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Developing and assessing educator beliefs about the common core

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Abstract The Common Core State Standards (CCSS) potentially shifts the way US schools approach teaching and learning. Research suggests that it is important to understand how educators view the CCSS and how they believe the CCSS may impact their practice. We developed and tested an instrument to investigate educator beliefs about the implementation of CCSS. We collected data from two samples of educators regarding their beliefs about the CCSS in mid-size school districts in California that had begun to introduce the CCSS. Our results indicate that the instrument consistently measured three interrelated, yet distinct, sub-constructs of educator beliefs about the CCSS implementation and that the sub-constructs are statistically significantly associated with trust, professional knowledge, and the pattern of CCSS-related professional interaction.

Keywords Common Core State Standards · Educator beliefs · Instrument · Efficacy · CFA · Trust · Professional knowledge · Social network

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1 Introduction

The USA is currently in an era of change in national standards given the implementation of the Common Core State Standards (CCSS). Currently, 43 states and the District of Columbia (D.C.) have adopted the CCSS in mathematics and English language arts (ELA). The Standards aim to provide a consistent, clear understanding of the skills and knowledge that students at the elementary and secondary school levels need to acquire in order to be college and career ready (Common Core State Standards Initiative, 2013), which signals a fundamental policy change in education in its breadth and depth. The Standards call for a deep conceptual understanding of rigorous content as well as the capabilities to apply cross-disciplinary knowledge using high-order skills. Educators across the nation, as well as in California where this study takes place, are attempting to make sense of and implement the CCSS. As each of the 43 states and D.C. has its own discretion in implementing the CCSS, one can imagine that there is tremendous variation in terms of phases of implementation within and across schools and school districts (Hulce et al. 2013).

There has been a rapidly increasing amount of attention to the CCSS through multiple forms of public awareness such as forum, news report, workshops, and practitioners' articles (e.g., Supovitz et al. 2015). However, the empirical understanding of CCSS implementation has not kept pace; and, given the amount of debate and public uncertainty, access to high quality work is imperative. A number of the recent articles has focused on design principles and tips for particular use of classroom activities (e.g., Billings et al. 2013; Feeney 2014; Fraser 2013), while others examine the content of the Standards in specific area such as mathematics, ELA, as well as science and social science literacy and its potential influence on test and pedagogical styles (e.g., Dougherty Stahl and Schweid 2013; Silbey 2013; Troia and Olinghouse 2013). To our knowledge, empirical studies that investigate factors related to the understanding of teachers' preparedness for the CCSS and individual CCSS beliefs are scarce. This study proposes a carefully designed instrument that measures teacher beliefs about the CCSS as a way to deepen the understanding of not only the current reform practices but also future needs for CCSS implementation.

2 Current teacher preparedness for the Common Core State Standards in California

The current study takes place in California, one of the 43 states adopting the CCSS which has given rise to a significant shift in conventional expectations for both teaching and learning in all subject areas. The CCSS calls for a more comprehensive manner in terms of being college and career ready through a set of rigorous standards. While this intention sounds promising, a large number of concerns are still unresolved due in large part to whether or not among other things the degree to which assessments are aligned to the Standards. As teaching in the era of the CCSS has become increasingly complex due to new demands it is increasingly important to understand the degree of teachers' self-perceived preparedness for undertaking such a big task. A recent report discloses preliminary findings around teachers' preparedness for the CCSS from a small group of

elementary and secondary teachers in California (Center for the Future of Teaching & Learning, 2012). The report indicates a few key findings:

1. Overall, teachers appreciated the fact that the CCSS focus on critical thinking, connection to real-world problem solving, and consistency of the Standards across grade levels (p. 2).
2. Elementary school teachers, especially those with less experience, perceived a greater need for more guidance on the implementation of CCSS (p. 3).
3. Secondary school teachers perceived a strong need for professional trainings for implementing the CCSS (p. 2).

These findings, although from a small group of teachers' perceptions, signal an important message to policymakers, practitioners, as well as educators as to the importance of capitalizing existing useful resources for successfully implementing the CCSS. Time and structures are necessary for mobilizing relational human resources as well as developing individual capacity for implementing the CCSS through professional development, etc., which in turn may lead to desired teaching and learning outcomes. As these aspects reflect the current needs in relation to reform, it is imperative to understand how well educators are equipped to implement the CCSS and make informed instructional decisions based on the empirical evidence. To date, we have little evidence to support understanding about the current reform practices in terms of educators' preparedness for the CCSS. This study aims to address this critical need by way of designing and validating an instrument that measures educator beliefs about the implementation of the CCSS, called the CCSS Beliefs Instrument (CCSSBI), with two large groups of educators to broaden and deepen our understanding of educators' sense of preparedness for the CCSS implementation.

3 Theoretical lens

3.1 Educator beliefs

The concept of individual beliefs, from the lens of social cognitive theory, assumes that personal factors, human interactive behaviors, and social context interact and serve as determinants of one another (Bandura 1997). According to Bandura (1997), individual beliefs act as a fundamental driver for human actions, because it is less likely that people are to act if they do not believe they can or will accomplish a given task. Such individual perceived beliefs are concerned with one's judgments of his/her ability to successfully perform the task, rather than concerned with the quantity of the skills one possesses. In this regard, individual beliefs may be related to one's decision making on whether or not he/she chose to perform the task as well as the level of engagement one put forth his/her cognitive efforts in order to achieve purposive goal (Bandura 1982). Therefore, where there are higher levels of individual perceived beliefs, there is greater likelihood of successfully accomplishing a given task/goal (Tuckman and Sexton 1990).

In education contexts, educator beliefs can be defined as individual beliefs about his/her capacity for successfully carrying out academic tasks such as reform practice at

designated levels of engagement/persistence (Bandura 1986, 1993; Greene et al. 2004). Educators develop his/her beliefs system, which serves as a cognitive lens through which they make sense of their context as well as devote their efforts to achieving a goal (Kelchtermans 2009; März and Kelchtermans 2013). The notion of educator beliefs, while being widely used and studied in education research, remains unclear, under-theorized, and widely defined (Pajares 1992). For instance, Tabachnick and Zeichner (1984) defined teacher beliefs as *teacher perspectives*. They viewed teacher perspectives as *the ways in which teachers thought about their work (e.g., purposes, goals, conceptions of children, curriculum)* (p. 28). In a similar vein, Clark (1988) defined teacher beliefs as *implicit theories* that help us understand our social and physical environments. Clark proposed that these implicit theories play an important part in the day-to-day judgments and interpretations in the classroom. Furthermore, Kagan (1992) defined teacher beliefs as *personal knowledge* that equates to *implicit assumptions about students, learning, classrooms, and the subject matter to be taught* (p. 66). Kagan posited that teacher beliefs reflect the instruction the teacher provides to his/her students in the classroom. Goodman (1988) defined beliefs as *intuitive screens* through which new experiences and knowledge are filtered. The intuitive screens provide an orientation point from which new ideas and activities are interpreted and understood. Given that researchers differ in their definition of educator beliefs as subjective propositions, assumptions of truth, generalizations drawn from personal experiences, perspectives from personal experiences, and filters, it becomes even more important to revisit the construct of educator beliefs with a more focused angle that is focused on a specific educational effort (e.g., CCSS).

There is a body of research connecting teacher beliefs and various educational processes and outcomes such as students' motivation and achievement (Caprara et al. 2006; Fang 1996; Siwatu 2011). Scholars suggest that teachers align their instructional practices with their beliefs, which may have a direct influence on both instructional effectiveness and student achievement (e.g., Lee et al. 2013; Putman 2012). Teacher beliefs are suggested to mediate the effects of job-related policies such as changes in curricula (Organisation for Economic Co-operation and Development 2009). As such, teacher beliefs may be expected to influence the degree to which teachers engage in change efforts, such as the implementation of the CCSS. Taken together, we contend that educator beliefs may influence the extent to which he/she makes sense of and carries out reform tasks. Executing these tasks involves interaction between one's self assessment of his/her capability (individual), judgment about the likelihood of reform task completion based on contextual factors (contextual), and the degree of contribution one has made in relation to his/her persisting efforts (consequential). These aspects are uniquely important as each presents its unique perspective in understanding the perceived preparedness for the CCSS implementation. In the following section, we propose three sub-constructs of educator beliefs with a specific attention to the current reform context of CCSS implementation.

4 Educator beliefs about implementing the CCSS

We posit that the individual, contextual, and consequential aspects make up the construct of educator beliefs, which may influence whether or not one may accomplish

purposive action/goal such as implementing the CCSS. Given that educational reform is a complex phenomenon that is closely related to organizational change and learning and has been underexplored with a large scale in the current context of CCSS, it is our primary goal to understand the extent and range of educator beliefs. With such endeavor, we may better able to provide empirical evidence in support of current reform efforts and further add to our knowledge base regarding educator beliefs. In order to understand this complex phenomenon of individual educator beliefs system and its potential influence on carrying out CCSS, we build on Fives and Buehl's (2012) categorization to the context of CCSS by examining three important aspects of educator beliefs about the implementation of CCSS: beliefs about efficacy (individual), resources (contextual), and impact (consequential).

Fives and Buehl (2012) categorized the research on teacher beliefs into investigations of beliefs about (1) context (i.e., beliefs about their environment, school culture or climate, perceived relationships with colleagues, parents, administrators), (2) self (i.e., beliefs about teachers' sense of efficacy, identity and their role as a teacher), (3) content (i.e., beliefs about disciplinary knowledge), (4) teaching practices (i.e., beliefs about cooperative learning, inquiry strategies), (5) teaching approaches (i.e., beliefs about constructivism, developmentally appropriate practices, developing conceptual understanding), and (6) students (i.e., beliefs about diversity, ability, learning, development). As their categorization is based on the review of existing research literature, it may have less psychometric properties in assessing educator beliefs. Therefore, we propose three sub-constructs of educator beliefs based on Five and Buehl's (2012) work and the existing research on individual beliefs.

Efficacy (individual/self) First, we conceptualize educator beliefs about individual/self in relation to CCSS by focusing on educators' sense of efficacy in implementing the CCSS. Efficacy is a well-studied belief that refers to an individual's confidence that she/he can successfully take actions to accomplish certain tasks or goals (Ashton and Webb 1986; Bandura 1993; Gibson and Dembo 1984). The concept of efficacy helps us understand how individuals' beliefs in their ability to perform tasks for specific goals may influence the outcomes of their actions (Bandura 1995). In this sense, efficacy refers to one's judgment of whether or not she/he is capable of reaching specific goals, not whether or not the actual skill sets are present (Bandura 1986, 1995). As such, there is interplay between individual's cognitive beliefs and behaviors (*ibid*), meaning that an individuals' performance may be dependent upon efficacy beliefs and her/his performance may also influence perceptions about efficacy.

In education settings, research has shown that teachers with a strong sense of efficacy are more open to new ideas and willing to try new practices in order to meet the needs of their students (Guskey 1988; Stein and Wang 1988), exhibit more task persistence when faced with struggling students (Gibson and Dembo 1984), and are related to higher rates of student engagement (Ashton and Webb 1986). A number of recent studies on inservice teachers' practice examine individual teachers' sense of efficacy and its relationship with their performance in different subject areas. This suggests that those teachers who perceived themselves to be more efficacious in a particular subject area were also more likely to obtain effective outcomes in teaching and pedagogical change (Lee et al. 2013), classroom management (Putman 2012), co-teaching experience in professional development (Pancsofar and Petroff 2013), web-

based learning design (Annetta et al. 2013), and inclusive education (Savolainen et al. 2012). Another line of research suggests that teacher efficacy is explained by individual and collective trust (Van Maele and Van Houtte 2012) and that teacher efficacy predicts teachers' willingness to implement curriculum reform (Cerit 2013) and teachers' (pedagogical) content knowledge (Abbitt 2011; Swars et al. 2007). Nevertheless, we do not have such a rich base of empirical study related to inservice teachers' as well as other educators' (e.g., school administrators and instructional support staff) beliefs about their ability to carry out the current reform around the CCSS. Given that studies suggest individual teachers' efficacy plays a significant role in their performance, we propose self-efficacy as one important aspect of educator beliefs system that may influence the way in which they go about reform.

Resources (contextual) Second, we conceptualize educator beliefs about the context as identified by Fives and Buehl (2012) by examining educator beliefs about the contextual resources surrounding the implementation of CCSS. Educators may have different beliefs about the availability and adequacy of the resources provided to them in support of implementing CCSS. Educator beliefs about whether they have sufficient and relevant instructional materials, whether they have access to staff for instructional and pedagogical support, and the degree to which they have been given sufficient time to prepare for the implementation of CCSS may vary among teachers and schools (e.g., Handal and Herrington 2003).

A recent national survey of over 10,000 preK-12 public school classroom teachers found that while the majority of teachers were aware of the CCSS, they did not feel prepared to teach to these standards (Primary 2012). Specifically, teachers reported that they needed additional resources such as professional development focused on the requirements of the CCSS, student-centered technology to help students learn to the new standards, and new curricula and learning tools aligned to the CCSS. Prior research on educational reform has demonstrated that access to such resources and guidance from the district or school may significantly impact the successful implementation of reform (Gigante and Firestone 2008; Madda et al. 2007). Additional research also suggests that teacher beliefs about instructional resources such as their pedagogical skills and understandings are associated with their (pedagogical) content knowledge (Abbitt 2011; Sahin et al. 2013; Swars et al. 2007). In this paper, we propose that educator beliefs about the resources in relation to implementing the CCSS serve as the second important aspect of their beliefs system that may affect the extent to which educators carry out the CCSS.

Impact (consequential) Third, we combine Fives and Buehl's (2012) categorization of beliefs about Teaching Practices, Teaching Approaches, and Students by examining educator beliefs about the impact that the CCSS may have on these categories as we regard such impact as the consequential/resulting output of interaction between individual efficacy and contextual resources related to implementing the CCSS. Educators may have different beliefs about the impact of CCSS on their teaching and student learning, and whether they regard the CCSS as a valuable and promising reform effort (e.g., Enderle et al. 2014). Studies that have investigated teacher beliefs about reforms have demonstrated that teachers hold differing beliefs about reform approaches (Barlow and Cates 2006; Czerniak and Lumpe 1996; Enderle et al. 2014). Czerniak and Lumpe

(1996) found that teachers varied in their beliefs about the necessity of various reform strands for being an effective teacher, and that these beliefs influenced the degree of reform implementation in their classrooms. In the previously mentioned national survey of over 10,000 preK-12 public school teachers, 64 % of the teachers reported that CCSS would make a significant impact on improving student achievement (Primary 2012). Since teacher beliefs about the impact of current reform may also influence their teaching performance and student learning, we propose educators' perceptions of the impact of CCSS to be the third key aspect measuring their beliefs about the CCSS.

Based on the literature described above, we posit that self-efficacy of implementing the CCSS, resources for CCSS implementation, and impact of the CCSS serve as three important sub-constructs that measure educator beliefs about the CCSS. However, to our knowledge, no instrument currently exists in published education studies, which have undergone adequate examination of psychometric properties. Given that there has been an increased call for obtaining empirical data in relation to the implementation of CCSS as trusted information to make more informed decisions, this study aims to address the gaps in practice and research by developing, assessing, and validating an instrument tool which is particularly designed to measure educator beliefs about the CCSS. In further testing the validity of the CCSS Beliefs construct, we conducted correlations and inferential statistics between the CCSS Beliefs construct and selected key study variables such as trust, professional knowledge, and professional interaction in our final phase. We selected trust, professional knowledge, and professional interaction as the correlating variables because they are largely studied in education and thus may provide a strong case in validating the CCSS Beliefs instrument.

5 Procedure

In developing the CCSS Beliefs Instrument (CCSSBI), we followed a four-step procedure of established measurement for developing and validating measures (Crocker and Algina 1986; Sax 1997): (1) reviewing the literature and existing scales regarding teacher beliefs, (2) consulting with practitioners and researchers in the area of teacher education with regard to selection and refinement of the survey items in the scale, (3) piloting the revised instrument (Study 1), (4) conducting item analysis and factor analysis to determine the number of constructs to be retained for the instrument, and (5) administering the second data collection to test the revised instrument (Study 2).

6 Developing the CCSSBI

Teacher beliefs, at the present time, have been measured through surveys and questionnaires that have been constructed based on either face validity or an emphasis on generic aspects of individual teacher beliefs. There was no empirical evidence to support our understanding of teacher beliefs about the implementation of CCSS. As there has not been an adequate psychometric measurement of teacher beliefs, nor has there been a valid instrument measuring beliefs about the CCSS and its implementation, this study aims to develop and validate an instrument tool, CCSSBI, to assess teacher beliefs.

To measure teacher beliefs, a survey was developed that consist of 18 items refined from a former 25-item survey used in initial pilot studies. The design of the survey was based on previous research studies in the field of teacher education and education in general with regard to one's beliefs about teaching, learning, pedagogical (content) knowledge, and its relation to various outcome variables such as teaching performance, teacher knowledge, classroom management, and so forth. While this line of studies provides important insights and implications to the field, it has not tapped directly into the current demands for CCSS implementation. Therefore, we incorporated Fives and Buehl's (2012) categorization of teacher beliefs and further constructed three main constructs about teacher beliefs (i.e., efficacy, resources, and impact) and its relating items. For example, items related to the CCSS beliefs about resources require participants to think about different kinds of, yet relevant resources that may help them implement the CCSS (e.g., time, materials, professional development support, etc.), and as such the items were designed to measure participants' perception of such supporting resources.

Background information was collected for each participant on the survey, such as gender, race/ethnicity, highest degree, grade level, job title, and years of experience. In addition, we have also collected self-perception about teacher knowledge, network intentionality, organizational commitment, and school climate. This study will focus on teacher beliefs in the survey.

As the resources and impact aspects of teachers' CCSS beliefs require more detailed information to fully capture a range of areas related to CCSS implementation than it does for efficacy (Fives and Buehl 2012), and thus the number of items assessing resources and impact is more than that for efficacy. Despite the difference in the number of items designed to measure efficacy, resources, and impact for teacher beliefs, each aspect measures a distinct concept. The CCSSBI for teacher participants uses a six-point Likert scale response format ranging from 1 (strongly disagree) to 6 (strongly agree).

7 Modifying the CCSSBI

Our first draft of the CCSSBI instrument consisted of a total of 30 items. We invited a group of teachers as well as school principals and a panel of experts to jointly edit the items for clarity, redundancy, and readability. We included the school principals in the process of modifying the instrument as they play an important role in the implementation of CCSS. The teacher candidates were randomly selected from a preK-12 school district based on a simple stratified random sample strategy by grade level to ensure the teacher candidates are represented in the sample. We ended up with 35 teachers in the total sample who were from each grade level proportionately at three schools as well as the school principals from the three schools. These teachers and principals were also not included in our validation study. The panel of experts included three teacher educators, three faculty members in the field of teacher education, and three post-doctoral scholars whose career trajectory is teacher education. We were then able to further eliminate six items due to redundancy and unclarity. Therefore, the initial draft of the CCSSBI contained a total of 25 items that were categorized into three sub-constructs: CCSS efficacy, CCSS resources, and CCSS impact. The CCSS efficacy

sub-construct measures a teacher's beliefs about his/her ability to implement the CCSS, consisting three items. The CCSS resources sub-construct measures a teacher's perception of whether s/he believes there are sufficient resources and support for the CCSS implementation, consisting seven items. The CCSS impact sub-construct measures a teacher's perception of whether s/he believes the CCSS will have an impact on teaching and learning in general, consisting 16 items.

8 Study 1: piloting the CCSSBI

Following the initial revisions as described above, we conducted a pilot study using the revised version of the CCSSBI with a group of teacher candidates and school administrators in an urban fringe school district in California in 2012. The school administrators were included in the pilot study as their perception of the CCSSBI is equally important in understanding the cohesion of the reform efforts, regardless of the potential difference in perception between teachers and administrators. We argue that internal consistency of the perceived reform efforts as measured through the CCSSBI among teachers and school administrators is critical for achieving the desired cohesion. Data were retrieved from a total of 329 educators of 11 elementary schools (grades K-6) in the district, reflecting a response rate of 84 %. The district has introduced and begun implementing the CCSS since 2011. The 11 schools were selected based on their interest in learning more about the CCSS and willingness to participate in the pilot study. The number of respondents per school ranged from 17 to 41 (M=10.9, SD=6.9). The schools' student demographics reflected overall district demographics in terms of ethnicity, number of ELL students, and free/reduced lunch status. The sample consisted of 89 % teachers (N=293) and 11 % administrators (i.e., associate principals, coaches, resource specialists) (N=36) who were involved in the schools' transition to the CCSS. The educators had between 1 and 34 years of experience working in the district (M=10.4 years, SD=6.2). Of the total of participants, 7 % were Asian/Asian American, 43 % Hispanic, and 43 % White. Additional sample demographics of the pilot study are presented in Table 1.

Study 1 data analysis and results The survey data from Study 1 were first analyzed for item analysis to determine the extent to which the various items are related to each other. Principal component analysis (PCA) was then employed to further reduce the number of items that remain to be problematic on factors that precluded clear interpretation. Next, we performed exploratory factor analysis (EFA) to investigate the underlying patterns of the CCSS Beliefs item loadings on the three proposed sub-constructs, followed by parallel analysis used to determine the number of factors to be retained.

Item analysis We retained only those items that best represented the CCSSBI, meaning that items with the highest item-to-total correlations (i.e., item-to-total correlations of .30 or higher) (Nunnally 1978; Robinson et al. 1991). This resulted in the elimination of two items (i.e., Item 10 and 21 as indicated in Table 2). The item-to-total correlations for these 23 items ranged from .31 to .72.

Table 1 Study 1 sample demographics

	Number (%)
Gender	
Male	59 (17.9 %)
Female	270 (82.1 %)
Position	
Teacher	293 (89 %)
Non teaching roles[a]	36 (11 %)
Race/ethnicity	
Asian	24 (7.3 %)
Hispanic	141 (42.7 %)
White	142 (43.2 %)
Other	23 (6.8 %)
Years of working in the school	
<5 years	80 (24.2 %)
5–8 years	76 (22.9 %)
>8 years	68 (20.7 %)
No response	105 (32.2 %)

Note: N=329. [a]Non teaching roles include principal, coach, and resource specialist

Next, we conducted a preliminary principal components analysis from the existing 23 items to examine the extent to which there might be remaining items that are identified to have problematic loadings on across factors that precluded clear interpretation. As any factor/construct is to some degree related to other factors/constructs, even if the proposed constructs are indeed uncorrelated, using orthogonal rotation methods may potentially misrepresent the findings. As such, we selected promax rotation method (oblique solutions) to take into account the inter-correlation concern. While orthogonal rotation is considered less susceptible to sampling errors, our large sample size is sufficiently good (Comrey and Lee 1992; MacCallum et al. 1999) to address the concern of replicability (Hetzel 1996; Pett et al. 2003). The pattern of factor loadings from PCA indicates that Item 20 had factor loadings less than .40 (Henson and Roberts 2006; Park et al. 2002) and loaded on three factors greater than .30. Therefore, Item 20 was eliminated, resulting in this two-step item-reduction procedure yielding a pool of 22 items that met the criteria for item retention. These items would also be subjected to principal axis factoring to assess the factor structure of the CCSS Beliefs scale. Finally, the internal consistency reliability estimate for the resulting 22-item scale total score was .91.

Dimensionality of CCSS Beliefs To determine the factor structure of the 22-item CCSSBI, we further performed factor analysis on the 22 items using principal axis factoring method and promax factor rotation. It is commonly suggested that the oblique rotations is more desirable than orthogonal rotation (Hair et al. 1987) at the early stage of scale development. We selected promax factor rotation rather than direct oblimin, although with a fairly small difference between these two rotation methods, because of its relatively conceptually simplicity (Robins et al. 2007). Our sample size presents a sufficient subject to item ratio of 12:1. Whether or not sample size is sufficient is

Table 2 Item-total correlations in study 1

Item	Item-total *r*
1. I am familiar with the Common Core Standards	.54
2. I have a working understanding of the Common Core Standards	.62
3. I am able to implement the Common Core Standards	.67
4. I have the resources and materials I need to implement the Common Core Standards	.62
5. I have been given extra time to learn about the Common Core Standards	.62
6. I have access to staff or consultants for mentoring, advice, and ongoing support around the Common Core Standards	.67
7. There is alignment between the Common Core Standards, assessments, and professional development.	.64
8. Most teachers know what they need to do to implement the Common Core Standards	.63
9. The Common Core Standards encompass our school as a whole rather than focusing on particular grade levels, subjects, students, or teachers	.61
10. I think that the Common Core Standards overemphasize literacy across content areas	.26
11. My school is well prepared for the Common Core Standards	.72
12. Most of the teachers in the school would like to see the Common Core Standards continue	.55
13. I would like to see Common Core Standards continue	.58
14. Most of the teachers in the school believe there is value in the Common Core Standards	.57
15. I believe there is value in the Common Core Standards	.53
16. The Common Core Standards are a promising reform effort	.55
17. The Common Core Standards will have a positive impact on my teaching	.65
18. The Common Core Standards will have a positive impact on my students	.63
19. I think that a focus on standardized test scores will remain central to the common core standards	.30
20. I think that the common core standards will result in more formative assessments	.42
21. I believe that the common core standards will result in less emphasis on standardized testing	.29
22. I think that a focus on standardized test scores will remain central to the common core standards	.32
23. I believe that the common core standards will continue to emphasize standardized test results	.40
24. I think that Common Core Standards will change the way teachers are formally evaluated	.34
25. I think that Common Core Standards will improve the way teachers are formally evaluated	.40

dependent upon the nature of the data and less on the absolute number of cases (Fabrigar et al. 1999; MacCallum et al. 1999). As our data, according to the PCA loadings, show that items are closely correlated to the target construct (i.e., very few cross-loading items and different sets of variables strongly tapped the targeted factor), the required sample size would be small. As such, we believed the sample size to be adequate for principal axis factoring. The principal axis factoring yields a five-factor solution that satisfied the Kaiser-Guttman criterion of retaining only those factors with eigenvalues exceeding 1.0 (Table 3). However, the Kaiser-Guttman rule is not an optimal strategy to determine the true factor structure of data due to its overestimate the number of latent factors (Hayton et al. 2004). Therefore, we further performed parallel analysis (PA) (Horn 1965), suggested as a more accurate approach to factor

Table 3 EFA results in study 1

Item	1	2	3	4	5
15. I believe there is value in the Common Core Standards	.91				
18. The Common Core Standards will have a positive impact on my students	.86				
13. I would like to see Common Core Standards continue	.84				
17. The Common Core Standards will have a positive impact on my teaching	.83				
14. Most of the teachers in the school believe there is value in the Common Core Standards	.78			−.27	
16. The Common Core Standards are a promising reform effort	.76				
12. Most of the teachers in the school would like to see the Common Core Standards continue	.63	.33			
11. My school is well prepared for the Common Core Standards		.84			
4. I have the resources and materials I need to implement the Common Core Standards		.73			
8. Most teachers know what they need to do to implement the Common Core Standards		.73			
6. I have access to staff or consultants for mentoring, advice, and ongoing support around the Common Core Standards		.73			
7. There is alignment between the Common Core Standards, assessments, and professional development		.68			
5. I have been given extra time to learn about the Common Core Standards		.65			
9. The Common Core Standards encompass our school as a whole rather than focusing on particular grade levels, subjects, students, or teachers		.61			
2. I have a working understanding of the Common Core Standards			.88		
1. I am familiar with the Common Core Standards			.69		
3. I am able to implement the Common Core Standards			.68		
22. I think that a focus on standardized test scores will remain central to the common core standards				.99	
23. I believe that the common core standards will continue to emphasize standardized test results				.86	
19. I think that a focus on standardized test scores will remain central to the common core standards				.68	
24. I think that that Common Core Standards will change the way teachers are formally evaluated					.81
25. I think that that Common Core Standards will improve the way teachers are formally evaluated					.81
Eigenvalue	8.57	3.47	2.18	1.38	1.14
Cumulative percentage of variance explained	37.60	52.11	61.04	65.87	69.66
Coefficient alpha reliability estimates	.94	.90	.88	.88	.82

Note: Retained factor loading coefficients greater than .30

selection and as a primary method if running EFA to determine the number of factors (Glorfeld 1995; Hayton et al. 2004; Henson and Roberts 2006).

We ran PA using principal axis factor analysis for permutations of the raw data set of the five factors extracted from EFA. The PA results (Table 4) indicate that the eigenvalues from the first three factors extracted from the actual data are larger than its corresponding 95th percentile random data eigenvalue. This suggests that the first three factors are at a statistically significant level to be retained for interpretation. The parallel scree plot from the PA graphs the observed (in black) and estimated (in gray) eigenvalues (Figure 1). The point at which all three lines intersect indicates the number of factors that must be retained according to the PA criterion (O'Connor 2000). In this case, the intersection occurs at the third factor and thus we may retain the first three factors that have met not only the Kaiser-Guttman rule but also the more parsimonious criterion of PA.

In sum, the Study 1 results suggest that three factors were identified from the 22-item CCSSBI. The instrument is summarized in Table 5. The first factor measures the CCSS Beliefs—Impact, reflecting the extent to which educators believe the CCSS will have value and positive impacts on their teaching and student learning (7 items, α=.95). The second factor measures the CCSS Beliefs—Resources, reflecting the extent to which educators believe they have sufficient resources to implement the CCSS (7 items, α=.91). Finally, the third factor measures the CCSS Beliefs—Efficacy, reflecting the extent to which educators feel able to implement the CCSS (3 items, α=.88).

9 Study 2: confirming factor structure and testing construct validity

The purpose of Study 2 was to confirm the factor structure derived in Study 1 by replicating the factor structure from Study 1 using a well-represented sample as well as test construct validity by correlating the CCSS Beliefs scale with the hypothesized factor such as trust, professional knowledge, and professional collaborative interaction. Following the revisions from Study 1, we administered the three-factor version of the CCSSBI with another group of educators (i.e., teachers, administrators, and support staff) in an urban school district in California in 2012. A total of 347 educators of 11 elementary schools (grades K-6) joined the survey, reflecting a response rate of 94 %. The selection of these 11 schools and the school district was based on the similar criteria as we did in Study 1. The number of respondents per school ranged from 17 to

Table 4 Parallel analysis in study 1

Factor	Observed eigenvalue	Mean	95th Percentile
1*	1.61	.22	.33
2*	.32	.10	.17
3*	.07	.01	.06
4	−.18	−.07	−.02
5	−.23	−.16	−.10

Note: Model: principal axis factor analysis. Method: permutations of the raw data set. Number of simulated sample: 1000. Eigenvalue at 95th percentile. * p<.05

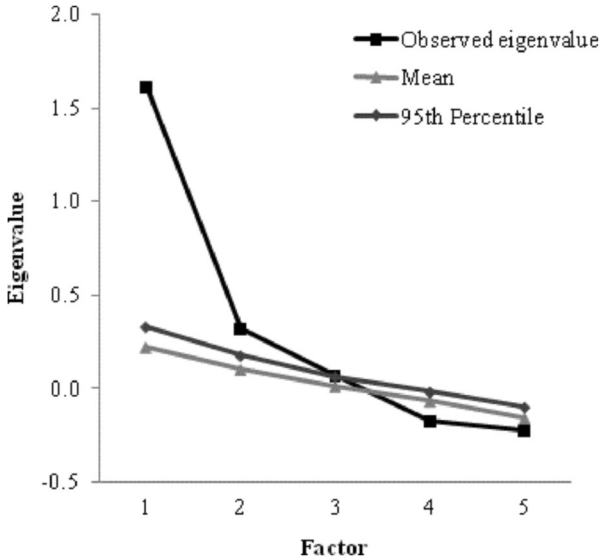

Fig. 1 Parallel scree plot in study 1

46 (M=12.0, SD=5.5). The schools' student demographics reflected overall district demographics in terms of ethnicity, number of ELL students, and free/reduced lunch status. The sample consisted of 91 % teachers (N=316) and 9 % administrators (i.e., associate principals, coaches, resource specialists) (N=31). The educators had between 1 and 39 years of experience working in the district (M=11.7 years, SD=6.7). Of the total of participants, 12 % were Asian/Asian American, 32 % Hispanic, 1 % African American, and 50 % White. Additional sample demographics of Study 2 are presented in Table 6.

Study 2 data analysis and results We first performed item analysis, followed by exploratory factor analysis using principal axis factoring to ensure that the factor structure obtained from Study 1 remains consistent in Study 2. It is suggested that if the pattern of factor structure is consistent across multiple samples, in this case samples from Study 1 and 2, the evidence supporting the obtained factor solution is considered strong (MacCallum et al. 1999). We then conducted confirmatory factor analysis to test the proposed theoretical concept that the three dimensions comprised the CCSS Beliefs construct. Next, we ran correlation analysis to validate the relationships between the CCSS Beliefs construct and trust and professional knowledge. We ran correlations as a number of previous studies suggest that educator efficacy beliefs in general are positively correlated with their perceived trust (Wahlstrom and Louis 2008) as well as content knowledge for teaching (Swars et al. 2007).

Finally, we employed multilevel statistical modeling[1] to examine whether or not the CCSS Beliefs sub-constructs are associated with the degree of educators' collaborative

[1] For more information regarding the multilevel modeling, please refer to Zijlstra et al., 2008; and Zijlstra et al., 2006.

Table 5 Study 1 CCSSBI with three-factor solution

	1	2	3
	Impact	Resources	Efficacy
1. I believe there is value in the Common Core Standards.	.92		
2. The Common Core Standards will have a positive impact on my students.	.92		
3. The Common Core Standards will have a positive impact on my teaching.	.92		
4. The Common Core Standards are a promising reform effort.	.87		
5. I would like to see Common Core Standards continue.	.83		
6. Most of the teachers in the school believe there is value in the Common Core Standards.	.79		
7. Most of the teachers in the school would like to see the Common Core Standards continue.	.67		
8. My school is well prepared for the Common Core Standards.		.91	
9. I have access to staff or consultants for mentoring, advice, and ongoing support around the Common Core Standards.		.78	
10. Most teachers know what they need to do to implement the Common Core Standards.		.74	
11. There is alignment between the Common Core Standards, assessments, and professional development.		.73	
12. I have the resources and materials I need to implement the Common Core Standards.		.73	
13. I have been given extra time to learn about the Common Core Standards.		.71	
14. The Common Core Standards encompass our school as a whole rather than focusing on particular grade levels, subjects, students, or teachers.		.58	
15. I have a working understanding of the Common Core Standards.			.91
16. I am familiar with the Common Core Standards.			.80
17. I am able to implement the Common Core Standards.			.63
Eigenvalue	8.34	2.92	1.13
Cumulative percentage of variance explained	47.25	62.64	67.54
Coefficient alpha reliability estimates	.95	.91	.88

Note: Retained factor loading coefficients greater than .30

interaction. This investigation is grounded on the literature around social capital and social network in education (cf., Daly 2010). This line of literature suggests that educator efficacy beliefs play a statistically significant role in explaining their intention to engage in reform-related collaboration with others. Therefore, we aim to test this research inquiry into educator beliefs and pattern of professional collaborative relationships using the CCSBI as explanatory variables. We believe that the CCSSBI offers a more holistic understanding of educator beliefs system in the current reform context as the instrument measures not only educators' self-efficacy in taking reform actions but also their beliefs about the contextual (resources) and consequential (impact) dimensions in the CCSS implementation. Linking educators' CCSS Beliefs and their reform-related actions would yield valuable insight into our understanding of the interplay between educators' perceptions and their actual actions/behaviors around the CCSS implementation.

Table 6 Study 2 sample demographics

	Number (%)
Gender	
Male	45 (12.7 %)
Female	302 (87.3 %)
Position	
Teacher	316 (91.1 %)
Non teaching roles[a]	31 (8.9 %)
Race/ethnicity	
African American	4 (1.1 %)
Asian	41 (11.6 %)
Hispanic	110 (31.8 %)
White	174 (50.2 %)
Other	18 (5.2 %)
Years of working in the school	
< 5 years	60 (17.4 %)
5–8 years	78 (22.4 %)
> 8 years	121 (34.8 %)
No response	88 (25.4 %)

Note: N=347

[a] Non teaching roles include principal, coach, and resource specialist

Item analysis and factor analysis The item-total correlation of the 17 items range from .45 to .71 and thus we retained all 17 items for factor analysis. We then performed factor analysis on the 17-item scale of CCSSBI using principal axis factoring method and promax factor rotation, yielding a four-factor solution with eigenvalues exceeding 1.0. The pattern matrix indicates that Item 9 and 12 have loadings higher than .40 across two factors and thus were eliminated for further analysis. The resulting factor structure of the 15-item CCSS Beliefs scale explained 66 % of the total variance with factor loadings ranging from .64 to .95. The internal consistency reliability estimate for the three factors ranges from .87 to .95 (Table 7).

Model fit We used IBM SPSS Amos 22.0 to run confirmatory factor analysis (CFA) using the maximum-likelihood (ML) estimation method as research suggests that ML produces accurate results in most situations (Fan et al. 1999; Kline 2005; Levine 2005; Thompson 2004). We employed the two criteria strategy (Hu and Bentler 1999) including not only the conventional chi-square fit index but also at least two or more different types of fit indices to examine the model from different angles (Kline 2005). Thereby, a number of oft-used fit indices were used to evaluate the model and parameter estimates such as the ratio of chi-square relative to the degrees of freedom (χ^2/df), Comparative Fit Index (CFI), the Normed Fit Index (NFI), the Tucker-Lewis Index (TLI), the Goodness-of-Fit Index (GFI), the Adjusted Goodness-of-Fit Index (AGFI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR) as suggested by several studies (Hu and Bentler 1999; Marsh et al. 2004; Tucker and Lewis 1973; Wheaton et al. 1977). A value of 5 or

Table 7 Study 2 CCSS beliefs scale with three-factor solution

	1 Impact	2 Resources	3 Efficacy
1. I believe there is value in the Common Core Standards	.95		
2. The Common Core Standards are a promising reform effort	.94		
3. The Common Core Standards will have a positive impact on my students	.91		
4. I would like to see Common Core Standards to continue	.90		
5. The Common Core Standards will have a positive impact on my teaching	.89		
6. Most of the teachers in the school believe there is value in the Common Core Standards	.64		
7. I have access to staff or consultants for mentoring, advice, and ongoing support around the Common Core Standard		.84	
8. My school is well prepared for the Common Core Standards		.74	
9. I have been given extra time to learn about the Common Core Standards		.73	
10. Most teachers know what they need to do to implement the Common Core Standards		.71	
11. There is alignment between the Common Core Standards, assessments, and professional development		.68	
12. I have the resources and materials I need to implement the Common Core Standards		.66	
13. I have a working understanding of the Common Core Standards			.93
14. I am familiar with the Common Core Standards			.82
15. I am able to implement the Common Core Standards			.78
Eigenvalue	6.87	2.55	1.64
Cumulative percentage of variance explained	43.93	58.67	67.61
Coefficient alpha reliability estimates	.95	.87	.88

Note: Retained factor loading coefficients greater than .30

less for the χ^2/df ratio is considered acceptable model fit (Wheaton et al. 1977). The fit indices such as CFI, NFI, TLI, and GFI should have a value of .90 or higher to be considered an accepted model fit to the data (Hatcher 1994; Hu and Bentler 1999; Medsker et al. 1994; Mulaik et al. 1989; Russell 2002). A value of .80 or higher is recommended for the AGFI (Gefen et al. 2000). The RMSEA should be .06 or lower, however, .08 or lower should be acceptable in most circumstances for the SRMR (Marsh et al. 2004).

The CFA results are presented in Table 8 and Figure 2. The three-factor proposed model was tested for fit. Model one was tested for its initial fit and the fit after fixing large covariance between items within the targeted factor (e.g., between Item17 and 18 and between Item 8 and 11). As the standardized residual covariances of Item 14 are above .04 across five items and thus considered causing discrepancy between the proposed model and the estimated one, we further removed Item 14 to test the model fit, reflecting the results in our second model. The results indicate that the model has an improved fit from the first to the second model after fixing covariance issues. The fit indices such as CFI, NFI, and TLI had values even greater than .95 (ranging from .95 to .98). The GFI value increased from .87 to .93, indicating a good fit model given our

Table 8 Confirmatory factor analysis model fit indices in study 2

	Model 1		Model 2
	Initial	Covariate	
CMIN/DF (χ^2/df)	2.86	2.17	1.91
CFI	.94	.97	.98
NFI	.92	.94	.95
TLI	.93	.96	.97
GFI	.87	.91	.93
AGFI	.83	.87	.89
RMSEA	.09	.07	.06
SRMR	.05	.05	.04

sufficiently large sample size. The AGFI had an increased value from .83 to .89. While the AGFI index was a little below the .90 well-fitting threshold, it met the .80 acceptance level (Gefen et al. 2000). As for the residual-based indices, the RMSEA value dropped from .09 to .06, indicating the proposed model is a better fit to the estimated covariance matrix and the SRMR yielded a good model fit (SRMR decreasing from .05 to .04). Figure 2 presents the final three-factor model of the CCSSBI.

CCSS Beliefs and trust and professional knowledge The final phase is to test whether or not the proposed three-factor CCSSBI is associated with factors such as trust and professional knowledge as suggested by previous studies on teacher beliefs (Brown 2012; Jimenez-Silva et al. 2012; Swars et al. 2007; Siwatu 2007; Wahlstrom and Louis 2008). Both trust and professional knowledge scales have been validated based on previous studies (Bryk and Schneider 2002; Evans 2011; Swars et al. 2007; Tschannen-Moran 2004) (see Appendix 1). Trust is a single-factor construct with internal consistency reliability of .86 (sample item *Teachers are open with each other.*). The construct of professional knowledge is comprised of five items with Cronbach's Alpha of .86 (a sample item: *It is important for teachers to have expert subject matter knowledge.*). Table 9 presents the descriptive statistics and correlation matrix of the study variables. Correlations indicate that CCSS Beliefs—Impact is positively and statistically significantly correlated with collective trust (r=.26, p<.01) and professional knowledge (r=.31, p<.01). The CCSS Beliefs—Resources is positively correlated with collective trust (r=.33, p<.01) and professional knowledge (r=.29, p<.01). The CCSS Beliefs—Efficacy is positively correlated with professional knowledge (r=.28, p<.01), and yet not correlated with collective trust (p=.06). Corresponding to previous studies on teacher beliefs, the proposed three-factor CCSSBI is related to the extent to which trusting relationship exists among educators and educators perceived the importance of possessing professional knowledge.

CCSS Beliefs and professional interaction In addition to the correlation results, we further examined whether or not the three-factor CCSSBI plays a statistically significant role in explaining the extent to which educators engage in collaborative activities

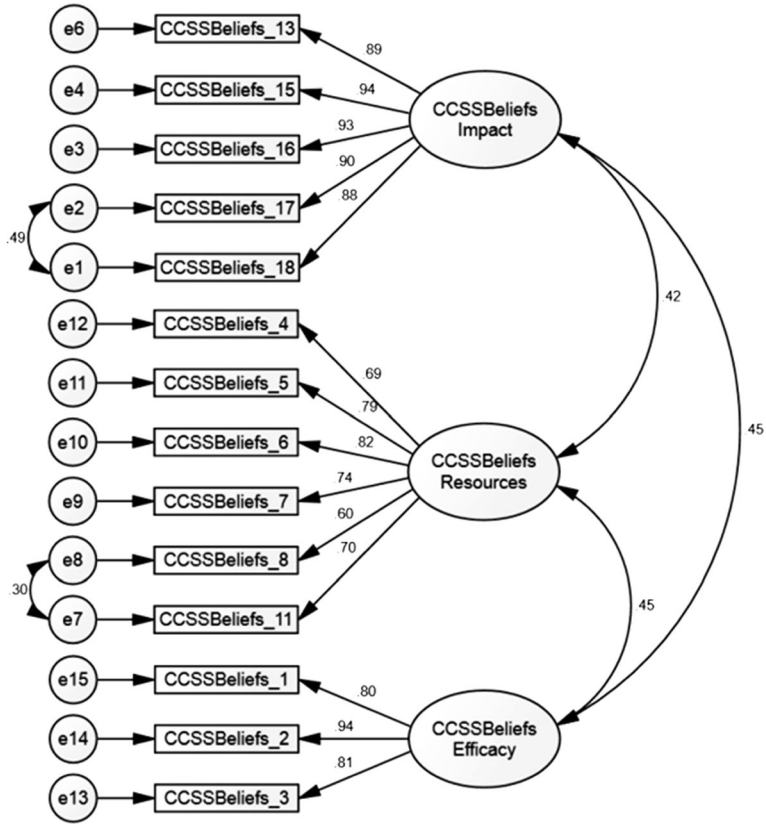

Fig. 2 Final model specification—CFA of the 14-item CCSS Beliefs scale in study 2

related to the CCSS implementation. Research literature on teacher collaboration suggests that educator beliefs may influence individuals' behaviors and actions for purposive goals such as engaging in reform efforts (Fives et al. 2007; Forbes and Billet 2012; Siwatu 2011). A growing body of research has begun to explore the phenomenon of educators' professional interactions related to reform efforts from a social network's perspective using a number of network indices that measure an educator's interpersonal professional relationship, for example advice seeking (e.g., Daly et al. 2011; Penuel et al. 2009; Spillane et al. 2012). This line of study suggests that highly efficacious educators in their ability to lead reform changes and/or to teach and learn tend to be nominated by their colleagues as a source of expertise (incoming ties received from others) as well as be able to quickly access their colleagues for reform-related resources (outgoing ties sending to others) (Daly et al. 2014; Kim and Youngs 2011; Penuel et al. 2009).

To further verify this line of inquiry into educator beliefs and their professional interaction, we conducted correlations and two-level social network modeling (relational ties nested in individuals) from the sample in Study 2 to investigate the relationship between educators' professional interactions around the discussion and sharing ideas about the CCSS are associated with their beliefs about the CCSS as

Table 9 Descriptives and correlations of the CCSS beliefs, collective trust, professional knowledge, and CCSS discussion ties in study 2

	Mean	SD	α	Correlation matrix					
				2	3	4	5	6	7
1. CCSS Beliefs—impact	4.70	0.91	0.95	.43**	.47**	.26**	.31**	.28**	.23**
2. CCSS Beliefs—resources	3.28	1.06	0.87	–	.41**	.33**	.29**	.23**	.21**
3. CCSS Beliefs—efficacy	4.35	0.88	0.88		–	.12	.28**	.24**	.24**
4. Collective trust	4.42	0.65	0.86			–	.17*	–	–
5. Professional knowledge	5.39	0.81	0.86				–	–	–
6. CCSS discussion outdegree	0.18	0.20	–					–	–
7. CCSS discussion indegree	0.18	0.11	–					–	–

Note: The CCSSBI and collective trust and professional knowledge are on a 6-point scale (factor loadings are provided in Appendix 1). α (Cronbach's Alpha) indicates the internal consistency measure of the scale. $^{*}p<.05$, $^{**}p<.01$

measured by the CCSSBI. Correlations (Table 9) indicate a series of positive and medium relationships between the three sub-constructs of CCSS Beliefs and educators' CCSS discussion outdegree (seeking others to discuss the CCSS) and indegree (being

Table 10 Parameter estimates of the *p2* model on the likelihood of discussing the CCSS

	Parameter estimate	SE	95 % CI
Individual covariates			
Sender effects (*reaching out for discussion*)			
Formal position (teacher/other)	0.95	0.83	(−0.65/2.50)
Years of experience at school	−1.23*	0.46	(−2.10/−0.30)
Gender (female/male)	−1.47*	0.70	(−2.74/−0.07)
CCSS Beliefs Impact	1.66*	0.66	(0.77/3.10)
CCSS Beliefs Resources	−1.33*	0.68	(−2.51/−0.13)
CCSS Beliefs Efficacy	0.52	0.70	(−0.82/1.65)
Receiver effects (*being sought for discussion*)			
Formal position (teacher/other)	−1.39^	0.74	(−3.08/0.01)
Years of experience at school	0.48	0.34	(−0.13/1.16)
Gender (female/male)	0.77	0.49	(−0.39/1.72)
CCSS Beliefs Impact	−0.57^	0.32	(−1.29/0.02)
CCSS Beliefs Resources	1.42*	0.57	(0.28/2.55)
CCSS Beliefs Efficacy	−0.47	0.39	(−1.28/0.24)
Dyadic covariates			
Different beliefs about CCSS Impact	−0.01	0.04	(−0.10/0.07)
Different beliefs about CCSS Resources	−0.06	0.04	(−0.14/0.02)
Different beliefs about CCSS Efficacy	−0.11*	0.04	(−0.18/−0.04)

Note: Examination of 20,736 present relationships from 241 educators. $^{*}p<.05$, $^{\wedge}p<.10$

sought by others for the discussion of CCSS) (r ranging from .21 to .28, $p<.01$). The two-level model (summary of main findings in Table 10) indicates that controlling for demographics information (e.g., gender, years of experience, and position), CCSS Beliefs—Impact positively contributes to educators' seeking their colleagues for discussion around CCSS, and CCSS Beliefs—Resources positively contributes to educators' being sought by colleagues for discussion around the CCSS but negatively explains educators' seeking behaviors. The CCSS Beliefs—Efficacy although does not explain educators' seeking and receiving behaviors; it however statistically significantly explains the likelihood of establishing a tie between educators to engage in CCSS discussion. In sum, the results from two-level modeling confirm previous studies on educator beliefs and their professional interactions and further specify the type of beliefs and its relationship with pattern of interactions that are tailored to understanding the CCSS efforts.

10 Limitations, implications, and conclusion

As educator beliefs play an important role in how they go about implementing an important reform, this study examines educators' perceptions of their beliefs about the CCSS from three aspects and the extent to which their CCSS beliefs influence their pattern of reform-related relationships. The present study proposed a CCSS Beliefs instrument and validated the instrument resulting in three core sub-constructs related to educator beliefs about implementing the CCSS in an effort of understanding how educators perceive their preparedness the CCSS implementation. The three sub-constructs include: educator beliefs about their efficacy in implementing the CCSS, educator beliefs about resource and/or training availability in support of implementing the CCSS, and educator beliefs about the impact of CCSS on teaching and learning. Our work is timely and promising as it offers a useful and practical tool to help schools not only unpack the complex cognitive understanding of educator beliefs about the CCSS, but also target high leverage areas in relation to evaluating the implementation of CCSS. We provide a number of implications in both research and practice for future scholars who are interested in studying educators' CCSS beliefs and relationships between their CCSS beliefs system and other important factors that may affect collective practice of educators.

11 Delimiters and research implications

The 14-item three-factor CCSS Beliefs Instrument was developed and validated in this research and found to reflect adequate psychometric properties as supported by the confirming evidence across the two studies from two different samples of educators. An underlying three-factor dimensionality of the CCSSBI was established in Study 1 and was further confirmed in Study 2, with well-acceptable fit indices. Corroborating previous research results, we found statistically significant associations between the CCSSBI sub-constructs and trust, professional knowledge, and professional interactions (i.e., ties for CCSS discussion).

As with many empirical studies, we acknowledge a number of limitations regarding this research. Despite the sufficiently large sample size of the two studies in our work, these educators in the study samples only represent the group of educators at the elementary school level. Future studies should broaden the scope of targeted population to include educators across different levels of education such that a more representative voice could be heard in informing policy making with regard to the current reform, CCSS. Such effort may increase our confidence in the measure ability to speak for a larger segment of stakeholders. In addition, as our work provided preliminary correlations and inferential statistics results as one way of validating the CCSSBI, future studies are encouraged to collect criterion data such as outcome measures across a large group of representative sample to further confirm criterion-related validity using multilevel inferential statistics. In addition, future research may include other factors such as student achievement, index measuring teaching performance, and if possible, the extent to which educators have taken actions in support of their existing CCSS practice that is aligned with their beliefs about the implementation so as to understand the predicting effect of individual beliefs about reform on his/her actual reform-related performance.

12 Practical implications

The development of the CCSS Beliefs Instrument sheds new light on the existing research and practice regarding assessing the degree of preparedness in implementing the CCSS among educators. As such, the instrument has a number of potential uses. First, we encourage school districts to administer the CCSSBI to include a wide range of stakeholders including teachers, school and district level administrators, instructional support staff, as well as parents and community members with proper modification of the instrument to fit the participating subjects. Information gathered from the CCSSBI helps identify potential gaps and weaknesses in certain aspects that may need greater attention. Such evaluative effort is critical in not only helping schools and the district become more aware of the existing reform practice as the process of formative auditing but also supporting the larger community of policy makers to make informed decisions based on collective feedback.

Second, we believe that by understanding the level of preparedness for the CCSS implementation, schools and districts may be better able to explore ways of strengthening their beliefs system about implementing the CCSS. In terms of increasing educator beliefs about the CCSS implementation, one course of action may include ongoing reflection on the existing structured time, physical space, and opportunities for professional trainings for educators to engage in discussion and exchange of ideas with a clear focus on CCSS-related instructional strategies. The district may enhance its internal capacity by reallocating and maximizing the use of existing capital resources (such as teacher leaders) that are influential and necessary for moving along reform efforts. For instance, districts could utilize the central roles as key points of information/resource hubs to disseminating and exchange information about positive impact of some of the useful practices related to teaching and student learning.

Third, our work suggests that educators and clinical researchers may benefit from using the CCSSBI for engaging action research. For instance, teacher education faculty

may use the instrument to measure pre-service teacher beliefs about the CCSS implementation as a way to prepare our teachers at their early career stage for managing the challenges of carrying out CCSS. Similarly, educational leader preparation programs may also conduct the assessment of school and district leader beliefs about the CCSS to help districts identify aspects in leader beliefs that require the most attention and explore strategies in creating an organizational climate that fosters shared beliefs about reform and professional collaboration around reform among and between leaders.

Fourth, while the CCSSBI measures three conceptually distinct sub-constructs which help unpack and comprehend our understanding of educator beliefs system, it is important to note that these sub-constructs are to a degree inter-correlated with each other. As the majority of previous studies investigated *individual* level of personal beliefs, namely self-efficacy, to our understanding none of the exiting studies have taken into account the *contextual* (resources) and *consequential* (impact) aspects of personal beliefs in relation to CCSS. Our work, while recognizing the interconnectivity between sub-constructs, places equal weight on the three unique aspects of educator beliefs about CCSS in that each makes its particular contribution to understanding educator beliefs system that is related to the CCSS. As is suggested in many previous studies, personal beliefs drive actions (Bandura 1997), and therefore educator beliefs about reform may as well influence the ways in which they go about implementing a reform. If educators perceive having less access to resources and guidance provided by the school/district, it is less likely they would feel confident in their ability to carry out the reform. Following the same thread, given the interplay between efficacy beliefs and the contextual aspect of their beliefs, we may speculate that it may be even less likely educators would perceive positive impacts on teaching and student outcomes.

Finally, building on the previous point of examining different aspects of educator beliefs, our results from Study 2 showed a difference in CCSS Beliefs perception among the three sub-constructs. The educators in our sample perceived the lowest level of CCSS Beliefs—Resources, with a medium level of perception of CCSS Beliefs—Efficacy and a highest level of perception of CCSS Beliefs—Impact. We may interpret the finding that while the educators felt that there might be insufficient and non-accessible resources (e.g., instructional materials, professional trainings) provided for them to implement the CCSS, they felt a higher level of confidence in their ability to implement the reform, which might lead to a even higher perception that they believed there will be positive impact on their teaching and student learning. Therefore, for schools and districts to unfold the complex phenomenon of educational reform, the use of CCSSBI may be one useful approach as its multidimensional design helps deepen our understanding of the work of educators at different levels (self, contextual, and consequential).

As educator beliefs about the implementation of CCSS have had much less attention and limited empirical evidence, we feel that our work provides a nuanced and in-depth understanding with regard to how we may better prepare ourselves for the next wave of educational change. This critical understanding may serve as a foundation for future reform practices in that individual behaviors are based on the extent to which their beliefs system informs them whether or not to take corresponding actions. We feel that our work is imperative as it addresses the existing gaps in our understanding of how educators believe about change as one reform wave after another.

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Conflict of interest As we have no formal relationship with the study school district in terms of teaching responsibility, supervisory duties, or evaluation, we have no conflict of interest.

Appendix

Table 11 Factor loadings of the study variables

	Factor loadings
Collective trust (α=.86)	
Teachers are open with each other	.89
Teachers trust each other	.88
Teachers have faith in the integrity of their colleagues	.88
Teachers are honest with each other	.87
Even in difficult situations, teachers can depend on each other	.84
Teachers really care about each other	.81
Teachers typically support each other	.80
When teachers tell you something you can believe it	.79
Teachers do their jobs well	.62
Professional knowledge (α=.86)	
It is important for teachers to…	
have a broad and deep understanding of the content area(s) they teach	.90
have expertise in the subject area(s) they teach	.88
have expert subject matter knowledge	.83
have knowledge of how students learn	.74
have knowledge of how to motivate students	.70

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