we're problem solving I try to highlight how they've done that in their thinking.”

MTEs reported including the Standards for Mathematical Practice and their relationship to current trends and issues in mathematics education. As one MTE reported focusing specifically on the Standards for Mathematical practice

because the SMPs “get overshadowed, unfortunately.” Another MTE reported, “the practices need serious and continued discussion”. And while some MTEs questioned the longevity of the overall CCSSM, one MTE believed the SMPs, in particular, would “stand the test of time.”

## Discussion

It will take some time to fully understand the impact of the CCSSM. As with past reform efforts in mathematics education, the advertised end-goal of the CCSSM is to make long-lasting change and improve mathematics education for all students. As Larson (2012) questions, we also wonder if the CCSSM will be just another ‘footnote’ in mathematics education in ten years. Will the CCSSM positively influence *all* students’ learning? This study provided evidence that MTEs are including the CCSSM in their courses to some degree. These MTEs have differing beliefs about the role of the CCSSM in their courses and as a result use the CCSSM in their course in different ways. These results speak to the need for further research on how the standards are being included in courses for PSTs and what the impact might be on those PSTs’ practice.

The suggested instructional shifts (focus, coherence, and rigor) are intended to help us understand how the CCSSM are different from previous standards and may help to ensure that the standards “are not intended to be new names for old ways of doing business” (National Governors Association Center for Best Practices, Council of Chief State School Officers 2010, p. 5). However, nearly one-third of the survey respondents reported never discussing the instructional shifts and 40 percent reported only mentioning the

instructional shifts during “some” class sessions. If MTEs are not helping PSTs understand the kinds of instructional shifts necessary to achieve the vision put forth by the CCSSM, then can we expect to see measureable results?

Most of the faculty interviewed said they had autonomy over how they addressed CCSSM in their courses. The fact that all the surveyed MTEs reported the inclusion of CCSSM in their courses while none of the MTEs interviewed had formally learned about the standards through professional development is noteworthy and something that is needed to be further researched. During an interview with one MTE, they reported on their knowledge of and comfort with the CCSSM:

I don't feel like I am an expert in this at all or very knowledgeable at all in this, so it's not helping me with my students. I'm struggling myself to catch up and make sense of the Common Core, so right now it's not a tool that I can use to help me move my students forward. I have to do it all on my own basically because there isn't as far as I know professional development opportunities. It's more like just reading things and digging in or whatever. I think if my own knowledge and ways of how can I use the Common Core in my content courses was improved and enhanced, then I really could answer that question in a different way.

We argue this is all the more reason we need to have literature in the field on best practices for preparing prospective teachers with regards to

CCSSM. Findings from this study support Newton, et al. (2013) results such that MTEs believe PSTs should have an awareness of the CCSSM and use the standards and practices in lesson planning as well as field experiences. Additionally, we are still seeing a divide between content and methods courses at most institutions. That is, those faculty teaching content courses are not aware of what the methods faculty are teaching, and vice-versa. So if faculty don't communicate and neither content nor methods faculty are addressing the content and practice standards or instructional shifts, then there is the possibility that some prospective teachers are not being informed about the CCSSM, or important aspects of them, in their teacher preparation.

There seems to be substantial variation to the extent to which prospective teachers are given opportunities to learn about the CCSSM. As we saw in Table 1, and as we might expect, mathematics methods courses emphasize CCSSM to a greater extent than content courses. We think, however, it is worth noting that CCSSM are not solely being addressed in methods courses – that is, content courses are also addressing the need to prepare future teachers with respect to the new standards. Most mathematics teacher educators reported they believe CCSSM is important and should be addressed during teacher preparation – as opposed to leaving this responsibility to districts and schools.

In answer to the question, “what would you say is the role of the CCSSM in your courses?” a few mentioned the role is to show prospective teachers how implementing the standards and practices is supposed to look in the classroom. One mathematics teacher educator said, “we

use videos of teachers using the teaching practices to discuss how classrooms are different from their own math experiences.” It is only natural for prospective teachers to resort back to the way they are most comfortable – which is mostly teaching the way they were taught. By seeing actual examples of teachers successfully using the practices, prospective teachers see how much more effective mathematics instruction is when using the standards vs. traditional methods.

Some faculty in this study reported feeling the need to teach PSTs about the history, complexity, and political nature of the CCSSM. For example, one MTE reported using course time to “demystify the CCSSM” and thus engaged in discussions with PSTs about “what the CCSSM are and what the CCSSM are not”. Another reported, “I believe that it is my responsibility to orient my students to the role of standards and curriculum and their evolution on a national, state, and local level.” While most MTEs in the study reported addressing the CCSSM in their courses in some way, concerns surfaced in some MTEs responses about the creation, implementation and legacy of the standards. One MTE stated:

It has driven the profession of teaching to be more in the spotlight politically, as such I have worked to educate my students to be aware of policy and advocacy issues so they can protect the profession.

Responses related to these concerns fell along a continuum from “We do examine controversies regarding the CCSSM examining editorials, journals, etc. that allow candidates to provide some of their understanding and beliefs based on

theoretical principles” to “I don't get into political debates about whether it is good or bad”. As one MTE expressed in an interview:

Within every mathematics methods course, prospective teachers need to have exposure to how this and any policy document relates to pedagogy. PSTs come into the classroom with their own dispositions, prior experiences and beliefs. My own beliefs are that there are some good things and some not-so-good things associated with CCSSM. This need not affect appropriate pedagogy, though it will influence it to some degree. Helping PSTs navigate this balance between such professional obligations is a role of mathematics methods instructors.

The comparison of the Rorschach test to the CCSSM by one MTE is an interesting one. As with the Rorschach test, the hard work of understanding the standards may be completely dependent on individual perspectives. Does what MTEs say about the standards say more about the MTEs perspective than about the standards themselves? By asking MTEs to tell us about the CCSSM, they are actually telling us about themselves and how they project meaning on the real world. Future research could include a more representative sample by interviewing more faculty from across the nation.

Several questions have emerged for us as a result of this study. What have we learned from past ‘standards’ movements that could help ensure that the CCSSM will be effective in improving mathematics education for *all* students? Are the complicated issues tied to the

CCSSM too thorny to ensure the kind of results the field of mathematics education has been working towards? These are questions that MTEs struggle with in helping their PSTs be prepared for classrooms where the CCSSM are required. An MTE’s role is critical in preparing PST’s to be advocates for students and families.

## Conclusions

This research is situated in the practice of preparing mathematics teachers (K-12) and contributes to the field of mathematics education by providing evidence of what prospective teachers are currently learning about the CCSSM in their preparation as reported by MTEs. As Wilson et al. (2001) asserted, one way to help reduce the gap in our knowledge of teacher preparation is for research to focus on practices and policies across institutions. Study results provide opportunities for analyzing and revising methods and content courses as well as understanding and guiding policy related to the preparation of mathematics teachers to teach the CCSSM. Study results also shed light on the fact that MTEs report having little to no preparation on the CCSSM or how to best address them in their courses. Given the current push to increase the quality of STEM education in the United States, this study contributes to that effort by providing a picture of the current emphasis on the CCSSM in various teacher preparation programs.

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