

Paper Title: Linking Teacher Concerns and Professional Development with the CCSSM

Implementation

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## Linking Teacher Concerns and Professional Development with the CCSSM Implementation

The *professionalism principle of Principles to actions* (National Council of Teachers of Mathematics, 2014) asserts that it is the responsibility of educational leaders to offer sustained relevant professional development (PD) opportunities that foster teacher growth and development and support a culture of coaching and collaboration. This principle is fundamental as education leaders grapple with the comprehensive reform associated with the implementation of the Common Core State Standards (CCSS). It is essential to understand the teacher's concerns during the implementation because research has shown that curriculum reform is likely to fail if pre-reform teacher efficacy beliefs are ignored (Christou, Eliophotou-Menon, & Philippou, 2004; Charalambous & Philippou, 2010). Also, teachers' concerns and beliefs about their content knowledge and teaching methods, as well as access to PD programs affect the fidelity to curriculum innovations (O'Sullivan, Carroll, & Cavanagh, 2008; Tunks & Weller, 2009). As students' perceptions and beliefs originate from engagement in classroom activities; it is crucial to understand the teachers' struggles and frustrations they encounter when implementing curricula reform (Stickles, 2011). It is the beliefs, rather than methods or curriculum, that underlie practices at a level to make a significant difference in education reform (Beswick, 2007).

The purpose of this mixed-methods study was to investigate and understand the concerns of secondary level mathematics teachers during the initial stages of implementing the CCSSM and to determine if a relationship existed between the concerns and PD received during the initial stages. Data gathered from this study is relevant as it could be used to project levels of use in subsequent stages of the curriculum implementation. These projections can be used by education leaders to design interventions and effective PD aiding teachers in the continued implementation

of CCSSM. Also, the results can be used by future change facilitators to understand the relationship between teacher concerns and PD.

### Statement of the Problem

In order to align interventions and PD with the levels and stages of concern, it was important to understand how the implementation was affecting the various groups involved in the change. Thus, this study investigated the concerns teachers experienced during the initial phase of implementation of the CCSSM. The researcher also investigated if concerns and levels of intensity varied by subgroups differentiated by primary grade level taught, years of teaching experience, geographic location, highest degree held, method of mathematics licensure, National Board Certification (NBCT), and the type and amount of PD received prior to and during the initial implementation. Specific data targeting these subgroups will help change facilitators develop interventions and continuing PD to aid in the future implementation years of the CCSSM and other education-based innovations and, most importantly, affect student achievement by improving instruction.

Professional development, designed to aid in the implementation of curricular reform and support a paradigm shift in teacher beliefs, must recognize the extent to which teacher beliefs influence how they implement new curriculum materials (Rogers, Cross, Gresalfi, Trauth-Nare, & Buck, 2011). To fully understand a teacher's willingness to participate in opportunities to learn, their beliefs that constitute their identity need to be realized and targeted (Collopy, 2003).

Professional development opportunities should reflect the current teacher concerns and beliefs, as their concerns are the lenses with which teachers view reform. Once these concerns are recognized, interventions can be prescribed to facilitate successful innovation implementation (O'Sullivan, Carroll, & Cavanagh, 2008; Drake, 2006). Professional

development design must diagnose and target one of two assumptions prevalent in eliciting change in teacher beliefs: (1) beliefs change before practices, or (2) beliefs change after positive evidence of learning outcomes (Guskey, 1986).

Implementation of the CCSSM requires innovative reform tactics that are indeed a paradigm shift in many teacher belief systems. Thereby, reform of this magnitude will elicit substantial teacher concerns. Successful implementation of CCSSM relies on PD that is intensive, ongoing, connected to practice, focused on student learning, addresses specific content, aligned with school improvement goals, and fosters teacher collaboration (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009).

Curriculum innovation is a very tenuous and complicated process interwoven with many variables, each one affecting the other. The underlying root of the process is the belief system of all stakeholders involved in the innovation. Consequently, successful educational innovations have inherent beliefs about change: change is based on learning and improvement is based on change; successful change requires social interaction; individuals must change before the school changes; change has an effect on emotions and behaviors of humans; change occurs more readily if people recognize the benefits of change; and the change leaders role in the process is one of facilitator (Hord & Roussin, 2013). Even with all of the research being conducted on beliefs, concerns, and their relationship to the change process as well as the need for continued and sustained professional development to support the change, few studies have been conducted at the secondary level delving into the relationship of concerns, specifically prescribed PD, and the successful implementation of the innovation.

## Theoretical Framework

The Concerns Based Adoption Model (CBAM) is a robust and empirically grounded theoretical model for the implementation of innovations (Hord & Roussin, 2013). CBAM was designed to measure, describe, and explain the process of change experienced by teachers involved in attempted curriculum innovations and to discover how the reform process is affected by interventions from change-facilitators (Hord & Roussin, 2013). The essential elements of the model include basic assumptions about change, concepts on the Stages of Concern (SoC), Levels of Use, and Innovation Configurations (Anderson, 1997). There are seven stages of concern: unconcerned, informational, personal, management, consequence, and refocusing (Anderson, 1997). Stage progression is not always linear and embedded within each stage are levels of intensity (Hall & Hord, 2001). Delineating the characteristics of each stage is a core feature of CBAM.

CBAM was introduced by Gene Hall and associates from the Research and Development Center for Teacher Education in the early 1970's (Hall & Hord, 2001). CBAM was conceived because the adoption of innovations had not been sufficiently studied within the context of the developmental process in which the concerns of the individual adopter and the relationship of these concerns to the use of the innovation are vital to the implementation of the innovation (Hall & Hord, 2001). CBAM built upon the work of Fuller (1969) who conducted in-depth studies of concerns of student teachers to create a model consisting of four levels: Unrelated, Self, Task, and Impact (Hall & Hord, 2014).

Concern is defined as a mental exercise encompassing questioning, analyzing, re-analyzing, searching for alternative responses, and predicting consequences (Hall & Hord, 2001).

Understanding teacher concerns is necessary as individual concerns of teachers can impact reform implementation. The SoC model provided the tool to gain an understanding of teachers' beliefs and concerns in relation with the expected behaviors of the reform which in turn will aid in implementing the reform process with fidelity (Tobia, LaTurner, Litke, & Butler, 2013). Ideally, under the auspices of a closely facilitated implementation, the developmental path of concerns during the implementation of an innovation moves from early Self-concerns to Task-concerns during the first years of use progressing ultimately to Impact concerns after three to five years (Hall & Hord, 2014). Unfortunately, this progression can be arrested and redirected if change facilitators do not provide effective support or interventions during the implementation (Hall & Hord, 2014). The SoC framework provided the structure needed to analyze and interpret teachers' concerns during the initial phase of implementing the CCSS.

An implementer of an innovation will have concerns at each stage, and may have intense concerns at more than one stage. This array of concerns can be illustrated graphically by using a concerns profile by representing the SoC on the horizontal axis and the relative intensity of concerns on the vertical axis (Hall & Hord, 2014). The peak stages show the more intense stages; whereas, the valleys show the lower levels of intensity (Hall & Hord, 2014). It is possible for a person to exhibit multiple peaks of concern during various stages of implementation.

Within the construct of the CBAM there are three ways to assess concerns which include an informal semi-structured interview process, an open-ended concerns statement, and the SoC questionnaire (SoCQ) (Hall & Hord, 2014). To maintain anonymity and to obtain a larger sample size, this study only used the tools of the SoCQ and the open-ended concerns statement. The SoCQ is the most rigorous method for measuring concerns as raw scores are calculated for

each stage and then converted into a graphical representation of the data creating a concerns profile (Hall & Hord, 2014). The open-ended statement allows the respondent to express their concerns in their own words; thereby, allowing the researcher to delve deeper into the concerns (Hall & Hord, 2014). The open-ended statement verified the results of the concerns profile.

As the results of this study could be used to inform interventions and professional development to aid in the process of future stages of implementation of the innovation, it is important to align the interventions with the concerns of those engaged in the implementation process (Hall & Hord, 2014). For example, when teachers are involved in the first year of a standards-based innovation, such as the CCSSM, they are likely to be exhibiting intense concerns at Stage 3, Management (Hall & Hord, 2014). Teachers with intense task concerns are not interested in the philosophy of the innovation, they want methods and resources to help them implement the innovation on a daily basis; whereas, teachers at the Impact level of concern are more interested in the abstract and subtleties of the innovation (Hall & Hord, 2014).

## **Research Design**

### **Research Questions**

Research question 1: What concerns did Mississippi secondary mathematics teachers experience during the implementation of the Common Core State Standards?

Research question 2: What relationships existed between the type of professional development received on the implementation of the Common Core State Standards and the concerns that teachers are experienced?

## **METHODOLOGY**

This mixed-methods study utilized three research methods to answer the research questions: quantitative which included means, frequencies, standard deviations, and a

multivariate analysis of variance; a profile analysis including peak stage interpretation, and a qualitative analysis. Using the Concerns-Based Adoption Model (CBAM) as the theoretical framework, the researcher investigated the concerns held by Mississippi mathematics teachers during the initial phases of the implementation of the CCSSM. The primary tool for the research was the online version of Stages of Concern Questionnaire (SoCQ) which included two open-ended statements.

Data gathered in this study was analyzed quantitatively via a MANOVA research methodology looking for any relationships present within the stages of concern between subgroups. Using the graphical profile analysis and the SoCQ percentile data provided by the SEDL online data collection program the researcher performed an interpretation of the Peak Stage Scores and a Profile Interpretation (George, Hall, & Stiegelbauer, 2006). This interpretive analysis was performed for each individual response and each subgroup. The researcher assigned a user profile to each respondent and subgroup. The profile interpretation included the highest SoC, the second highest SoC, the Lowest SoC, and a user-profile (non-user, beginning user, and experienced user). The first open-ended question on the questionnaire was analyzed holistically to verify the profile assignments garnered from the Peak Stage analysis and the Profile Interpretation. Both open-ended responses were analyzed qualitatively to search for themes within the concerns data as a whole and also by subgroups and the assigned profiles.

### Participants

Participants in this study consisted of 88 secondary mathematics teachers from 29 public school districts across the state of Mississippi spanning grade levels seven through high school. Focusing on Mississippi teachers was not only a convenience sample, but a necessity for this study: each state's standards were different and each state implemented the CCSS in different



ways. Therefore, concerns of teachers across the nation will vary depending on the rigor of their former standards

## Instrumentation

### *Validity and Reliability*

The instrument used in this study was the Stages of Concern Questionnaire (SoCQ) Form 075 which was initially developed and validated in 1974 to quickly score the seven Stages of Concern about an innovation (George, Hall, & Stiegelbauer, 2006). The SoCQ was tested at the Research and Development Center for Teacher Education at the University of Texas at Austin for estimates of reliability, internal consistency, and validity with several samples of varying sizes and through 11 different innovations (George, Hall, & Stiegelbauer, 2006). Since 1974 the SoCQ has been used and psychometric properties tested a myriad of times both for educational and non-educational innovations (George, Hall, & Stiegelbauer, 2006). Table 1 shows the alpha coefficients of internal consistency for each of the seven Stages of Concern scales. The coefficients reflect the degree of reliability among items on a scale in terms of overlapping variance computed using a stratified sample of 830 teachers in 1974 (George, Hall, & Stiegelbauer, 2006). Stage 0 does have a coefficient below the minimum desired score of .70, but inclusion of Stage 0 in this study makes sense as most participants in the study will not be Stage 0 as they are currently in the implementation stages of the Common Core.

Table 1

### *Internal Reliability Ratings*

Coefficient of Internal Reliability for the SoCQ							
Stage	0	1	2	3	4	5	6
Alpha	.64	.78	.83	.75	.76	.82	.71

(George, Hall, & Stiegelbauer, 2006, p. 20)

## Data Analysis

*Quantitative analysis.* Statistical analysis of each hypothesis included frequencies, means, standard deviations, and multivariate analysis of variance, MANOVA with an alpha of .05 was used to investigate any differences in the means of the relative levels of intensity present within the subgroups.

*Profile Interpretation.* RQ1 was addressed by using the graphical profile analysis of each respondent and subgroup by analyzing the percentile scores for all seven stages and interpreting the meaning of the highs and lows and their interrelationships. Peak Stage Scores for the whole group and for each subgroup were determined by examining both the highest and second highest stage scores by using a data matrix to cross tabulate each individual's highest and second highest SoC (George, Hall, & Stiegelbauer, 2006). To obtain a richer clinical picture of the concerns, a Profile Interpretation for each individual, subgroup, and the whole group was implemented by examining the percentile scores for all seven stages and interpreting the meaning of the peak scores and their relationship to the whole SoC profile (George, Hall, & Stiegelbauer, 2006). Peak scores, the first and second highest scores, as well as lowest score and a user-profile (non-user, beginning user, and experienced user) were assigned to each individual and subgroup (George, Hall, & Stiegelbauer, 2006). An overall profile analysis of all respondents and subgroups was then be made. Each graph was analyzed for the presence of a 1-2 split which is when there is an obvious difference between Stages 1 and 2. A negative 1-2 split is when Stage 2 is higher than Stage 1; whereas, a positive 1-2 split is when Stage 1 is higher than Stage 2. A negative 1-2 split indicates possible resistance to the innovation; while, a positive 1-2 split indicates positives tendencies to continue with the innovation. The relationship of Stage 6 was also analyzed. If Stage 6 tailed up, this meant the respondent was looking to refine the

innovation either to replace it or to improve the innovation to make it work better for the respondent. A tail down indicated the respondent was either so frustrated with the innovation that they decided not to continue use of the innovation, or they were still at the stage of working through the innovation. The positive or negative tendencies of Stage 6 depended upon the relative intensities of the other stages. Anxious users were identified if the analysis showed high levels at most of the stages. This analysis was compared to the results of the quantitative study of the research hypotheses looking for similarities and discrepancies.

*Qualitative analysis.* Once all the data has been analyzed quantitatively, a qualitative analysis ensued to delve deeper into the intricacies of concerns to gain a better understanding of the concerns teachers had during the implementation of CCSSM. Participants who responded to the open-ended questions were included in the qualitative analysis. The first open-ended question (OE1) asked "What do you think about the implementation of the Common Core Standards for Mathematics, what concerns do you have?" It was analyzed within the framework of CBAM as described by Hall and Hord (2014) by initially reading the statement and determining if the overall theme reflects one of the concern dimensions of Unrelated, Self, Task, or Impact. The statement was further analyzed by rereading the statement sentence by sentence, and assigning a SoC to each sentence. Finally, the whole statement was judged holistically to determine peak SoC. The qualitative analysis included the process of looking for themes using descriptive coding followed by elaborative coding within the realm of CBAM literature (Saldana, 2013 & Patton, 2002).

RQ2 was answered by analyzing the second open-ended response on the SoCQ. The second open-ended statement, "Describe the type and amount of professional development you have received on how to implement the Common Core State Standards for Mathematics in your

classroom including any concerns you have with professional development for the CCSSM", was qualitatively analyzed looking for themes using descriptive coding followed by elaborative coding within the realm of CBAM literature (Saldana, 2013 & Patton, 2002). Queries were run to search for any patterns and/or relationships prevalent within the data as a whole as well as within the subgroups and user profiles.

### **Results**

The MANOVA analysis only revealed a significant difference between the raw scores of the seven stages of concern based on the highest degree held by teacher with  $F(14, 158) = 2.653$ ,  $p = 0.002$ . The individual ANOVA's on the Tests of Between-Subjects showed that there was an effect at Stage 4, Consequence, with  $F(2, 84) = 6.119$ ,  $p = .003$ . A Tukey HSD post hoc test showed the difference within the subgroups was between respondents who held bachelors and masters degrees. The mean difference between the two groups was 4.3387 with  $p = .005$ . This result implies that the means revealed respondents with bachelor's degrees had a higher relative level of intensity of concern at Stage 4, Consequence, than the respondents who held a master's degree. The quantitative analysis was inconclusive in revealing relationships among the subgroups.

The profile interpretation methodology of the CBAM revealed a beginning user profile for the whole cohort as noted in figure 1. The cohort exhibited intense concerns at the personal level coupled with intense management concerns. The profile revealed a tailing up at the refinement stage; this behavior indicated that teachers have intense personal and task concerns

and are looking for a way to refine the implementation process.

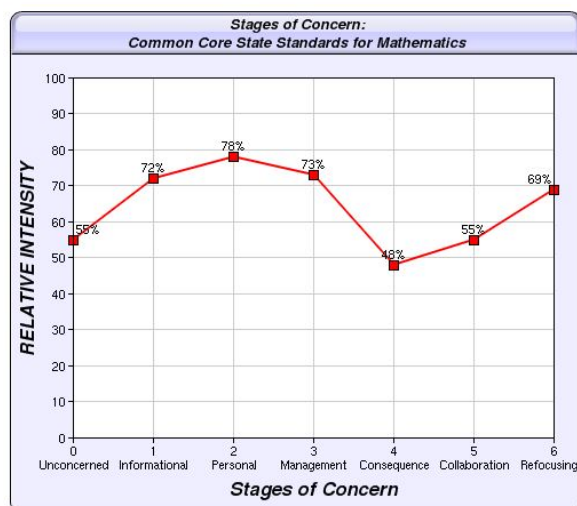


Figure 1. Stage of Concern graphical analysis of the whole cohort.

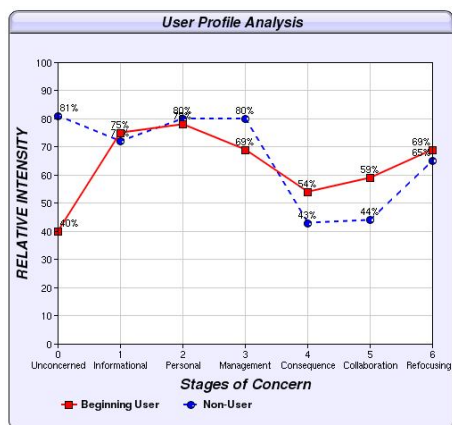
In order to compare the peak scores and second highest peak scores, a matrix which cross-tabulated these scores was analyzed as displayed in Figure 2. Most of the peak scores were coupled with an adjacent second highest SoC which shows a linear progression of working through the stages synonymous with the wave motion of user profiles. Of interest, respondents with a peak stage score at Stage 3, Management, tied for second highest score at Stages 1, 2, and 6. Stages 5 and 6 were coupled with non-adjacent stages of Stage 1 and Stage 3, respectively.

Highest Stage of Concern	Second Highest Stage of Concern							Percentage of participants	Number of participants
	0	1	2	3	4	5	6		
0 Unconcerned	0	33	25	25	0	0	17	13.8%	12
1 Informational	0	0	42	11	0	11	37	21.8%	19
2 Personal	15	30	0	20	10	25	0	23.0%	20
3 Management	12	29	29	0	0	0	29	19.5%	17
4 Consequence	50	0	50	0	0	0	0	2.3%	2
5 Collaboration	13	63	13	13	0	0	0	9.2%	8
6 Refocusing	0	33	11	44	11	0	0	10.3%	9
	Total								87

Figure 2. Matrix cross-tabulation of highest to second highest Stage of Concern.

### *User Profile Analysis*

36% of the respondents were classified as non-users while 64% were classified as beginning users. Of note, no respondents were classified as an experienced user. Figure 3 illustrates a comparison between the relative intensity levels of each user profile. An obvious difference between the profiles occurs at Stage 0 which is a peak score for the non-user and a low score for the beginning user. The two profiles are similar at Stages 1 and 2. The non-user has a higher level of intensity at Stage 3; whereas the beginning user has higher relative levels of intensity at Stages 4 and 5. Both profiles tail-up at Stage 6 with similar levels of intensity, although the non-user's tail up is steeper than the beginning user. The non-user has a negative 1-2 split; where the 1-2 split is barely distinguishable for the beginning user.



*Figure 3.* Graphical analysis of the user profiles.

*Subgroup analysis.* Contrary to the literature (Hall & Hord, 2014), teaching experience did not show significant differences within the profiles. Perhaps the numerous confounding variables such as the paradigm shift in teaching practices, lack of information and resources, and negative media associated with the implementation affected this finding. Teachers from across the state revealed similar profile analyses distinguished only by levels of intensity. The analysis of the subgroups comparing the education level of the teachers was limited due to the small number of

higher degreed respondents. The teachers with bachelors and masters degrees were similar at the self stages, but teachers with bachelor's degrees showed higher levels of intensity at the task and impact stages as evidenced on the quantitative analysis. Perhaps a more in depth qualitative study should be initiated to investigate this significant variance. Another surprising result was the negative findings of a difference between National Board Certified Teachers and those without the certification. The reflective nature of the certification process should have allowed NBCT's to progress quicker through the stages of concern. The non-significant findings of differences between the subgroups illustrate the overall intense concerns at the self and task levels of all teachers no matter their level of experience or education. These intense concerns in the early stages are masking the concerns of later stages, thereby, inhibiting the linear progression through the stages. The negative findings associated with teaching experience and education reveal that PD should target the "how" to include information, resources, and task management as opposed to training targeted at the "why" to include the philosophy of the CCSSM (Hall & Hord, 2014).

*Effect of PD.* Figure 4 shows that the teachers who received no PD on the implementation of CCSSM to be non-users with a positive 1-2 split and a tailing-down at Stage 6. Teachers receiving minimal PD were classified as beginning users with a positive 1-2 split but with a tailing-up at Stage 6. The teachers who received sporadic PD showed early signs of beginning use but with no clear peak stage scores and a tailing-up at Stage 6. The teachers who received ongoing PD through the use of district curriculum specialists or consultants accompanied by a structured professional learning communities (PLC) show a clear progression of the wave motion indicating a beginning user that is progressing linearly through the stages of concern with an obvious tailing-up at Stage 6. The teachers who received ongoing PD with the

addition of a school instructional coach and reflective, active PLCs displayed a graph with minor differences between Stages 1, 2, and 3 but an increase at Stage 5 and a tailing-down at Stage 6 indicating increased concerns for teacher collaboration consistent with the active, reflective PLCs. Comparing the graphs simultaneously it is obvious that the subgroups of minimal and sporadic training have the highest concerns at Stage 1 as they are in need of more information regarding the CCSSM.

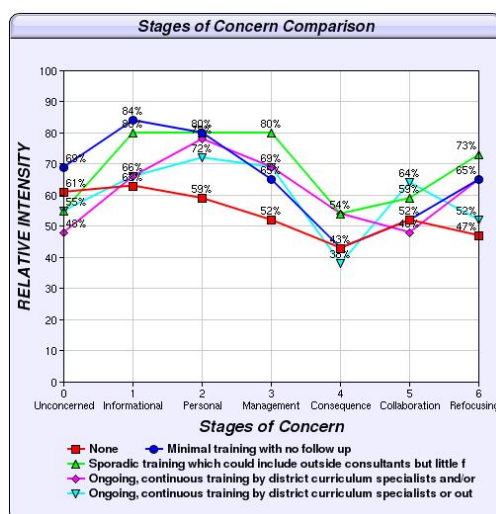


Figure 4. Graphical profile analysis of the subgroups delineated by the amount of professional development received.

*User profile versus professional development.* A query was run comparing user profiles and the amount of PD a teacher received. There were a higher percentage of non-user respondents who received none to minimal amounts of PD. The respondents receiving sporadic training were equally dispersed between the two groups. There was a higher percentage of beginning users who received ongoing training; but a higher percentage of non-users who received intensive training which included school coaches and reflective PLC's.

The themes that emerged during the qualitative analysis of the open-ended questions consisted of accountability, adjustments in learning, implementation, leadership, resources,



student ability, assessments, frustration, teacher training, time, and understanding the CCSSM.

*Teacher training.* Teachers reported receiving training from various sources including consultants, curriculum trainers, district and school personnel, PLC's, workshops, personal research, and the state department of education. Training described by the teachers was not consistent across the state. One teacher stated, "My greatest concern is the amount of time along with the lack of adequate training." Some teachers received training on the curriculum their district used to implement CCSSM, but no training specifically on the actual standards. Many schools and districts provided training on Common Core in general, but no content specific training as noted by this teacher: "Most of my training has been general implementation where all teachers in all subjects were involved." Other teachers claimed, "My district provides professional development at least once every 9 weeks. We also have a math coach that is around to help about twice a week." Teachers had concerns about training received from the state as it was presented in a train-the-trainer format and required newly trained teachers to go back and train other teachers. One teacher expressed a concern as follows: "MDE does not offer accessible, on-going, targeted PD for teachers to ensure we are knowledgeable of the content." Throughout the comments on training a common thread were concerns about training regarding 'unpacking' the standards declaring that these trainings were "a waste of time" and "not very helpful".

### Discussion

Although the effect of PD overall was inconclusive, teachers who received minimal PD revealed a non-user profile but exhibited positive tendencies of wanting information to properly implement the standards; whereas, teachers who received sporadic PD showed anxious tendencies consistent with teachers struggling with the implementation harboring the possibility

of abandoning the implementation. Teachers who have received intensive PD including the use of reflective PLC's and instructional coaches revealed a beginning user profile with intense collaboration concerns reflecting the desire to use collaboration to refine the implementation.

*Educational Importance of the Research.* Reflective, ongoing PD focused on task management and resources is indicated by the results. Teachers need help dealing with their intense personal and task concerns. Unless these concerns are addressed, teachers will never reach the stage of modifying their methods to affect the consequences of the standards towards their students and thereby affect student achievement. Although teachers are willing to embrace the new standards, their pre-reform efficacy beliefs need to be challenged with convincing evidence of the benefits of the new standards and methods of teaching. Providing training opportunities involving reflective conversations with teachers of elementary level students detailing the advances of students' thinking skills as a result of the new standards and practices would be effective in combating and supporting the change process needed to affect pre-reform efficacy beliefs. Also, specific content training ingrained with the mathematical practices linking conceptual understanding and connections of the mathematical content is necessary to boost teacher self-efficacy beliefs. The qualitative analysis did reveal teachers' concern for students, but the intense personal concerns are hindering the teachers progress to the Consequence stage. Reflective PLC's would provide the structure needed to afford teachers the opportunity to collaborate and discuss the effect of the instructional changes on the students and their achievement levels as well as providing the opportunity to modify their instructional strategies to address these needs. Care should be taken to ensure that teachers modify their practices to reflect the practices inherent within the CCSSM and not modify the CCSSM to meet their needs.

## REFERENCES

- Anderson, S. E. (1997). Understanding teacher change: Revisiting the concerns based adoption model. *Curriculum Inquiry*, 331-367.
- Beswick, K. (2007). Teachers' beliefs that matter in secondary mathematics classrooms. *Educational Studies in Mathematics*, 65, 95-120.
- Charalambous, C. Y., & Philippou, G. N. (2010). Teachers' concerns and efficacy beliefs about implementing a mathematics curriculum reform: integrating two lines of inquiry. *Educational Studies in Mathematics*, 75, 1-21.
- Christou, C., Eliophotou-Menon, M., & Philippou, G. (2004). Teachers' concerns regarding the adoption of a new mathematics curriculum: an application of CBAM. *Educational Studies in Mathematics*, 157-176.
- Collopy, R. (2003). Curriculum materials as a professional development tool: How a mathematics textbook affected two teachers' learning. *The Elementary School Journal*, 103, 287-311.
- Darling-Hammond, L., Wei, R., Andree, A., Richardson, N., & Orphanos, S. (2009). *Professional learning in the learning profession: A status report on teacher development in the United States and abroad*. Dallas: National Staff Development Council.
- Drake, C. (2006). Turning points: Using teachers' mathematics life stories to understand the implementation of mathematics education reform. *Journal of Mathematics Teacher Education*, 9, 579-608.
- Fuller, F. F. (1969). Concerns of teachers: A developmental conceptualization. *American Educational Research Journal*, 207-226.

- George, A. A., Hall, G. E., & Stiegelbauer, S. M. (2006). *Measuring implementation in schools: The stages of concern questionnaire*. Austin, TX: Southwest Educational Development Laboratory.
- Guskey, T. R. (1986). Staff development and the process of teacher change. *Educational Researcher, 15*(5), 5-12.
- Hall, G. E., & Hord, S. M. (2001). *Implementing Change: Patterns, Principles, and Potholes*. Massachusetts: Allyn and Bacon: A Pearson Education Company.
- Hall, G. E., & Hord, S. M. (2014). *Implementing Change Patterns, Principles, and Potholes* (4th ed.). Pearson.
- Hord, S. M., & Roussin, J. L. (2013). *Implementing change through learning: Concerns-based concepts, tools, and strategies for guiding change*. Thousand Oaks, CA: Sage.
- National Council of Teachers of Mathematics. (2014). *Principles to Actions - Ensuring Mathematical Success for All*. Reston, VA: NCTM.
- O'Sullivan, K.-A., Carroll, K., & Cavanagh, M. (2008). Changing teachers: Syllabuses, subjects and selves. *Issues in Educational Research, 18*, 167-182.
- Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods*. Thousand Oaks: Sage Publications.
- Rogers, M. A., Cross, D. J., Gresalfi, M. S., Trauth-Nare, A. E., & Buck, G. A. (2011). First year implementation of a project-based learning approach: The need for addressing teachers' orientations in the era of reform. *International Journal of Science and Mathematics Education, 9*, 893-917.
- Saldana, J. (2013). *The Coding Manual for Qualitative Researchers* (2nd ed.). Thousand Oaks, CA: Sage.

SEDL. (2014, October 5). *SEDL: Advancing Research Improving Education*. Retrieved from Stages of Concern, a Dimension of the Concerns-Based Adoption Model (CBAM):

[http://www.sedl.org/cbam/stages\\_of\\_concern.html](http://www.sedl.org/cbam/stages_of_concern.html)

Stickles, P. R. (2011). Using instructional logs to study teachers' adaptation to curricular reform.

*School Science and Mathematics, 111*, 39-46.

Tobia, E., LaTurner, J., Litke, B., & Butler, V. (2013). *CBAM 101: Getting Your Feet Wet*

[Webinar]. Retrieved September 22, 2013, from SEDL Organization Web Site:

[https://sedl.adobeconnect.com/\\_a1014190199/p9nfhd2oe88/?launcher=false&fcsContent=true&pbMode=normal](https://sedl.adobeconnect.com/_a1014190199/p9nfhd2oe88/?launcher=false&fcsContent=true&pbMode=normal)

Tunks, J., & Weller, K. (2009). Changing practice, changing minds, from arithmetical to algebraic thinking: an application of the concerns-based adoption model (CBAM).

*Educational Studies in Mathematics, 72*, 161-183.