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AN EXAMINATION OF THE RELATIONSHIP AMONG THE INTENTIONS, FEATURES,
AFFORDANCES, AND OUTCOMES OF SATURDAY ACADEMY FOR MATH
PROFESSIONAL DEVELOPMENT FOR MATHEMATICS TEACHERS

A Dissertation
submitted in partial fulfillment of the requirements
for the degree of
Doctor of Education
in the Department of Teacher Education
The University of Mississippi

by

Brian Buckhalter

May 2019

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ABSTRACT

This study examined the affordances made by participants of a professional development program. The program, Saturday Academy for Math (SA4M) was created around the intentions of providing teachers with experiences to deepen their content knowledge, widen their instructional practices, and do so in a collaborative setting.

Using a design framework to connect the features of SA4M to the affordances reported, participants of SA4M deepened their content knowledge on both conceptual and skill specific levels, and expressed intentions to incorporate many of the tasks from SA4M into their practices. There are implications for those tasked with creating and evaluating professional development for teachers.

To the future. To better.

ACKNOWLEDGMENTS

To everyone who has ever shared a word of encouragement, thank you. To my family, thank you for the lessons, intentional and not. To my advisor, Dr. Joel Amidon and my dissertation committee, thank you for your patience. To the Center for Mathematics and Science Education, thank you for your guidance. To the Oxford School District family of colleagues and former students, thank you for cementing my love for teaching and learning.

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CHAPTER 1

INTRODUCTION

From the most recent Trends in International Mathematics and Science Study (TIMSS), we know that our 4th and 8th grade students in the United States are performing above the international benchmark, but still behind the most competitive counterparts (Provasnik et al., 2016). Only two years ago, not even half of the nations 4th, 8th, or 12th graders were performing at or above proficient on the National Assessment of Educational Progress (NAEP) assessment; according to the National Center for Educational Statistics (NCES) locally, Mississippi's 4th and 8th graders only outperformed 4 and 3 other states respectfully (NCES, 2015). Several external factors to student learning are often brought into the limelight of low-to-no student achievement such as a lack of resources for some students, lack of support from home, and lack of students' self-motivation. Even if these factors were removed or improved, would student achievement improve? Perhaps. Perhaps not. Without a knowledgeable teacher crafting students' learning experiences, there is still little chance for student growth (Sowder, 2007; Szatjn, 2011; Cai & Ding, 2015; Hill, Rowan, & Ball, 2005; Mizell, H., 2010; Resources for Learning, 2016). In other words, "teachers are key to enhancing learning in schools. In order to teach in a manner consistent with new theories of learning, extensive learning opportunities for teachers are required," according to the Nation Research Council (2000).

Background of the Problem

Almost all teachers in the public schools receive some type of professional development over the course of a school year according to the Schools and Staffing Survey of 2011 (NCES, 2012). The purpose of professional development (PD) is to improve student learning (Loucks-Horsley, et al, 2010) through expanding and deepening teachers' content knowledge and instructional practice. However, many professional development opportunities lack thoughtful design (Mizell, H., 2010), such as a design built on learning designs and standards, like the Standards for Professional Learning, as presented by Learning Forward (2011). Today's traditional model is a broken system with holes that fail to support ongoing teacher improvement (Hill, 2009; Curwood, 2013). In these models, participants absorb information from a person responsible for delivering the professional development. However, these models also fail to extend over time, fail to develop learning communities, and fail to allow teachers to assume the role of the learner, all vital components in successful professional development (Knight, 2007; National Research Council, 2000; Lutrnick & Szabo,). Without PD, many teachers do not have opportunities to sharpen their knives of content and pedagogy, for it is the knowledgeable teacher that is key to raising student achievement for all students (Sowder, 2007). Without PD, improved student achievement is not achievable (Hill et al, 2005; Sowder, 2007).

Teachers who attend "one shot" professional development experience can easily find themselves disengaged and distracted, and disconnected from both the professional development presenter and content (Knight, 2007). Knight personally saw these hindrances emerge during a professional development session on Concept Mastery Routine. The teachers in his session expressed a disconnect in understanding the purpose of the professional development and could make few connections to their classroom practices (Knight, 2007). Many models of teacher

professional development lack that integration of teachers' strengths, interests, and needs (National Research Council, 2000). Many teachers report that they have little-to-no input in the development of professional development they attend (Resources for Learning, 2016). Just as important as recognizing the individualism in professional development for teachers is planning the knowledge to be acquired during the experience (NCES, 2006).

As a teacher's goal is to develop student understanding of given topics (National Research Council, 2000), the teacher must understand the how to achieve the goal. Central to this is the teacher's knowledge and disposition regarding the topics. Professional development is a means for teachers to develop the necessary competencies to help students achieve the goals. Teachers need expertise in both content and best teaching practices (National Research Council, 2000), but many professional development opportunities fail to help them strengthen these necessities.

A Proposed Solution

Saturday Academy for Math (SA4M) was created out of a need for teachers of grades Kindergarten through 4th grade to be collaboratively engaged in unpacking the Common Core State Standards for Mathematics (NGA, 2010), while expanding their mathematics content knowledge and developing instructional tools and techniques to meet the demands and rigor of the standards and their students' needs. Building from the Standards for Professional Learning (2011), a structure for this voluntary monthly professional development was designed specifically around the principles of learning communities (Kanold, 2005), learning designs, and outcomes (Bransford, 2000). Using these standards as a foundation, SA4M offers teachers opportunities to learn from their own practices, the practices of their colleagues, and the guidance of an elementary mathematics coach. Teachers meet once a month for two hours with

their grade band peers, K-2 and 3-4. SA4M offers teachers up to 16 contact hours of professional development over the course of one school year. The Saturday sessions are comprised of opportunities to unpack content and practice standards, engage in tasks that can be implemented in the teachers' classrooms, and participate in discussions about student learning. At the heart of SA4M is the learner-centered structure, that allows the teacher to be an active participant in building on their strengths, interests, and needs (Bransford, 2000; National Research Council, 2000). The safe environment of this learning opportunity takes a community-centered learning environment approach by allowing teachers to collaborate without fear, making themselves and their beliefs vulnerable, but open to reform. A large portion of this safe environment is attributable to the active engagement in tasks with complexity that warrant meaningful communication and discussion about content and instructional practices. Teachers feel safe and trust one another in this setting as they lower their sandbags of weak conceptual competency, and rebuild fortified walls together of sound mathematical competency and a sound pedagogical disposition to teaching mathematics. It is the intent of SA4M to offer teachers effective teaching and learning experiences, as well as the support and resources needed for them, and their students, to reach their maximum learning potential (NCTM, 2014).

Most importantly, SA4M exemplifies the principles of learning communities through the design and outcome expectations. Teachers have the opportunity to build professional learning communities that actively investigate best practices and explore how these practices can be translated into their classrooms. These teachers build relationships with one another over the course of the Saturday sessions that allow honesty, reflection, and group problem solving (Kanold, 2005). This form of collaboration is aided by the design of the Saturday sessions.

Teachers work collaboratively as active learners, replicating situations and problems that their students may face. Problem solving from the student perspective allows teachers to investigate how conceptual and procedural mathematics is developed, as well as anticipated student misconceptions. The same models of learning that guides student instruction can also apply to teacher instruction. Like the students they teach, teachers benefit from a balance professional development that embodies characteristics of learner-centered environments, knowledge-centered environments, and community-centered environments (National Research Council, 2000). Understanding that each learner brings to each learning experience a background of knowledge, experience, and beliefs shapes the core of learner-centered environments. Adopting this model for understanding and teaching teachers reflects the same culturally responsive perspective required for teaching and understanding students (Ladson-Billings, 1995).

Finally, the outcome for teachers is explicit: find a way to implement the task and/or knowledge of the session into your classrooms. Each Saturday session concludes with teachers responding to a discussion post on how they will use the day's activities in their own classrooms. The ultimate goal for the SA4M form of professional development is to impact the instructional practices of the teachers. This period of knowledge acquisition and later transfer (Bruner 1981) is vital and validates the need to blend the characteristics of learner-centered environments with the characteristics of knowledge-centered environments. This blend is important as the knowledge learners presently have will be expanded during the time of learning (National Research Council, 2000).

Research Problem

Although many studies exist on the impact of professional development, there is a lack in studies that examine the design features of the programs and their impact on mathematics professional development (Sztajn, 2011).

This study seeks to respond to a directive from the National Research Council (2000):

“It is recommended that alternative models of professional development be reviewed for their alignment with the principles of learning. Features that promote or conflict with the principles should be highlighted. The research should also examine the effects of alternative types, and amounts, of professional development training on teacher performance and student achievement.” (p. 265)

Purpose of the Study

The purpose of this study is to examine the relationship among the intentions, features, affordances, and outcomes of Saturday Academy for Math (SA4M) professional development. Also of interest is how teachers who participate in SA4M interpret their experiences in terms of their personal content and pedagogical growth. The final purpose for this study is to contribute to the literature on effective professional development by highlighting the logistics and structure of SA4M. Although AERA organized standards for reporting empirical social science research (AERA, 2006), there is still a void in what is being reported. Many of the research studies reporting on mathematics PD neglect to report features of the program such as the adult learning theories consulted, whether the opportunity was forced or voluntary, and what teacher voice was considered in creating the PD (Sztajn, 2011). If teachers truly are the key to enhancing learning, our student achievement nationally and locally are in desperate need for opportunities for teachers to grow in order to grow their students.

Research Questions

The following questions emerge in examining the relationship between SA4M and student growth:

1. What relationships exist between the features and affordances of Saturday Academy for Math (SA4M) professional development?
2. How do teachers interpret their experiences in SA4M, specifically in regards to their own content knowledge and instructional practices?
3. What relationships exists between the intentions and outcomes of Saturday Academy for Math (SA4M) professional development, specifically, do the students of teachers who participate in SA4M grow more than their counterparts under teachers who do not attend SA4M?

Research Hypothesis

Specifically related to the last research question, the researcher hypothesizes that students of teachers who participate in SA4M grow more in mathematics competency than their counterparts under teachers who do not attend SA4M.

Audience

The audience for this study includes school personnel responsible for and delivering professional development, such as curriculum coordinators, academic coaches and specialists, as well as researchers and other educational stakeholders with interest in exploring effective professional development designs. This study will offer insight into the necessary design components for effective professional development, as measured by program participation outcomes, the influence on classroom instructional practices and student achievement. This study will also provide foundation in developing a sustained professional development experience

beyond the typical school hours, with the potential of redefining professional development experiences for teachers.

CHAPTER 2
LITERATURE REVIEW
Student Achievement

As of the most recent international comparison of students' mathematics achievement, the U.S. 4th and 8th grade students are performing above the international expectations (Provasnik et al., 2016). In fact, both grades have seen 20-plus point gains on the Trends in International Mathematics and Science Study (TIMSS) since its inception in 1995, with 8th graders spiking at their highest math average although they had yet to even crack the international average (Provasnik et al., 2016). Although much progress has been made since the first international gauge of students mathematics achievement in 1995, and there have been profitable strides taken regarding standards and expectations, still, much work to be done to secure our Nation's place in the top ten of mathematics and science education.

The initial TIMSS was used as a gauge of an ambitious initiative taken on by the entire U.S., and by 1994, the nation began to take legislative action to reform education. One of the goals of the "Goals 2000: Educate America Act" ("Goals 2000", 1994) saw to establish the U.S. as "first in the world in mathematics and science achievement" (p. 8) on the heels of the damaging 1983 report, *A Nation at Risk*, that described the failing situations of American schools and insecurity in international competition ("Goals 2000", 1994; NCEE, 1983). The "Goals 2000: Educate America Act" contained many recommendations for improvement, many of them addressing content, standards, and expectations, and an entire goal dedicated to increasing

student achievement in mathematics and science. In an effort to meet these demands, the late 80s and early 90s saw a surge in guidance from the research and professional sector of mathematics education. The National Council of Teachers of Mathematics (NCTM) established the commission on standards for school mathematics in 1986 and released their *Curriculum and Evaluation Standards* in 1989 and *Professional Standards for Teaching Mathematics* in 1991 (CSMS, 2004).

As the results of the first TIMSS emerged in 1995, the mathematics community remained at work revising the standards, expectations, and actions needed to develop high quality mathematics programs. In 2000, the NCTM continued its tradition of offering guidance to the mathematics education community through the release of its Principles and Standards for School Mathematics, which detailed six essential principles for highly quality mathematics education programs, grade specific standards for students, and 5 accompanying process standards (NCTM, 2017). Still it seemed that students were only hitting the surface level of mathematical understanding.

Books such as Stigler & Hiebert's *The Teaching Gap* (1999) began to emerge, and the focus of student achievement began to shift from rankings themselves to the cause for the disparity in scores. "Teaching we say is the passageway through which all education reforms must travel if they are to make it through the classroom door and, ultimately, improve students learning." (xi). Their work recommends that more attention be placed on what and how teachers are teaching.

Professional Development

The role of teachers in today's professional development must differ from the past. Whereas professional development of the past often required teachers to be passive learners,

today's teacher requires active experiences that can be transferred into their classroom practices (Hill, 2009; Hill & Ball, 2004; National Research Council, 2000). The traditional model of teachers learning solely from an external expert charged with delivering professional development can be replaced with more meaningful opportunities, such as teachers learning from their own practices, interactions with other teachers, and from other teachers and teacher educators in their schools (National Research Council, 2000).

Knowledge Needed

In the report “Focusing on Mathematical Knowledge: The Impact of Content-Intensive Teacher Professional Development” (2016), the impact of content-intensive professional development on teachers’ content knowledge and instructional practices was closely examined. The PD was comprised of a summer workshop and follow-up opportunities throughout the school year, totaling over 90 hours of teacher learning. The results of the study found a positive impact on both teacher knowledge, visible through a 21-percentile point difference between treatment and control groups of teachers, and instructional practices, particularly “richness of mathematics” (Garet et al., 2016, p. ES-1). Professional development experiences have the potential to deepen teachers’ knowledge for teaching, with the potential to influence their instructional practices.

Content knowledge. Teachers must possess a foundation in specific types of knowledge needed for teaching. Identified by Lee Shulman in 1985, teachers need several types of knowledge, such as content knowledge, pedagogical content knowledge, and pedagogical knowledge (Shulman, 2013). Of the three types of knowledge, content knowledge may be the most vital for teaching and trumps all other external factors’ influence, such as years of experience and degree) on student learning (Etcuban & Pantinople, 2018; Hill et al., 2005; NRC,

2000). If the teacher does not know the content they are to teach students, how are the students to learn it? Who will guide the students in unpacking their misconceptions and overgeneralizations? Who will promote students sharing their reasoning? Who will help students represent their thoughts through thought provoking prompts and tasks? Teaching requires both an overall understanding of content and connections within it, as well as specialized content knowledge at specific grade levels and within specific grade bands (CBMS, 2012). The level of content understanding a teacher possess, or lack thereof, will determine the quality of instruction a teacher delivers to his or her students (NRC, 2000). Maintaining one's current knowledge base and seeking to be a continuous learner is no easy feat, but for teachers to prepare students for jobs and careers that have yet to be created, teachers, and students alike, will have to learn new and different mathematics (Sowder, 2007).

Pedagogical content knowledge. Simply attaining the content knowledge is not enough to equip mathematics teachers to guide their students on adventures of discovery in reasoning, patterns, and other features of mathematics classes. How to teach the content becomes the next building block in effective instruction. Sowder (2007), describes the following as four components of pedagogical content knowledge as identified by other researchers: overarching knowledge and belief about purposes for teaching, knowledge of student thinking, knowledge of curriculum and materials, and knowledge of instructional strategies and representations. Teachers who possess an understanding of how to teach the content that they specialize in are able to find a common language to speak with their students. Teachers' increase in specific knowledge to teach content has been shown to lead to student competency and positively predict student gains (Hill et al., 2005). An example of this type of knowledge from Ball (1990) involves being able recognize and evaluate the appropriateness of specific models for specific content,

which students will eventually generalize and apply to future situations. By knowing the content, teachers can evaluate where students are in their understanding. Being well versed in pedagogical content knowledge, teachers can develop appropriate experiences for students to continue growing and moving on their personalized learning continuum.

Pedagogical knowledge. Having the needed experiences created for students also requires being able to sequence them appropriately, requiring teachers to possess curriculum knowledge. This type of knowledge requires teachers to be able to organize the series of learning events for students, both at the grade level, understanding place value before using it as a strategy for addition in younger grades, and beyond the grade-level, such as the scaffolded conceptualization of fractions (NGA, 2010). Structuring learning is important. When learning is structured beginning at a place where students are currently performing and mapped to the desired outcome, students are allowed to bring innate, internalized problem solving methods and strategies, in turn allowing them to evaluate and explain their reasoning (Van de Walle, 2014, p. 6-7). Teachers with this type of knowledge are aware of how the factors that they ultimately approve of, such as number choice, vocabulary, problem contexts, representations, and scaffolding all impact student learning.

Student knowledge. Enacting these sets of knowledge's- content, pedagogical, and curriculum awareness, teachers can begin to differentiate learning experiences to support the success of all students. Differentiation, although one of today's buzzwords in education, is a time old practice hardly new education. Think back to the little red schoolhouse in which a single teacher taught students of various ages, "grades", and needs in the one room. The teacher probably had a sense of the development of the content, and had to provide each student with a meaningful, personalized route to the end goal. Fast forward to today's classrooms: still full of

students, sometimes varying in age, but definitely still varying in needs. Forsten et al (2006) may have said it best that or students still have different needs and differentiating instruction creates a learning path for them all. All students deserve access to success.

Professional Learning Communities

As teachers work together, they develop methods of teaching together, leading to teacher and student success (Stigler & Hiebert, 1999). Professional learning communities, or PLCs, are intended to be a step above the typical collaborative effort of teachers such as pacing the semester's lessons or distributing school reminder to parents. Instead, PLCs operate from various directions to focus solely on student achievement. The work of a PLC may include tasks such as unpacking standards in creating measurable learning targets for students, analyzing student data, and reflecting on instructional practices that facilitate student learning. PLCs are not as much about the people involved, as they are about the work that happens. DuFour (2010) describes a PLC as the essence of student learning, an "ongoing process in which educators work collaboratively in recurring cycles of collective inquiry and action research to achieve better results for the students they serve" (p. 11). Along with the difference in international student achievement between the U.S. and other countries, the instructional methods and teacher preparation has come into investigation as well.

Researchers have noted the lack of planning time U.S. teachers devote to understanding the math they teach and how to teach it (Ma, 2010). In my own background as a classroom teacher, I can recall devoting a substantial amount of collaborative planning time to housekeeping and day to logistics, instead of working the problems I would soon assign my students. This time would have been better spent anticipating the misconceptions students may generate and investigating ways to help them overcome those misconceptions. To achieve

success with more rigorous standards, teachers must collaborate in strengthening mathematics education, which will require more “conversation, reflection, adaptation, experimentation, and personal accountability” (Kanold, 2012, p. *xii*). Of course, this transition in preparation practices is not an easy one to make. Teachers gain their first informal “teacher preparation” as pupils in the educational system. From an early age, the concept of school and the structures within it are ingrained into our dispositions. Naturally, as a cultural activity, teaching is expected to resist change (NCTM, 2014, p. 107; Hoong et al., 2015). Because the PLC vehicle of collaboration presents reform in the form of a disposition, as opposed to simply implementing a new program, it may take longer for this approach to be accepted by the general education community.

Learning Design of SA4M

Teachers need time to learn from one another. Teachers also need opportunities to learn from each other. What would an opportunity for teachers to become learners with their peers, over time, and create blueprints for instructional success look like? SA4M offers teachers up to 16 contact hours of professional development with their peers over the course of one school year. Common themes or big ideas in the grade bands’ upcoming instruction as dictated by their district pacing guides helps drive the content focus for each Saturday session. Teachers have an instant ownership in the learning because of the relevancy of the session’s focus. Teachers meet voluntarily once a month for two hours to build an understanding of the curriculum vertically, allowing the participants to operate as a PLC in understanding student learning. This level of collaboration is designed to allow teachers to expand their content and instructional techniques. Teachers often use this time together to share the hardships they face in daily instruction; they also use the time to learn various strategies, models, and possible solutions to the barriers they encounter in teaching.

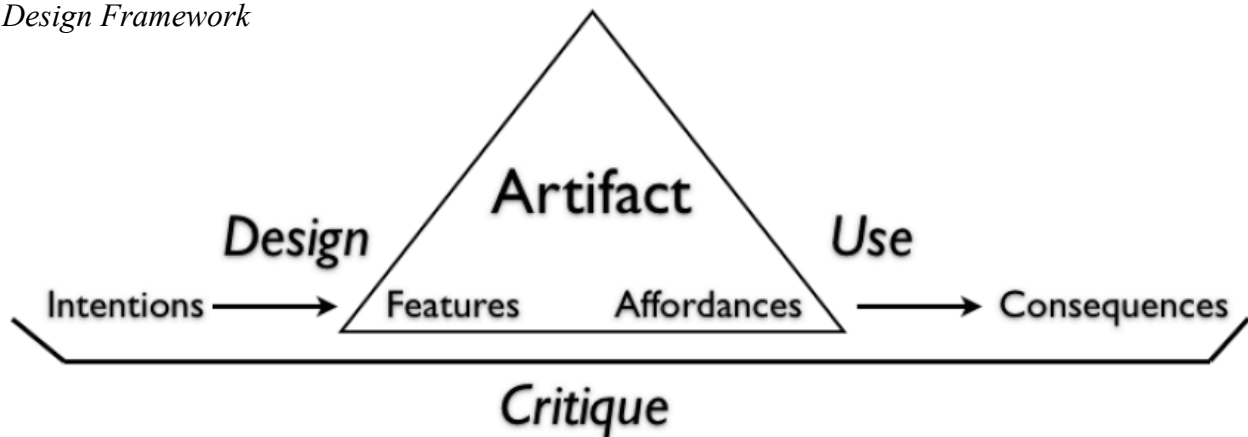
The Saturday sessions are comprised of rich opportunities to unpack content and practice standards, one of the most productive practices of PD (Ball, 1990; Sowder, 2007) while engaging teachers in tasks that can be implemented in the teachers' classrooms. Another benefit of teachers acting as learners in tasks is the ability to develop not just the content, but the habits of the mind associated with learning specific content (CMBS, 2012, p. 19) At the heart of SA4M is the learner-centered structure, that allows the teacher to be an active participant in building on their strengths, interests, and needs (National Research Council, 2000). To better understand how student learning develops, it will take collaborative efforts of studying and unpacking student expectations (Kanold, 202, p. 8). Student improvement is activated through teacher improvement in content knowledge and instructional methods (Stigler & Hiebert, 1999).

Design Framework

Is SA4M just another average professional development? The realm of education is filled with artifacts, tools such as initiatives, unique school schedules, programs, policies, and legislation aimed at improving teaching and learning (Halverson et al, 2010). Gauging the impact of an artifact, such as SA4M, is vital in determining if the intentions and features of the artifact are being met. Through the use of design-based research, creators of artifacts are able to make explicit the "behind-the-scenes" decisions that would otherwise go unnoticed (Halverson et al, 2010; Curwood, 2013). Many of the thoughts and ideas that birth artifacts, such as PD, are not communicated and left on the boardroom floor. However, a design-based research framework seeks to illuminate the intentions and design features of artifacts, in this case SA4M PD, and relate them to the affordances and outcomes of the participants of the PD. Figure 1 shows the relationship among the intentions, features, affordances, and outcomes with the design framework.

Figure 1

Design Framework



SA4M was designed with the intention of helping teachers unpack current state level mathematics standards, deepen their content knowledge, and broaden their repertoire of instructional strategies. From those intentions, the features of SA4M were born. Throughout the course of the school year, teachers are engaged in each session in hands-on collaborative tasks, discussions and dialogue around standards' expectations, and resources and materials ready to implement in their classrooms.

To gauge the effectiveness of SA4M, the extent to which teachers do, or do not, respond to the features of SA4M should be measured. What do teachers learn from the tasks as active learners? Have they expanded their content knowledge because of this experience? What implications do teachers see for their classrooms as a result of the monthly discussions? This study seeks examine the design of SA4M by asking- and answering- the question, "Are teachers getting out of Saturday Academy for Math what was intended?"

CHAPTER 3
METHODOLOGY
Sample and Site

This study sought to gain an understanding between the intentions and features of a professional development program and its returned affordances and outcomes. To gauge how teachers responded to the specific design features of SA4M, teacher reflections were coded for themes centered around the features of SA4M. To initially gauge one potential outcome, impact on student achievement, student achievement data was also analyzed. All of the data collected and used was from the 2016-2017 and 2017-2018 SA4M sessions.

The sample of teachers in this study were elementary math teachers in a remote school district in the Southern United States. Based on census data from 2010 the city that houses the host school district has a county population of 44,823, of which 19,393 reside within the city limits. Demographically, the city of “Bolt” is 72% White, 21.8% Black, 3.3% Asian and 2.5% Hispanic (AdvancED, 2012). Currently, the district has the second highest scoring school among elementary and middle schools in the state (MDE, 2016). For the 2016-2017 school year, 30 teachers from the host district only participated in SA4M. For the 2017-2018 school year, 29 teachers from 4 neighboring districts were invited to and participated in SA4M, joining 7 other teachers from the host school district.

Participating teachers had the opportunity to attend up to 8 SA4M sessions each academic year. Teachers who attended at least 6 out of the 8 sessions, or 75% of the offered

sessions, composed the treatment group. This threshold was selected as the same attendance criteria is used to award Continuing Education Units (CEUs) that allow teachers to renew their state issued teaching certificate. With the given criteria, two teachers were eligible to participate in the treatment group for both 2016-2017 and 2017-2018.

Eligible participants of the control group were identified as teachers who taught at the same school as the members of the treatment group, but did not attend any of the 2016-2017 or 2017-2018 SA4M sessions. From that pool of teachers, those who taught the same grade level were selected as members of the control group. The control group was comprised of five teachers for the 2016-2017 school year, and 6 teachers for the 2017-2018 school year.

Access and Permission

Access and permission was obtained from the University of Mississippi's IRB and the local school district. The NWEA MAP assessment data from 2016-2017 and 2017-2018 data were retrieved from the district's archive.

Research Design

For this study, a mixed-methods study was conducted. By infusing aspects of both quantitative and qualitative research into the study, I was able to access multiple data sources, such as participant narratives and student achievement scores, and was afforded opportunities to triangulate my data and look for connections between the quantitative and qualitative data (Creswell, 2009).

To examine the relationship between the features and affordances of SA4M, a phenomenological study was conducted to describe the common experience of participants of SA4M. The purpose for using this type of study was to “reduce individual experiences with a phenomenon to a description of the universal essence (Creswell, 2013, p. 76).” The phenomenon

in this study became the affordances built from multiple forms of the intended features of SA4M. The individual responses of the participants were categorized by their relationships to the intended features of SA4M. Additionally, a to validate the categories and coding of the researcher, a member check will be conducted with select SA4M participants. Finally, a description of what the participants experienced and how they experienced it will be created to report the overall experience, or essence (Creswell, 2013) of SA4M.

To examine the impact on student growth, I used independent t-tests to compare the growth of students in the treatment group to those in the control group.

Instruments

Following each of the eight yearly sessions, participants responded via virtual discussion board to the following prompt, “Next steps: Describe how you will continue to develop both your personal content knowledge and instructional practices after today’s session”. Those teacher responses from the 2016-2017 and 2017-2018 SA4M cycle were coded to identify connections between the features and (un)intended affordances of the participants.

To examine the relationship between the intentions of SA4M and one possible outcome, increased student academic growth, eligible treatment group participants were identified as having attended 75% or more of the 2016-2017 and 2017-2018 Saturday sessions. The individual growth for students of the teachers in the treatment and control groups on NWEA Measures of Academic Progress (MAP) assessment, administered to students in the fall and spring semesters, were obtained from the district archive. The MAP assessment is a norm-referenced assessment, administered to students in grades K-11 several times throughout the school year. On the assessment, students responded to adaptive questions and are given a RIT (Rash Unit) score, which allowed comparisons between the student’s performance and national

achievement and growth norms (NWEA, 2016). According to the 2015 RIT Scale Norms Study (NWEA, 2015), growth norms were calculated from the testing results of 72,000-153,000 student test records in each grade level, in over 1,000 schools. This sample was drawn from a pool of over 10.2 million students in over 23,500 public schools.

Data Collection

Again, pre-existing data in the form of teacher reflection responses after each Saturday session was coded to identify potential affordances and outcomes as a result of the design of SA4M. These teachers were de-identified and represent the available sample for the treatment group.

To obtain the control group participants, or teachers who did not attend any SA4M sessions during the course of a school year, sign-in sheets were cross-referenced with the school's teacher rosters for the 2016-2017 and 2017-2018 school terms. These teachers were de-identified and represented the available sample for the control group.

To gauge and compare student growth, the treatment and control groups' students' scores on the Northwest Evaluation Association (NWEA) Measure of Academic Progress (MAP) were accessed from the hosting schools district's archive .

Data Analysis

Each teacher response to the 2017-2018 post-session discussions were initially read in order to create marginal notes about the response. The features of SA4M were then used as themes to aggregate the post-session teacher narratives into categories. The responses were then segmented and coded. The coded segments for each theme were interpreted as the affordances participants developed related to that theme.

Descriptive statistics, such as mean, median, mode, variance, standard deviation, and were collected for the 206-2017 and 2017-2018 data. An independent t-test was used to compare the growth of the students in the treatment group to the growth of the students in the control group.

At the conclusion of each Saturday Academy for Math (SA4M) session, participants reflected by responding to a post discussion prompt on the learning management system, Schoology. Their responses can then be seen by their fellow participants once posted. A total of 66 post discussion prompts from 2015-2018 were retrieved from the post session discussion boards in Schoology and used to answer the research question, “How do teachers interpret their experiences in SA4M, specifically in regards to their own content knowledge and instructional practices?”.

To begin coding responses, a preliminary exploratory analysis was conducted by reading all of the prompts to get a general sense of the data. To begin coding the participants’ discussion responses, three categories, which reflect the intended designed features of SA4M, were created: content, tasks/tools, and collaboration, and a fourth category for any unintended features that may emerge during my coding. Next, the responses were segmented and coded to be examined for language that reflected any of the three categories created. Several responses contained reflections that could have been assigned to multiple categories. Those responses were photocopied, and the portion of the response that fit into a specific category was highlighted within the appropriate category. Once the responses were categorized and posted to the appropriate category, similarities in the responses within each category were examined.

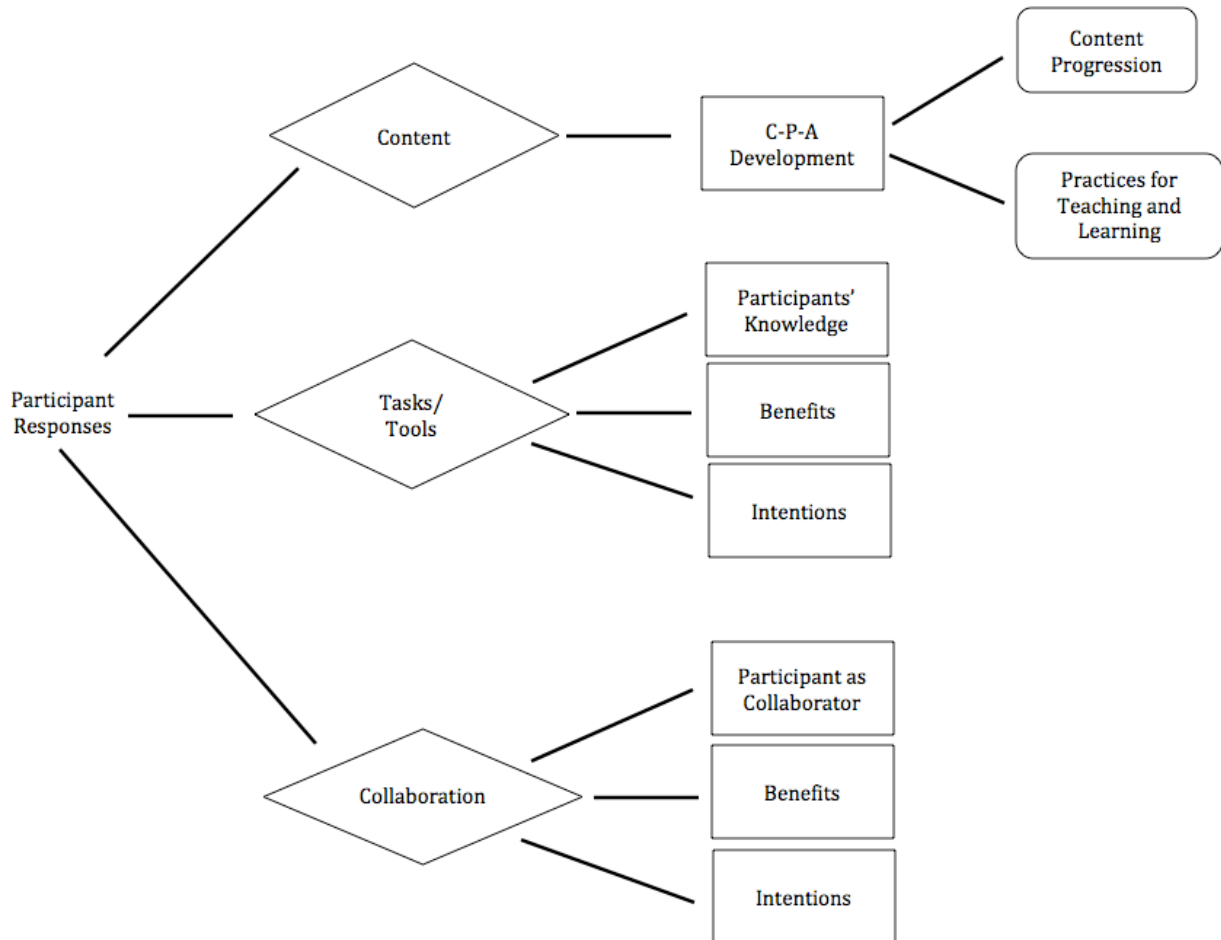
CHAPTER 4

RESULTS

Saturday Academy for Math (SA4M) was created to deepen teachers' content knowledge, promote the incorporation of tasks and tools in their mathematics instruction, and engage participants in meaningful collaboration experiences, all to impact the participants' students' achievement in mathematics. Using these intentions, each Saturday session was built to include content, standard, and skills explorations; opportunities to interact with tools and engage in meaningful tasks that promote mathematics understanding; and avenues to collaborate with colleagues at the same grade level and colleagues at different grade levels. Figure 1 displays the categorizing and collapsed codes that emerged from analyzing the participants' post session responses. This chapter will first examine the affordances made by participants of SA4M as interpreted through their responses to the discussion prompt that followed each Saturday session. Then, the impact on student growth will be examined through the statistical test described in Chapter 3.

Figure 1

Categories and Collapsed Codes



Content

Using the methodology described above, of the 66 post-discussion responses, 34 responses were categorized as related to content. The content category was composed of responses that were fragmented and coded as referring to specific content and skills taught, mentioned strategies and/or the importance of strategies, referenced to how students develop an

understanding of specific content, and evidenced the participants’ deepening their own content knowledge. From the initial codes (noted in Appendix A) emerged the collapsed codes for this category. Table 1 displays the codes that emerged from the responses categorized as content and the frequency of each code.

Table 1

Content Codes

<u>Code</u>	<u>Frequency</u>
C-P-A development	27
Content progression	30
Practices for Teaching and Learning Mathematics	34

C-P-A (Concrete-Pictorial-Abstract) Development

The C-P-A code was defined as instances where teachers referenced a progression of teaching and learning mathematics. Within this major code, two minor codes, content progression and practices for teaching and learning mathematics, emerged as participants reflected on the role of tools to explore mathematical concepts, practices for engaging students in learning mathematics, and the progression of content as it is built from foundational understandings to more complex understandings.

Content Progression

The minor code content progression was defined as instances of participants reflecting on how specific skills and content are developed over time. During the Saturday sessions, participants acknowledged being unaware of other grade levels’ content and skills; their math content knowledge was limited to the content and skills taught at their grade level. Based on their

reflection posts, SA4M participants demonstrated a more depth understanding of how content and skills are built from previous grades, and expanded in later grades. Participants named specific concepts, such as subitizing, instructional practices, such as employing a variety of problem types, and even specific computational skills, such as subtraction and division in which they had a better understanding of as a result of the Saturday sessions. The following are example responses that were coded “Content progression”.

“Several of my students still rely on their fingers for adding and subtracting. The article provided me with ideas that are used in earlier grades which I can use. I can take what I learned from today’s session to scaffold instruction for the students.”

“I thought it was very interesting to see how the upper grades (2nd) are using some of the things we are doing in Pre-K and K. Obviously, in the higher grades it is much more ‘built upon’.”

“This session has really helped me see the progression of our students understanding because as a teacher, it is often times difficult to scaffold the understanding when you want them to instantly get the ‘big picture’.”

“I love it when fourth grade is at Math Academy along with the third grade. Things that we do in third grade can help the fourth grade with building, or it can cause a problem for them.”

“I learned a lot today and am especially glad to know that the foundation we are creating for our students in Pre-K will transfer to much more complex mathematical thinking and processes for our students are upper grade levels.”

“I will continue to research different methods and ways to teach the topics to better my content knowledge.”

“I found this session beneficial in helping me understand terminology needed as a Pre-K student progress in learning math.”

Practices for Teaching and Learning Mathematics

The minor code “practices for teaching and learning mathematics” was defined as “vehicles to learning”- the instructional moves a teacher would employ during instructional and/or learning moves a student would enact while learning mathematics. For example, the use

of manipulatives to help build a foundation for understanding was a reoccurring sentiment in both instructional moves and learning moves. Through the participants' own use of manipulatives at SA4M, many participants were able to strengthen their own understanding of the content of that day's session, while reflecting on their students' use of manipulatives in their own classrooms. Within these responses, participants made note of scaffolding opportunities to adjust the rigor of their instruction, the importance of differentiating for different student needs, benefits of multiple strategies, vocabulary incorporation, and attentiveness to the Standards for Mathematical Practice. Finally, there were many connections made between initial interactions with manipulatives and tools and an abstract level of thinking. The following are example responses that were coded "practices for teaching and learning mathematics".

"My goal to take back to my classroom is to continue using a wide variety of concrete representations by using a variety of tools, to help build upon the foundation already set."

"I will provide opportunities for the students to use manipulatives and work with others to develop their thinking abstractly."

"I love the idea of having the students model and then show their thinking."

"Centers and games help children with understanding by giving them concrete representations and practice working with numbers."

"I am starting division Monday and use the activities today for my introduction. The students will be able to explore using manipulatives. I have a better understanding of what I am looking for from the students. I will be able to assist the students more confidently."

Tasks/Tools

Of the 66 retrieved responses, 31 responses were categorized as tasks/tools related. The code "tasks and tools" was defined as recognizing specific aspects, features, and benefits of infusing tasks and tools in instruction. These responses were fragmented and categorized as related to tasks/tools, having language that described specific tools and manipulatives, displaying

teacher confidence in incorporating tasks and tools into their instruction, noting benefits of using manipulatives and other tools, specific content/skills that can be enhanced using tasks and/or tools, and evidence of the participants’ expanding their own content knowledge as a result of experiences with tasks and tools at SA4M. From the initial codes (noted in Appendix B) emerged the collapsed codes for this category. Table 2 displays the collapsed codes that emerged from the responses and the frequency of each code.

Table 2

Tasks/Tools Codes

<u>Code</u>	<u>Frequency</u>
Participants’ knowledge of tasks and tools	54
Benefits of tasks/tools	28
Intention to use tasks/tools	26

Participants’ Knowledge of Tasks and Tools

The code “participants’ knowledge of tasks and tools” was defined as relating to developing an understanding of specific tasks and tools, and how specific tools tasks and/or tools increased the accessibility of the specific math content. Some of the specific tools and tasks mentioned were base ten blocks, Rekenreks, place value mats, non-traditional manipulatives, such as chickpeas, and number talks. There were also reflections that expressed an increased confidence in using tools and manipulatives in instruction. The following are example responses that were coded “Participant’s content knowledge”.

“The subitizing activity was an aha moment for me and I’m quite sure the K-2 teachers as well.”

“I have the flats, rods, and units in my classroom, but I was always hesitant to use them. This class has given me a confidence to use those manipulatives, if only as an introduction for upper grades.”

“I really liked the peas activity. It made me realize that I didn’t even fully understand the concept of regrouping.”

“I also realized the importance of being here today to actually use the tool and practice the activities I could use with my students. The Saturday Academy is such a valuable experience, and I hope to make it to every session.”

Benefits of Tasks/Tools

Having the experience of working with tools and developing a better understanding of the role of tasks and tools also allowed participants to see the benefits of such tools and tasks. The code “benefits of tasks/tools” was defined as identifying ways that tasks and tools in instruction can aid and benefit students’ learning. Participants noted various benefits of using tools and tasks to support instruction and student learning. Table 3 displays the codes within the benefits of tasks/tools code as described by the participants.

Table 3

Benefits of Using Tasks and Tools

<u>Benefit</u>	<u>Frequency</u>
Builds understanding of content	8
Aids in discussion	6
Aids in differentiating	3
Provides visuals	3
Promotes multiple solution methods	3
Exploration of strategies	3
Builds number sense	2

Based on their responses, SA4M participants developed an understanding of the role of tools and tasks in student learning and reflected on the role of tools and tasks in their own classrooms. The following are examples of responses that were coded with one of the benefits of tasks/tools.

“The session re-emphasized the importance of manipulatives (whether actual or virtual) to enable children to practice composing and decomposing. This is especially important because we are ready to start regrouping in second grade. In preparation for this, I plan to use a decomposition activity this week.”

“I will provide opportunities to for the students to use manipulatives and work with others to develop their thinking abstractly. The students will be encouraged to explain their reasoning and explanation skills.”

“I am looking forward to using this in my classroom next week. We discussed ways we can use these with our struggling students during our Charger Time and we also looked at ways to increase rigor and use it with our higher students. These activities are a great way to help the students with number sense. I look forward to the math conversations that will be happening in my classroom in the upcoming days.”

“I plan on using the Rekenreks to build a deeper understanding of ways to make 10. We are working on 5 and 10 relationships and this is the perfect tool to give students a visual.”

“I plan to use number talks right away to help implement more discussion in my room. I love the idea of starting off each math period with a number talk and discussing multiple methods to solve a problem.”

“I will use the strategy of regrouping like we did on our task card when we begin our subtraction with regrouping.”

“These activities are a great way to help the students with number sense.”

Intention to Use Tasks/Tools

The code “intention to use tasks/tools” was defined as participants expressing a desire or future plan to use a tool or tasks within their classroom instruction as a result of SA4M. Several participants reflected on their current practice with using tasks and tools, and future intentions to use the tools and/or tasks from activities during the Saturday sessions. The following are

example responses that were coded “Intention to use tasks/tools”.

“I will take the ideas from today to improve on the math talks I am doing now.”

“I have already requested a set of Rekenrek tools to use in my classroom. I think this will be a great tool to use for teach number sense.”

“The lessons that Buck used during our instruction today will also be very beneficial. I can use some of the games in centers after doing whole group instruction.”

“Today was AWESOME! I can’t wait to go back to my classroom and use number talks to introduce the topic of subtraction this week.”

“I will use the strategy of regrouping like we did on our task card when we begin our subtraction with regrouping. I love the idea of having the students model and then show their thinking. I am looking forward to the number talks we will be having in our classroom. The session was great!”

Collaboration

The major code “collaboration” was defined as instances of reflection centered on working with peers, and potential outcomes of working with peers. Of the 66 retrieved responses, 32 responses were categorized as related to collaboration. These responses were fragmented and coded as collaboration related based on language that described collaboration experiences of the participants during Saturday sessions, teacher-to-student and student-to-student classroom interactions, perceived benefits of collaboration, and intentions to facilitate collaboration opportunities. From the initial codes (noted in Appendix C) emerged the collapsed codes for this category. Table 4 displays the codes that emerged from the responses and the frequency of each code.

Table 4

Collaboration Codes

<u>Code</u>	<u>Frequency</u>
Participant as a collaborator	30

Benefits of collaboration	20
Intentions to facilitate collaboration	11

Participant as a Collaborator

The code “participant as a collaborator” was defined as responses that centered around reflecting on participants’ experience of collaborating with peers during SA4M sessions. These responses expressed what participants gained as a result of collaborating with their peers, which at times led to reflections on their current beliefs and classroom practices in allowing students to collaborate. Participants noted various levels of interaction in collaborating with their peers, such as sharing multiple strategies for problem solving, discussion, and vertical alignment with peers from other grade levels. This level of collaboration allowed participants to explore content expectations from various grade levels and share teaching practices. The following are example responses that were coded “Participant as a collaborator”.

“One of the main benefits I have seen through attending Saturday Academy for Math is the chance to work with our peers and have conversations about articles and concepts we are dealing with in our classrooms. I have gained many insights from the other attendees and look forward to learning even more from them.”

“It was so helpful to think, pair, and share with other grade levels to learn about how our counting skills lead to composing/decomposing.”

“A fellow teacher and I also plan to learn more about the use of compatible numbers to solve problems.”

“When we’re together at Math Academy, information flows back and forth. PLC’s and Math Academy have really helped me to understand the standards, which better prepares me for my students and the classroom.”

“I planned with others in my grade level to implement number talks in our classrooms next week.”

Benefits of Collaboration

Each Saturday's session included at least one opportunity to allow participants to collaborate in solving a task, exploring standards, or discussions about instructional practices. From these experiences, participants were able to identify potential benefits of collaboration. The code "benefits of collaboration" was defined as identifying ways that instruction can be supported through collaboration. These benefits included both those for the teacher and students. The following are example responses that were coded "Benefits of collaboration".

"The value of building these number talk conversations in the morning, I feel, will help with the math lesson later in the evening."

"I think teaching my students how to work in groups will make their understanding become much more concrete. I feel like using these number talks and collaborative grouping will allow us to learn the standard and objective much more in depth."

"The more opportunities they [students] have to talk about what they are seeing and doing, the more I will learn about their strengths and weaknesses. Also, the students will be able to learn from each other."

"My students enjoy seeing different ways to find the correct answer."

"I loved the idea of giving students the opportunity to come up with a strategy on their own instead of the teacher just saying 'this is how its done'. I think it is a great idea to name a certain strategy after the student that came up with it. It gives the students ownership of their learning and gives them confidence."

Intentions to Facilitate Collaboration

The overall hope for Saturday Academy for Math is to impact and influence the classroom practices of the participants. Several participants reflected their intention to begin or continue to engage students in collaborative moments. The code "intentions to facilitate collaboration" was defined as participants expressing a desire or future plans to engage students in collaborating with their peers within their classroom instruction. The following are example responses that were coded "Intentions to facilitate collaboration".

“I am excited to use these new strategies in my classroom and help guide the discussion. I feel like using the number talks and collaborative grouping will allow us to learn the standard and objective much more in depth.”

“My goal is to incorporate more hands-on and discussion activities for students to enjoy learning.”

“I will allow my students the chance to share multiple ways to solve problems and encourage them to explain their strategies to the class.”

“I need to do better myself letting the kids explain rather than me explain. I do lecture alot, but I also do a lot of questioning and I need to change my way of asking questions.”

“I will allow students to have conversations about math and build their conceptual knowledge which will, in turn, give them a deeper understanding of the importance of numbers in their daily lives.”

“My goal is to let the students explain and demonstrate their thinking on a regular basis.”

“I will ask questions but I will also have the students explain why they gave a particular answer. I do not know if this would be considered the process questions. I plan on implementing this method into my style of teaching.”

Unintended Features

Of the 66 retrieved responses, 2 responses were categorized as related to unintended features. “Unintended features” was defined as responses that did not directly relate to the themes of building participants’ content knowledge, increasing their understanding of the use of tasks and tools, or reflecting on collaboration. These two reflections were specific to a video of a student mentally solving a subtraction problem, which required regrouping. These reflections centered on allowing students appropriate think time. The following are the two responses that were coded “Unintended features”.

“The ‘ah ha’ moment for me was how serious Max was about solving the problem. I didn’t think he was struggling but mentally calculating his answer. Wow!”

“This session was somewhat of an eye opener for me as far as allowing students more time or enough time to solve the problems. For example, knowing the Max problem took him under a minute to solve, but with the silence it seemed more like five minutes made

me realize that just because the students aren't speaking or writing or moving right after you present the problem doesn't mean they are not trying to solve it.

Member Checking

In an effort to verify the accuracy of my coding and findings, I contacted two SA4M participants and conducted a member check. The two participants, who I will call critical friend #1 (CF #1) and critical friend #2 (CF #2), were both participants of SA4M in the years of this study, 2016-2017 and 2017-2018, having attended 14 and 15 sessions respectively, out of the 16 sessions offered over the two-year period, and also represented the members of the treatment group. I questioned them regarding my general findings across the three coded categories of SA4M: content, tasks/tools, and collaboration.

Content

I asked the critical friends, "How do you feel SA4M helps you understand the content you are teaching?" Both critical friends shared the sentiment that SA4M helps them breakdown the mathematics content they are responsible for teaching into "understandable parts, not just for me but for the children as well"; first for their understanding, as well as to teach for student understanding. They expressed gaining a sense of confidence in the content they are tasked to teach, as they are now able to modify content based on specific student needs. Below is an excerpt from our conversation.

CF #2: "Parts that I thought I wasn't understanding, I really was. But because of what you show us, I'm able now to break it down even more for the child's understanding, because some of these [standards] are vague, and some of them, I don't know how to break it down to a struggling third grader or a higher level third grader, so it's helped. You've given us lots of ways to, umm, accommodate, no.... I can modify what we're doing to fit each child's needs within that standard."

As a result of being engaged in content-rich experiences at SA4M, both critical friends take back to their classrooms better ways to teach, more hands-on experiences that promote

understanding, ideas of “things that work”, and a flow and organization to their instruction.

Below is another excerpt from our conversation.

CF #2: “It also helps us, helps me, with the flow. Because some standards we can’t take them ‘1, 2, 3, 4. Sometimes with you showing us different things, I think, ‘Ok, it would be better to show, to do this part of the standard, part B, after I do part D. So the flow is also there because my understanding of the standard has increased and I am able to say, ‘For my children, I need to move this around a little bit.’”

Next, I asked the critical friends, “When you say things like, ‘I will use what I’ve learned to teach my students, what does that look like in the classroom?’” Below is an excerpt from that part of our conversation.

CF#2: “Ok, by you modeling it for me, helps me to.... when the kids are doing it, I don’t have to anticipate what they do, I can appreciate what they do because you’ve modeled it for me. And you’ve allowed me to be more patient with the children rather than having my expectation take the place of what they’re actually doing. So I can enjoy what they’re doing.”

Tasks/Tools

I posed the following statement to the critical friends: “Several times, you mentioned allowing your students to use a manipulative to learn a specific skill. Describe the impact SA4M has had on your choice to incorporate manipulatives.” The critical friends shared that it was through the experiences of using the manipulatives at SA4M that they were able to internalize the benefits of using manipulatives and tools. From SA4M they learned to use manipulatives to help shape the big ideas and mathematical concepts that they are teaching, in short amounts of time, to their students. Both critical friends attributed their use of manipulatives and games to the Saturdays spent at SA4M. The critical friends reiterated that manipulatives are tools that can help students have a better understanding of what they are learning. Below is a snippet of the conversation about their use of tools and manipulatives.

CF #1: “Because of you, and what you said. It’s [using manipulatives] is going to help

them so much more, and it does, when they can maneuver, and touch, and talk, and do it.”

CF#2: “From my own experience with it [manipulatives], I can see the benefits of it. If I can see the benefits of it, then I am willing to share that with my children. Because I feel like I only have a limited amount of time and I really need to get everything going towards that end-of-year test, I feel reluctant to give up that time on something that I can’t understand how it’s going to work or see it working.”

CF #1: “Oh well, no, now I’m not. He made me see that it works.

CF #2: “And the manipulatives and stuff I’ve now learned now how to use them correctly, and how to put it all together to where it doesn’t take up that time that I thought it was going to. I mean I can get it in twenty minutes, we can, the kids have the opportunity to experience as much as they can, where they are individually. Also they can work in groups and learn from the others. In twenty minutes they can experience something that I can’t teach in an hour.”

CF #1: “I am much more manipulative friendly in my classroom because of your classes”.

CF #2: “That’s good. I feel the same way too.”

CF #1: “I grab ‘em and bring ‘em out and I’m excited because the kids, for some reason man, those are pretty good stuff.”

CF #2: “We were doing fractions, and we were touching on two-halves is the same as a whole, which is taking it from 2nd grade and bringing it to third, and I thought ‘Instead of keep saying this or putting up the fraction, I just grabbed the pattern blocks, and I just threw them out there. I said take the yellow one out, that’s your whole. Find two halves. And I just told, I said, ‘Find as many as you can.’”

Collaboration

I began the final part of the conversation with the critical friends by posing the following question: “You mentioned several times about ‘taking this back and sharing with colleagues’. When you do, what does that look like? How do your colleagues receive what you have shared?” It appears that SA4M gives both critical friends the confidence and developing expertise needed to share with their colleagues who do not participate in SA4M. Below is an excerpt from that portion of our conversation.

CF #2: [CF #1] brings back actually what we've done and she actually shows them what we did in this [SA4M]. So she actually brings it back, and models it and everything. And as we're going through it, she'll ask me 'Is that what we did?' Sometimes you know there's bit and pieces. And sometimes I will through outs something and somebody's already done it before but they've forgotten about it or they've heard of it, and we're able to expand on that. And then, it's amazing though, even though we bring it back, some of them will start modifying, making it fit. 'Oh I can see where that would work with something else.' That's happened too. So we expand on what happened here."

CF #1: "It helps us to contribute."

CF #2: "It gives them an opportunity to be part of the Saturday Academy, but without having to be here."

CF #1: "You know, learning how to do groups and getting my students to work in groups, it was fun because they started-they were determined-they started communicating with each other and stuff."

Perhaps the best way to sum up the critical friends' thoughts about the impact of SA4M on their practice is through one last snippet of our conversation.

CF #1: "We've been doing this [attending SA4M] for how many years? Would we keep coming if we weren't getting anything out of it?"

CF #2: "Oh, I've gotten more confidence in myself and more belief that I'm not just lucking out."

CF #3: "Plus I love learning bits and pieces of things I wasn't aware of."

The affordances made by the participants of Saturday Academy for Math (SA4M) can be categorized by the major themes of SA4M: building content knowledge, promoting incorporation of tasks and tools, and engaging participants in meaningful collaboration. The affordances spanned from large, pedagogical crosscutting ideas such as developmental understanding through the concrete-pictorial-abstract progression, to specific understandings, such as how to use a Rekenrek to provide a visual for specific addition strategies, such as doubles. Just as the intentions of SA4M appear to be recognized by the participants, the features of SA4M were

mentioned both explicitly and implicitly through the participants' responses, and the intended accompanying affordances were established.

To examine the impact of SA4M on student achievement, data from a benchmark assessment was collected and analyzed to compare the growth of students assigned to teachers who attend SA4M to the growth of students assigned to teachers who do not attend SA4M. This portion of the chapter reports the results of those tests for two consecutive school years, 2016-2017 and 2017-2018.

2016-2017 Student Growth

To compare the growth of students under teachers who participate in SA4M to the growth of students whose teachers do not attend SA4M, an independent t-test was conducted. On average, students of participants who attended 6-8 sessions of SA4M grew more ($N = 75$, $M = 20.93$, $SE = 0.928$) compared to the students of participants who attended no sessions ($N = 152$, $M = 17.49$, $SE = 0.567$). This difference, 3.440, BCa 95% CI [1.406, 5.582], was not significant $t(225) = 3.317$, $p = .240$.

2017-2018 Student Growth

On average, students of participants who attended 6-8 sessions of SA4M grew more ($N = 73$, $M = 14.77$, $SE = 0.681$) compared to the students of participants who attended no sessions ($N = 242$, $M = 14.00$, $SE = 0.441$). This difference, 0.767, BCa 95% CI [-0.854, 2.443], was not significant $t(313) = 0.865$, $p = .387$.

Although the SA4M participants appear to be making the intended affordances, it does not appear to translate yet to student growth as measured by the NWEA benchmark assessment. Whereas students whose teachers participated in SA4M outgrew their counterparts under teachers who did not participate in SA4M, this difference was not significant.

Table 5

2016-2017 NWEA Student Growth Data

	<u>SA4M Participants</u>	<u>Non SA4M Participants</u>
Number of Teachers	2	5
Number of Students Impacted	75	152
<i>M</i> (S.E.)	20.93 (0.928)	17.49 (0.567)

Table 6

2017-2018 NWEA Student Growth Data

	<u>SA4M Participants</u>	<u>Non SA4M Participants</u>
Number of Teachers	2	6
Number of Students Impacted	73	242
<i>M</i> (S.E.)	14.77 (0.681)	14.00 (0.441)

CHAPTER 5

DISCUSSION

Education is filled with artifacts- policies, programs, curriculum, and other initiatives- intended to influence the practice of others (Halverson et al, 2010). Professional development is an educational artifact familiar to many teachers. Positive changes in teachers' practice often happen as a result of sustained, content-focused professional development (Curwood, 2013). It is important to gauge the effectiveness of professional development initiatives by not just looking at end results, but by also examining the fidelity of the implementation of the artifact. In gauging the impact of professional development, a design framework allows one to unpack the professional development experience, at different times during its development, in terms of its intentions, affordances, and outcomes. If the outcomes of the experience are formed by the affordances made by participants, then it is wise to ensure the experiences in which participants are engaged will form the intended or desired outcomes. By examining the affordances and outcomes made by participants, one can see how well they relate to the original intentions and features, and contribute to evaluating the artifact's overall success.

Using Design Framework to Create

Deciding a starting point for professional development can be daunting. Prior to developing a professional development experience, a design framework can be utilized to establish the intentions or goals for participants. It is important to make these intentions explicit for later reflection. Once the intentions of the professional development have been established, specific features can then be designed around these intentions. Halverson et al (2010), describe

features as “ways that designs hope to influence the thinking and practices of artifact users” (p. 173). To ensure alignment between the big ideas and purpose behind the professional development, and the features intended to promote the desired change, the relationship between these parts deserve focus.

Using Design Framework to Gauge

Just as utilizing formative assessment is a useful practice in gauging the learning of students, the practice can also be beneficial in gauging the effectiveness of professional development. To check whether participants are making the intended affordances during the implementation of professional development, the design framework can then become a formative assessment tool. By gauging the developing affordances being made by participants, one can go back and compare them to the designed features and intentions. At this stage, appropriate adjustments can be made to necessary aspects of the professional development. For example, if exploring benefits of collaboration is a designed feature, but the participants do not seem to be making the appropriate affordances, it may be optimal to resign some of the collaboration features of the professional development experience.

Using Design Framework as Evaluation

Finally, as used in this study, the design framework can also be used as an evaluation tool for professional development. As noted before, participants’ affordances can be aligned, or not, with the intentions and designed features of the professional development. It is important to know if participants ever formed the intended affordances, especially in measuring the intended outcomes. This information can be used to begin the next cycle of designing future professional development opportunities.

Revisiting the Research Questions

The purpose of this study was to explore the relationship between teacher participation SA4M and student growth. This section will revisit each research question.

Affordances

What relationships exist between the features and affordances of Saturday Academy for Math (SA4M) professional development? The features of SA4M, content exploration, hands-on interactions with tasks and tools, and collaboration, were embedded in each Saturday's session. During each session, participants had multiple opportunities to enrich their content knowledge through standards explorations, collaboration with their colleagues, and rich, meaningful tasks, which often included the use of tools and manipulatives. As participants reflected on their experience each Saturday, they made connections between their experiences and recognized implications for their classrooms. They honed in on big ideas, such as the importance of student collaboration to allow sharing of ideas and strategies. The affordances that teachers walked away with were indeed the intended affordances of SA4M.

Experience

How do teachers interpret their experiences in SA4M, specifically in regards to their own content knowledge and instructional practices? Through this study, I have found that many teachers became reflective of their own content knowledge and instructional practices. They recognized their current practices that align with best practices, and they questioned the practices in need of refinement. They viewed their time at SA4M as beneficial for their growth as a teacher to meet the needs of their students. As a result of the many collaboration opportunities, many participants expanded their knowledge of their own grade-level content, and gained a sense

of the vertical alignment of content development. Many teachers expressed intentions to replicate their experiences at SA4M by using the tasks and tools used during the sessions.

Student Growth

What relationships exist between the intentions and outcomes of Saturday Academy for Math (SA4M) professional development, specifically, do the students of teachers who participate in SA4M grow more than their counterparts under teachers who do not attend SA4M? Although SA4M participants seemed to have deepened their own content knowledge and refined their instructional practices as a result of their attendance, and some made intentions to implement what they had learned, there was no evidence of a significant impact on their student's academic growth as measured by the NWEA benchmark assessment. When compared to students receiving instruction from teachers who do not attend SA4M, there was no statistical significance in the students' growth.

Implications

This study provides several implications for various stakeholders in teacher growth and student achievement. First, the idea that educational artifacts intended to facilitate change can be evaluated by examining its design structure. Using a design framework will allow expectations to be explicitly communicated, and close inspection of the alignment between design and outcomes.

Artifact Creators

Utilizing a design framework can help those who are responsible for creating education artifacts to closely analyze the relationship between the artifact designer's intentions and features, and the artifact user's perceived affordances, and outcomes (Curwood, 2013). To ensure that specific outcomes will be met, appropriate experiences that will lead to those outcomes need to be explicitly designed. In evaluating artifacts, it is important to examine if the artifact was

presented and implemented with the fidelity that its features were specifically designed to support its intentions.

Artifact Evaluators

For program evaluators, a design framework allows them to connect the outcomes back to the actions, and the affordances made because of them, in considering its effectiveness. If the intended outcomes were not met, it would be beneficial to reflect on each piece of the artifact to identify parts that may not have been as impactful as desired. Similarly, for an artifact that was successful in creating the desired outcomes, it would be beneficial to reflect on the pieces of the artifact that contributed to the success of the effort for future replication.

Limitations

Several limitations exist in this study, specifically regarding connecting student growth on the NWEA mathematics benchmark assessment to teacher participation in SA4M. Many factors can influence a teacher's instruction beyond a single professional development experience. Although there was a comparison group composed of teachers who did not participate in SA4M, this study does not consider other forms of professional development in which they may have been engaged. There was also no control for the ideas, tasks, and tools that are shared between participants of SA4M and non-participants in this study. Other threats to this study included specific events affecting instruction and learning occurring between the pre- and post growth assessments, varying class demographics such as students receiving services through Special Education or tiered support systems, and English Language Learners, and the consistency, or lack thereof, in attendance by SA4M participants. Because of the small sample size, I would be cautious to generalize the findings of this study to wider audiences.

Future Research

There will always be a need for effective professional development in supporting teachers and the growth of their students. Future studies may want to maintain a cohort of teachers engaged in professional development created and maintained with a design framework, and follow the growth of their students. It would be beneficial in future studies to control for other variables that may influence teacher knowledge and practice, such as certification route, years of experience, and content knowledge growth measures.

Conclusion

Professional development as an educational artifact may be one of the most powerful tools available to in-service teachers to refine their instructional practices and promote growth for all of their students. Research has identified some of the cornerstones of effective professional development, such as learning communities, active learning, and collective participation over time (Curwood, 2013). It is imperative that these catalysts of growth are infused in professional learning opportunities for teachers through an explicit design. Through the use of the design framework, participants in Saturday Academy for Math walked away with the content, practices, and perhaps most importantly, the confidence to provide the mathematics instruction that allows their students opportunities for individual and collective growth.

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APPENDIX

1. Content Codes

Participant Response	Assigned Codes
I definitely need to remember to teach the students: Are we looking for the number of groups or the number in each group?	Meaning of division
I will get students to break numbers a part in order to understand subtraction and borrowing. We can play with base ten blocks to break numbers a part to see the relationship with the types of blocks. It was informative, and I am excited to start with division soon.	Connections within content Decomposition
I will be sure to find problems that challenge my students to find both the unknown number in each group and the unknown number of groups. We will continue to share in our Monday PLC meetings on strategies that have worked with our students. Hopefully as we move forward, we can share before we run into problems instead of during/after.	Division- meaning
I found this session beneficial in helping me understand terminology needed as pre-k students progress in learning math. It was so helpful to think, pair, and share with other grade levels to learn about how our counting skills lead to composing/decomposing. I enjoyed the article and took from it that technology is just another tool to use in our math instruction, but that it doesn't replace the explanation/instruction of the teacher. I liked the activity where we participated as our students would with cubes, flats, longs, and units. Thanks for a wonderful organization and a relaxed learning environment. Appreciate you!	Building on own content knowledge Vocabulary Progression of content
I think a huge thing for me to keep remembering is not to straight to drawings or procedures. Even though drawings are representations of the base-ten blocks, students still need the experiences with them. I often want to skip to the procedures too quickly...before we have fully explored	Conceptual vs. procedural understanding C-P-A development

<p>concepts with manipulatives. I'll probably use some of the things we discussed with my students that are still struggling with these topics during small groups and/or Charger Time. Thanks so much for the fantastic ideas! :)</p>	
<p>Over the years, I came to realize that my way was not always the right way. The right way was the way the child understood. I try to give my students more than one option of solving a problem and allow them to choose the way they understand the best. As individuals, we see many things differently. In the last week, I've watched my students work and how they work problems. They are a very diverse group and they have worked things differently from what I would have chosen to do. The session brought my full attention to this idea even more. In the future, I will look for more options to improve my understanding of the math content and for new and different practices to teach my students.</p>	<p>Building on own content knowledge Multiple solution strategies</p>
<p>I am hoping to use instructional practices that will allow students to use hands on thinking and come up with their own explanations and definitions that we can evolve into more advanced definitions of how or why math problems can be solved. This will allow better understanding if they come up with the explanations on their own rather than me, as a teacher, just lecturing and telling them ways to solve a problem.</p>	<p>Conceptual vs. procedural understanding Strategies</p>
<p>I will continue to research different methods and ways to teach the topics to better my content knowledge. Showing different ways of teaching can help reach more students. With math, which ever concept (way) they grasp and understand better will make them feel more confident instead of just teaching them one way and one way only.</p>	<p>Strategies Building on own content knowledge Multiple solution strategies</p>
<p>Even though I shouldn't feel guilty about</p>	<p>Subitizing</p>

<p>my morning meeting routine with the calendar, eat. I gain a new look at how to utilize my carpet time with my kindergarten students. The value of building these number talk conversations early in the morning, I feel, will help with the math lesson later in the evening. The Subitizing activities were taken in and will be used informally. The other kindergarten teachers and I are very excited to create more subitizing activities for our morning meeting that will benefit the student in number talks in their future.</p>	
<p>I will provide opportunities for the students to use manipulatives and work with others to develop their thinking abstractly. The students will be encouraged to explain their reasoning and explanation skills.</p>	<p>C-P-A development</p>
<p>I was very intrigued by the subitizing activities and have already made some plates for my students to begin working on this skill. I will be finding more information about this strategy and finding more ways to include it in my teaching. A fellow teacher and I also plan to learn more about the use of compatible numbers to solve problems. This session provided a number of great ideas to explore! Looking forward to the next one!</p>	<p>Subitizing Strategies Building on own content knowledge</p>
<p>The session reemphasized the importance of manipulatives (whether actual or virtual) to enable children to practice composing and decomposing. This is especially important because we are ready to start regrouping in second grade. In preparation for this, I plan to use a decomposition activity this week.</p>	<p>C-P-A development Subtraction with regrouping Decomposition</p>
<p>Several of my students still rely on their fingers for adding and subtracting. The article provided me with additional ideas that are used in earlier grades which I can use. I can take what I learned from today's session to scaffold subtraction instruction for the students.</p>	<p>Progression of content Strategies</p>
<p>I thought it was very interesting to see how</p>	<p>Progression of content</p>

<p>the upper grades (2nd) are actually using some of the things we are doing in Pre-K and K. Obviously in the higher grades it is much more 'built upon'. Attending today's session also showed me how very important it is to use the correct terminology so that when children go through the grades from year to year and especially when testing this terminology is familiar to them. I will admit I haven't used the correct 'wording' as much as I have should have, but will definitely try to use it more to help my Kinders for the future! I also thought it was interesting how important it is to begin to try to show my Kindergarteners the many ways to try to 'compose/decompose' numbers (correct terminology!) more than I do now.</p>	<p>Multiple Solution Strategies Vocabulary Decomposition</p>
<p>The discussions between the fourth grade teachers and third grade teachers allows me to see what is expected of the students. When I hear and see what the fourth grade teachers are doing with the standards, it helps me know what I can do to better prepare my students for the fourth grade. I learned that how I present the information could inhibit what the fourth grade teacher is trying to get the students to understand. It would be better for all concerned if the fourth grade teacher did not have to correct a misconception the students have from something I taught in the third grade. By applying structure to the standards, their progression from grade to grade, and our teaching methods, would serve the learning community better by its continuity. It is my intention to question what I am doing to help the student make the transition to the next grade. I can ask next year's teacher what do I need to do to lay a foundation for a standard that will help you? What do I need to change in teaching the standards that will make it better for the students to learn from you? Some of the things we discussed was teaching and using math</p>	<p>Progression of content Vocabulary</p>

<p>vocabulary, when challenging our students, be careful to use the same methods as the next grade, and provide the students with the background information that will help with understanding the standard.</p>	
<p>I am looking forward to using this in my classroom next week. We discussed ways we can use these with our struggling students during our Charger Time and we also looked at ways to increase the rigor and use it with our higher students. These activities are a great way to help the students with number sense. I look forward to the math conversations that will be happening in my classroom in the upcoming days.</p>	<p>Rigor Differentiated Instruction Number Sense</p>
<p>Since we are beginning division I will use these manipulatives as we work our through all the ways to divide. As we have our PLC this week, I can share the division activities/methods with my team. And to remember that division is not always repeated subtraction!!</p>	<p>Meaning of division C-P-A development Multiple Solution Strategies</p>
<p>I love it when the fourth grade is at Math Academy along with the third grade. Things that we do in third grade can help the fourth grade with building, or it can cause a problem for them. We are in the same building, but we don't get to see much of each other. When we're together at Math Academy, information flows back and forth. PLC's and Math Academy have really helped me to understand the standards, which better prepares me for my students and the classroom.</p>	<p>Progression of content Building on own content knowledge</p>
<p>I hope to attend another SA4M session. I learned a lot today and am especially glad to know that the foundation we are creating for our students in Pre-K will transfer to much more complex mathematical thinking and processes for our students at upper grade levels. I am going to make sure I use my magnetic 10 frames with 2-sided counters and teach my students to decompose numbers. I plan to make sure I</p>	<p>Progression of content C-P-A development Vocabulary Decomposition</p>

<p>use mathematical terminology with visual representations. Thanks for a great morning, Buck!</p>	
<p>I will continue to research the topics I teach and improve my content knowledge. I am always looking for new ways to teach the content of math. Over the years I have found new ideas to teach concepts that some of my kids struggle with. I have also learned alot from the teachers who are fresh out of college. Its been a long time since i went to college and they are now learning new ways on different levels, such as classroom mangement and grouping.</p>	<p>Building on own content knowledge</p>
<p>Children's mastery of addition concepts is progressive. They move through different developmental stages and may not be ready for applying their knowledge of number representation to addition concepts, even if it appears they have the foundational skills. Centers and games help children with understanding by giving them concrete representations and practice working with numbers. I can apply this to my classroom by giving my students the opportunity to work with dice and other visual representations and also allowing them the freedom to use whatever method they need at the time to solve addition problems. (Counting all, shortcut, or counting on)</p>	<p>Progression of content C-P-A development Multiple Solution Strategies Conceptual vs. procedural understanding</p>
<p>I will use the strategy of regrouping like we did on our task card when we begin our subtraction with regrouping. I love the idea of having the students model and then show their thinking. I am looking forward to the number talks we will be having in our classroom. The session was great!</p>	<p>C-P-A development Subtraction with regrouping</p>
<p>After attending the Saturday Academy for Math, I am excited about introducing a variety of types of word problems to my students. My students have been using strategies like finding the key words, but during the session, I learned that this can actually inhibit them from understanding what is really going on in the problem. I</p>	<p>Conceptual vs. procedural understanding Subtraction with regrouping</p>

<p>realized that my students need focus on key actions instead of key words. I also am going to incorporate some of the strategies for regrouping. One of my favorites was the place value mat in the video that Buck showed us. I also liked the chick peas example, and think this could really help deepen my students' understanding of how regrouping does not change the value of a number.</p>	
<p>I can definitely see myself doing number talks to begin a lesson or new concept, as well as a good formative check! I think teaching my students how to work in groups will make their understanding become much more concrete! I am excited to use these new strategies in my classroom and help guide these discussion. I feel like using these number talks and collaborative grouping will allow us to learn the standard and objective much more in depth.</p>	<p>Strategies C-P-A development</p>
<p>Today was AWESOME! I can't wait to go back to my classroom and use number talks to introduce the topic on subtraction this week. I am going to break my students into groups and have them break apart a whole number into two parts and have discussion on strategies used to break the numbers apart. I feel like this is going to be so beneficial for all of my students in various ways, as they will have to problem solve and defend their strategy as to how they break apart their numbers, which will eventually lead into a discussion on using their strategies to write addition and subtraction sentences. Today was great because it has made me think about how I am going to add more rigor to my lessons and allow students to truly think about what strategies they are using and how they are getting to their answers.</p>	<p>Strategies Decomposition Subtraction</p>
<p>1) My big idea to take away from this SA4M is that it is so important for children to have repeated exposure to concrete</p>	<p>C-P-A development Differentiated Instruction Progression of content</p>

<p>representations with adding numerals. I did not realize before reading this article how critical it is to have the repeated exposure in the earlier years. Since we serve a wide variety of students in our school district, who come from backgrounds that vary, it is important that when they start school to expose them to a variety of concrete representations so that they have a repeated experience with manipulatives, allowing them to have that foundation to lead them to become fluent in addition. 2) My goal to take back to my classroom is to continue using a wide variety of concrete representations, by using a variety of tools, to help build upon the foundation already set. I want to continue to help those students who struggle, or have not been as exposed as others, to help them move from the representation to adding numerals so that they can become fluent in adding. I want my students to feel confident when adding and I want them to have a good grasp on connecting the concrete representation to adding numerals.</p>	
<p>I will use some of the apps shared in the class today to expand my use of virtual tools to teach my students. I will also be sure to use the vocabulary, even though it may seem "grown up" with my kindergarten students so that they can be prepared and aware of it when their teachers in the future use the vocabulary. I have the flats, rods and units in my classroom, but I was always hesitant to use them. This class has given me a confidence to use those manipulatives, if only used as an introduction for upper grades. Thank you Buck for the ideas, the conversation and the yummy goodies.</p>	<p>C-P-A development Vocabulary</p>
<p>After Saturday's lesson, I will use different strategies to help my students solve word problems. I will also go back and work</p>	<p>Subtraction with regrouping Differentiated Instruction Strategies</p>

<p>with those who struggled with regrouping. I really liked the peas activity. It made me realize that I didn't even fully understand the concept of regrouping.</p>	
<p>I am starting division Monday and use the activities today for my introduction. The students will be able to explore using manipulatives. I have a better understanding of what I am looking for from the students. I will be able to assist the students more confidently. Several members of my PLC attended and this will make the exchange of ideas and concerns easier for me.</p>	<p>Building on own content knowledge C-P-A development</p>
<p>I loved the chickpeas example, too. I don't have chickpeas, but I have little cups and beads and they will be all over the floor. This was a really valuable session because many of our children weren't successful on the Topic 11 test in second grade. I think we realized that part of it was the wording/format of the test, but we also need to expose students to different kinds of problems in class ... before the test.</p>	<p>Problem types</p>
<p>This session has really helped see the progression of our students understanding because as a teacher, it is often times difficult to scaffold the understanding when you want them to instantly get the "big picture". I can see myself implementing all of these activities to fit my students needs, but I would love to continue to learn and find new activities to make math fun and interactive!</p>	<p>Building on own content knowledge Progression of content</p>
<p>Today was very helpful! I have been looking for a way to "amp" up the engagement in math time. I think the Rekenreks will definitely be a benefit to my classroom. I am going to use them for interventions during charger time. I am noticing a lot of my kids (especially tier 2 and 3) are lacking in number sense. I love how in the video it started with just making ten numbers and then eventually grew to</p>	<p>C-P-A development Number sense Differentiated Instruction</p>

<p>recognizing the number when just viewing it for a couple seconds when the paper was lifted. I am going to use this strategy this week in my interventions. Also, I am going to use the Rekenreks as a way to introduce additions strategies this week. I like the activity where you seperate the colors and bring them to the middle. Im going to use this to teach doubles and review evens and odds. I also will use the center games for addition strategy centers!</p>	
<p>Today reminded me that I need to work on incorporating the 8 Mathematical Practices more when planning my math lessons.</p>	<p>SMPs</p>

2. Tasks/Tools Codes

Participant Response	Assigned Codes
<p>I will take the ideas from today to improve on the math talks I am doing now. Understanding how to use the students' ideas to guide the others will make it easier for me to evaluate the students' comprehension. I will use math talks as more than a starting place in a lesson, but also as the lesson evolves.</p>	<p>Number Talks Intention to use in class</p>
<p>I have already requested a set of Rekenrek tools to use in my classroom. I think this will be a great tool to use to teach number sense. I also believe this is a good way to show differentiated instruction. Every child will have their own strategies to compose and decompose numbers, number sentences, etc. Awesome workshop!</p>	<p>Benefit- differentiation Intention to use in class Rekenrek</p>
<p>I plan on using the rekenreks to build a deeper understanding of ways to make 10. We were working on 5 and 10 relationships and this is the perfect tool to give students a visual. I also think it is important to let the students explore these tools on their own so that they can come up with different ideas and expand their knowledge. The lessons that Buck used during our instruction today will also be very beneficial. I can use some of these games in centers after doing whole group instruction.</p>	<p>Benefit- visual Benefit- builds understanding Intention to use in class</p>

<p>I plan to use number talks right away to help implement more discussion in my room. I love the idea of starting off each math period with a number talk and discussing multiple methods to solve a problem. In the future, I plan to look more deeply at the questions I ask my students to guide them in their explanations of solving a problem, so that by the end of a week they will be the experts teaching me. I'm going to try and being with review problems where we can find multiple methods of solving a problem (with addition and subtraction word problems) for number talks, and then focus on using more detailed questions in teaching new material.</p>	<p>Intention to use in class Benefit-discussion Questioning Word problems Benefit- promote multiple methods</p>
<p>There is always something that I can bring back to school and use with the students I see daily. The subitizing activity was an aha moment for me and I'm quite sure the K-2 teachers as well.</p>	<p>Intention to use in class Teacher as learner</p>
<p>I will use some of the apps shared in the class today to expand my use of virtual tools to teach my students. I will also be sure to use the vocabulary, even though it may seem "grown up" with my kindergarten students so that they can be prepared and aware of it when their teachers in the future use the vocabulary. I have the flats, rods and units in my classroom, but I was always hesitant to use them. This class has given me a confidence to use those manipulatives, if only used as an introduction for upper grades. Thank you Buck for the ideas, the conversation and the yummy goodies.</p>	<p>Apps Intention to use in class Base Ten Blocks Teacher as learner Building confidence</p>

<p>I am starting division Monday and use the activities today for my introduction. The students will be able to explore using manipulatives. I have a better understanding of what I am looking for from the students. I will be able to assist the students more confidently. Several members of my PLC attended and this will make the exchange of ideas and concerns easier for me.</p>	<p>Intention to use in class Teacher as learner Building confidence</p>
<p>I'm ready to do a number talk with my students. I'm especially excited about investigating illuminations and learnzillion. I was not aware of these sites.</p>	<p>Number talks Apps Intention to use in class</p>
<p>After Saturday's lesson, I will use different strategies to help my students solve word problems. I will also go back and work with those who struggled with regrouping. I really liked the peas activity. It made me realize that I didn't even fully understand the concept of regrouping.</p>	<p>Intention to use in class Teacher as learner Non-traditional tools Benefit- builds understanding</p>
<p>I definitely want to use this tool the rekenrek with the students in my classroom. I love the building of number sense and deeper understanding that occurs when the students discuss the composition and decomposition of numbers using this tool. I am actually EXCITED to teach math with this tool, and I know that students will love it. I also realized the importance of being here today to actually use the tool and practice the activities I could use with my students. This Saturday Academy is such a valuable experience, and I hope to make it to every session.</p>	<p>Intention to use in class Teacher as learner Rekenrek Benefit- builds understanding Number Sense</p>
<p>This session has really helped see the progression of our students understanding because as a teacher, it is often times difficult to scaffold the understanding when you want them to instantly get the "big picture". I can see myself implementing all of these activities to fit my students needs, but I would love to continue to learn and find new activities to make math fun and interactive!</p>	<p>Intention to use in class</p>

<p>I work with 3rd grade students that have trouble with number sense. The more opportunities they have to talk about what they are seeing and doing, the more I will learn about their strengths and weaknesses. Also, the students will be able to learn from each other. I will continue to provide the opportunities and be more of a facilitator for them. I saw some number sense activities that I can use to help the students that fill the gaps that they have in their understanding. These activities can be done in a few minutes.</p>	<p>Intention to use in class Benefit-builds number sense</p>
<p>Today was very helpful! I have been looking for a way to "amp" up the engagement in math time. I think the Rekenreks will definitely be a benefit to my classroom. I am going to use them for interventions during charger time. I am noticing a lot of my kids (especially tier 2 and 3) are lacking in number sense. I love how in the video it started with just making then numbers and then eventually grew to recognizing the number when just viewing it for a couple seconds when the paper was lifted. I am going to use this strategy this week in my interventions. Also, I am going to use the Rekenreks as a way to introduce additions strategies this week. I like the activity where you seperate the colors and bring them to the middle. Im going to use this to teach doubles and review evens and odds. I also will use the center games for addition strategy centers!</p>	<p>Rekenrek Intention to use in class Benefit-builds number sense Benefit-strategies</p>
<p>I loved the chickpeas example, too. I don't have chickpeas, but I have little cups and beads and they will be all over the floor. This was a really valuable session because many of our children weren't successful on the Topic 11 test in second grade. I think we realized that part of it was the wording/format of the test, but we also need to expose students to different kinds of problems in class ... before the test.</p>	<p>Teacher as learner Non-traditional tools</p>

<p>I am trying to be patient during wait time. I was shocked to learn the time before the student responded was less than a minute. I am trying to incorporate more hands on activities to start math everyday. The students love the subitizing cards. We discuss how they were able to determine the number on the card. This provides other students opportunities to share how they solved. My goal is to incorporate more hands on and discussion activities for students to enjoy learning.</p>	<p>Intention to use in class</p>
<p>I am looking forward to using this in my classroom next week. We discussed ways we can use these with our struggling students during our Charger Time and we also looked at ways to increase the rigor and use it with our higher students. These activities are a great way to help the students with number sense. I look forward to the math conversations that will be happening in my classroom in the upcoming days.</p>	<p>Intention to use in class Benefit-differentiation Benefit-builds number sense</p>
<p>Children's mastery of addition concepts is progressive. They move through different developmental stages and may not be ready for applying their knowledge of number representation to addition concepts, even if it appears they have the foundational skills. Centers and games help children with understanding by giving them concrete representations and practice working with numbers. I can apply this to my classroom by giving my students the opportunity to work with dice and other visual representations and also allowing them the freedom to use whatever method they need at the time to solve addition problems. (Counting all, shortcut, or counting on)</p>	<p>Benefit- builds understanding</p>
<p>I have new ideas in using manipulatives in number talks in my classroom. I planned with others in my grade level to implement number talks in our classroom next week.</p>	<p>Intention to use in class Number talks</p>

<p>I found this session beneficial in helping me understand terminology needed as pre-k students progress in learning math. It was so helpful to think, pair, and share with other grade levels to learn about how our counting skills lead to composing/decomposing. I enjoyed the article and took from it that technology is just another tool to use in our math instruction, but that is doesn't replace the explanation/instruction of the teacher. I liked the activity where we participated as our students would with cubes, flats, longs, and units. Thanks for a wonderful organization and a relaxed learning environment. Appreciate you!</p>	<p>Teacher as learner Base Ten Blocks</p>
<p>Even though I shouldn't feel guilty about my morning meeting routine with the calendar, etc. I gain a new look at how to utilize my carpet time with my kindergarten students. The value of building these number talk conversations early in the morning, I feel, will help with the math lesson later in the evening. The Subitizing activities were taken in and will be used informally. The other kindergarten teachers and I are very excited to create more subitizing activities for our morning meeting that will benefit the student in number talks in their future.</p>	<p>Number talks Intention to use in class Subitizing</p>
<p>I was very intrigued by the subitizing activities and have already made some plates for my students to begin working on this skill. I will be finding more information about this strategy and finding more ways to include it in my teaching. A fellow teacher and I also plan to learn more about the use of compatible numbers to solve problems. This session provided a number of great ideas to explore! Looking forward to the next one!</p>	<p>Intention to use in class Subitizing</p>

<p>I will provide opportunities for the students to use manipulatives and work with others to develop their thinking abstractly. The students will be encouraged to explain their reasoning and explanation skills.</p>	<p>Intention to use in class Benefit- builds understanding Benefit- discussion</p>
<p>The session reemphasized the importance of manipulatives (whether actual or virtual) to enable children to practice composing and decomposing. This is especially important because we are ready to start regrouping in second grade. In preparation for this, I plan to use a decomposition activity this week.</p>	<p>Benefit- builds understanding Intention to use in class</p>
<p>Several of my students still rely on their fingers for adding and subtracting. The article provided me with additional ideas that are used in earlier grades which I can use. I can take what I learned from today's session to scaffold subtraction instruction for the students.</p>	<p>Benefit-differentiation</p>
<p>Since we are beginning division I will use these manipulatives as we work our way through all the ways to divide. As we have our PLC this week, I can share the division activities/methods with my team. And to remember that division is not always repeated subtraction!!</p>	<p>Intention to use in class</p>
<p>I hope to attend another SA4M session. I learned a lot today and am especially glad to know that the foundation we are creating for our students in Pre-K will transfer to much more complex mathematical thinking and processes for our students at upper grade levels. I am going to make sure I use my magnetic 10 frames with 2-sided counters and teach my students to decompose numbers. I plan to make sure I use mathematical terminology with visual representations. Thanks for a great morning, Buck!</p>	<p>Teacher as learner Intention to use in class Ten frames</p>

<p>1) My big idea to take away from this SA4M is that it is so important for children to have repeated exposure to concrete representations with adding numerals. I did not realize before reading this article how critical it is to have the repeated exposure in the earlier years. Since we serve a wide variety of students in our school district, who come from backgrounds that vary, it is important that when they start school to expose them to a variety of concrete representations so that they have a repeated experience with manipulatives, allowing them to have that foundation to lead them to become fluent in addition.</p> <p>2) My goal to take back to my classroom is to continue using a wide variety of concrete representations, by using a variety of tools, to help build upon the foundation already set. I want to continue to help those students who struggle, or have not been as exposed as others, to help them move from the representation to adding numerals so that they can become fluent in adding. I want my students to feel confident when adding and I want them to have a good grasp on connecting the concrete representation to adding numerals.</p>	<p>Teacher as learner Benefit- builds understanding Intention to use in class</p>
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<p>Today was AWESOME! I can't wait to go back to my classroom and use number talks to introduce the topic on subtraction this week. I am going to break my students into groups and have them break apart a whole number into two parts and have discussion on strategies used to break the numbers apart. I feel like this is going to be so beneficial for all of my students in various ways, as they will have to problem solve and defend their strategy as to how they break apart their numbers, which will eventually lead into a discussion on using their strategies to write addition and subtraction sentences. Today was great because it has made me think about how I am going to add more rigor to my lessons and allow students to truly think about what strategies they are using and how they are getting to their answers.</p>	<p>Intention to use in class Benefit- discussion Benefit-strategies</p>
<p>I will use the strategy of regrouping like we did on our task card when we begin our subtraction with regrouping. I love the idea of having the students model and then show their thinking. I am looking forward to the number talks we will be having in our classroom. The session was great!</p>	<p>Intention to use in class Number talks</p>
<p>After attending the Saturday Academy for Math, I am excited about introducing a variety of types of word problems to my students. My students have been using strategies like finding the key words, but during the session, I learned that this can actually inhibit them from understanding what is really going on in the problem. I realized that my students need focus on key actions instead of key words. I also am going to incorporate some of the strategies for regrouping. One of my favorites was the place value mat in the video that Buck showed us. I also liked the chick peas example, and think this could really help deepen my students' understanding of how regrouping does not change the value of a number.</p>	<p>Intention to use in class Place value mat Benefit- builds understanding</p>

<p>Most definitely through collaboration between peers both within and outside of my district. I will allow students to have conversations about math and build their conceptual knowledge which will, in turn, give them a deeper understanding of the importance of numbers in their daily lives. Giving students the ability to show you how they solve problems makes the understanding more meaningful to them and allows you to build on that understanding. MOVE AWAY FROM THE WORKSHEETS as a daily task and make learning an activity students begin to enjoy and love.</p>	<p>Benefit- builds understanding Intention to use in class Benefit-strategies</p>
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3. Collaboration Codes

Participant Response	Assigned Codes
<p>I will provide more prompts for those who are not as forthcoming when discussing their ideas. The idea that the discussion does not have to conclude at that time, but could extend to another time. Students will have the opportunity to come back later and offer more insight to the discussion.</p>	<p>Intention to facilitate discussion</p>
<p>I will continue to ask the students to explain their answers and thoughts. The encouragement of dialogue between students is another goal of mine. I hope to learn from the students as well as teach.</p>	<p>Intention to facilitate discussion</p>
<p>After reading the article "Never Say Anything a Kid Can Say", I see some ways of changing my teaching practice. I teach most classes with the lecture method. However, I combine this method with asking questions. I will ask questions but I will also have students explain why they gave a particular answer. I do not know if this would be considered the process questions. I plan on implementing this method into my style of teaching.</p> <p>In reading the article, I noticed the section on participation is not an option. I expect my students to participate. But I have heard the statement "I don't get it" several times this year. I want to conquer this statement and make the students realize they have to think and apply their knowledge in math.</p>	<p>Reflection on current practices Intention to facilitate discussion Questioning</p>
<p>My goal is to let the students explain and demonstrate their thinking on a regular basis.</p>	<p>Intention to facilitate discussion</p>

<p>I plan to continue with the Saturday Math Academy. It has really been great to work with my peers and learn new ways of doing math. I will continue to teach my students different ways to do math and encourage them to do different strategies. I do believe that I will enjoy my early Christmas gift. I am always looking for new ways to teach math. This has really been a blessing.</p>	<p>Multiple methods/strategies</p>
<p>One of the main benefits I have seen through attending the Saturday Academy for Math is the chance to work with our peers and have conversations about activities and concepts we are dealing with in our classrooms. I have gained many insights from the other attendees and look forward to learning even more from them. I do not always take the time to do this in my own building, but I realize that this is something that needs to be done more often. I also believe that I can learn more about instructional practices from my students. As a 23 year veteran, I am quite the control freak. I need to learn to let go and let my students show me more of what they know and how they think. There is always something new and exciting to learn.</p>	<p>Teacher as learner through collaboration Benefits</p>

<p>My personal content knowledge and instructional practices will continue to develop by continuing to have conversations with the teachers, not just conversation but through the sharing of ideas. Watching and listening to students as they talk to one another about the different strategies used to solve different math problems will also help to continuously develop content and instructional practice. Different literature that is written about different methods being utilized and also through effective professional development will also aid in continuous development.</p>	<p>Teacher as learner through collaboration Benefits Multiple methods/strategies</p>
<p>Most definitely through collaboration between peers both within and outside of my district. I will allow students to have conversations about math and build their conceptual knowledge which will, in turn, give them a deeper understanding of the importance of numbers in their daily lives. Giving students the ability to show you how they solve problems makes the understanding more meaningful to them and allows you to build on that understanding. MOVE AWAY FROM THE WORKSHEETS as a daily task and make learning an activity students begin to enjoy and love.</p>	<p>Teacher as learner through collaboration Benefits Intention to facilitate discussion</p>

<p>I found this session beneficial in helping me understand terminology needed as pre-k students progress in learning math. It was so helpful to think, pair, and share with other grade levels to learn about how our counting skills lead to composing/decomposing. I enjoyed the article and took from it that technology is just another tool to use in our math instruction, but that is doesn't replace the explanation/instruction of the teacher. I liked the activity where we participated as our students would with cubes, flats, longs, and units. Thanks for a wonderful organization and a relaxed learning environment. Appreciate you!</p>	<p>Teacher as learner through collaboration Benefits</p>
<p>Even though I shouldn't feel guilty about my morning meeting routine with the calendar, etc. I gain a new look at how to utilize my carpet time with my kindergarten students. The value of building these number talk conversations early in the morning, I feel, will help with the math lesson later in the evening. The Subitizing activities were taken in and will be used informally. The other kindergarten teachers and I are very excited to create more subitizing activities for our morning meeting that will benefit the student in number talks in their future.</p>	<p>Teacher as learner through collaboration Benefits Intention to facilitate discussion</p>
<p>I will provide opportunities for the students to use manipulatives and work with others to develop their thinking abstractly. The students will be encouraged to explain their reasoning and explanation skills.</p>	<p>Intention to facilitate discussion Multiple methods/strategies</p>

<p>I was very intrigued by the subitizing activities and have already made some plates for my students to begin working on this skill. I will be finding more information about this strategy and finding more ways to include it in my teaching. A fellow teacher and I also plan to learn more about the use of compatible numbers to solve problems. This session provided a number of great ideas to explore! Looking forward to the next one!</p>	<p>Teacher as learner through collaboration</p>
<p>I thought it was very interesting to see how the upper grades (2nd) are actually using some of the things we are doing in Pre-K and K. Obviously in the higher grades it is much more 'built upon'. Attending today's session also showed me how very important it is to use the correct terminology so that when children go through the grades from year to year and especially when testing this terminology is familiar to them. I will admit I haven't used the correct 'wording' as much as I have should have, but will definitely try to use it more to help my Kinders for the future! I also thought it was interesting how important it is to begin to try to show my Kindergarteners the many ways to try to 'compose/decompose' numbers (correct terminology!) more than I do now.</p>	<p>Teacher as learner through collaboration</p>

<p>I love it when the fourth grade is at Math Academy along with the third grade. Things that we do in third grade can help the fourth grade with building, or it can cause a problem for them. We are in the same building, but we don't get to see much of each other. When we're together at Math Academy, information flows back and forth. PLC's and Math Academy have really helped me to understand the standards, which better prepares me for my students and the classroom.</p>	<p>Teacher as learner through collaboration Benefits</p>
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<p>The discussions between the fourth grade teachers and third grade teachers allows me to see what is expected of the students. When I hear and see what the fourth grade teachers are doing with the standards, it helps me know what I can do to better prepare my students for the fourth grade. I learned that how I present the information could inhibit what the fourth grade teacher is trying to get the students to understand. It would be better for all concerned if the fourth grade teacher did not have to correct a misconception the students have from something I taught in the third grade. By applying structure to the standards, their progression from grade to grade, and our teaching methods, would serve the learning community better by its continuity. It is my intention to question what I am doing to help the student make the transition to the next grade. I can ask next year's teacher what do I need to do to lay a foundation for a standard that will help you? What do I need to change in teaching the standards that will make it better for the students to learn from you? Some of the things we discussed was teaching and using math vocabulary, when challenging our students, be careful to use the same methods as the next grade, and provide the students with the background information that will help with understanding the standard.</p>	<p>Teacher as learner through collaboration</p>
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<p>I can definitely see myself doing number talks to begin a lesson or new concept, as well as a good formative check! I think teaching my students how to work in groups will make their understanding become much more concrete! I am excited to use these new strategies in my classroom and help guide these discussion. I feel like using these number talks and collaborative grouping will allow us to learn the standard and objective much more in depth.</p>	<p>Benefits Intention to facilitate discussion</p>
<p>I have new ideas in using manipulatives in number talks in my classroom. I planned with others in my grade level to implement number talks in our classroom next week.</p>	<p>Teacher as learner through collaboration</p>
<p>I am trying to be patient during wait time. I was shocked to learn the time before the student responded was less than a minute. I am trying to incorporate more hands on activities to start math everyday. The students love the subitizing cards. We discuss how they were able to determine the number on the card. This provides other students opportunities to share how they solved. My goal is to incorporate more hands on and discussion activities for students to enjoy learning.</p>	<p>Benefits Intention to facilitate discussion</p>

<p>I work with 3rd grade students that have trouble with number sense. The more opportunities they have to talk about what they are seeing and doing, the more I will learn about their strengths and weaknesses. Also, the students will be able to learn from each other. I will continue to provide the opportunities and be more of a facilitator for them. I saw some number sense activities that I can use to help the students that fill the gaps that they have in their understanding. These activities can be done in a few minutes.</p>	<p>Benefits Intention to facilitate discussion</p>
<p>I will continue to research the topics I teach and improve my content knowledge. I am always looking for new ways to teach the content of math.</p> <p>Over the years I have found new ideas to teach concepts that some of my kids struggle with. I have also learned a lot from the teachers who are fresh out of college. It's been a long time since I went to college and they are now learning new ways on different levels, such as classroom management and grouping.</p>	<p>Teacher as learner through collaboration</p>
<p>After coming across this article several times during the school year, I stop to think and reflect on how we use MATH TALKS in our classroom. Are the students "Explaining" - "Evaluating" - and "Extending" in the different standards? I try to give the students enough time to solve the math problems in a way that is most appealing to them. They seem to enjoy learning from each other in our collaborative classroom setting.</p>	<p>Benefits Multiple methods/strategies</p>

<p>I will allow my students the chance to share multiple ways to solve problems and encourage them to explain their strategies to the class. I always to my students a lot of times in math there is more than one way to solve a problem. My students enjoy seeing different ways to find the correct answer!</p>	<p>Benefits Multiple methods/strategies Intention to facilitate discussion</p>
<p>I continue to ask students to explain their way of solving. This strategy helps students hear and see another way to solve a problem. I also ask students to restate what they heard their classmate say. I also use this strategy by restating what I heard them say and ask if anyone would like to add. I include positive feedback each time a student shares their thinking. I hope this will give students (those who tend to "hunker down" when they know I am about to ask a question) confidence and courage to share with their peers.</p>	<p>Benefits Reflection on current practices</p>
<p>The first thing I did this week as model how to explain mental math strategies for solving an addition problem. I then allowed partners to teach each other how they would solve an new addition sentence. I allowed groups to share what their partner's strategy was way to retell what they learned. It was exciting to hear all the different strategies they came up with!</p>	<p>Benefits Reflection on current practices</p>
<p>I am going to give my students more opportunities to share their thoughts and reasons for specific math questions. I love how in the video we watched when the teacher would put the students' names on the board with their math. I love how that gives the kids ownership!</p>	<p>Intention to facilitate discussion Benefits</p>

<p>I loved the idea of giving students the opportunity to come up with a strategy on their own instead of the teacher just saying "this is how it's done".</p> <p>I think it is a great idea to name a certain strategy after the student that came up with it. It gives the students ownership of their learning & gives them confidence.</p>	<p>Benefits Multiple methods/strategies</p>
<p>I will definitely keep attending Math Academy on Saturdays. Thanks, Buck, for clarifying fluency for us. It makes perfect sense to me now. I learn a lot in PLC's talking with my colleagues. I read the book you gave us at the beginning of the year. I'm now ready to jump into the wonderful Christmas gift that Santa brought us on Saturday.</p>	<p>Benefits Teacher as learner through collaboration</p>
<p>As an assistant principal, this will give me an opportunity to model some of the strategies I have learned today with teachers in my buildings. I like the idea of giving students the opportunity to come up with a strategy in solving a problem instead of "TELLING" them how to solve a problem.</p> <p>Allowing them this opportunity to develop their own method will make it more meaningful to the child and therefore they will retain the knowledge longer than if they were told to memorize an algorithm</p>	<p>Multiple methods/strategies</p>
<p>I need to make sure I ask why more and make the students explain on their reason for why they answer things the way they do</p>	<p>Questioning</p>
<p>After reading the article, I try to be more conscious of how I ask questions or respond to the questions students ask me. I try to respond to the questions in a way that requires them to think or lead them to answer their own questions.</p>	<p>Questioning</p>

<p>As I was reading the article, "Never Say Anything a Kid Can Say," I would catch myself grinning and thinking, I need to do better. I need to do better myself letting the kids explain rather than me explaining. I do lecture alot, but I also do a lot of questioniong and I need to change my way of asking questions. This year I am also not calling on the one that raises their hand first, but rather on someone that normally doesn't answer a question, I choose them. I enjoyed this article.</p>	<p>Questioning Shift in practices</p>
<p>After reading the article "Never Say Anything a Kid Can Say", I am coming to realize that good questions and time is very important. I am so use to just a few quick questions before being the lesson, most are probably more yes or no and just "one answer" questions. I like how the article stated " I should be able to learn something about what the students knows or does not know from her or his response." I need more open ended questions and or questions taht have more than one acceptable response. Also, just being patient and letting my students think and providing them enough time to process the question and what they think the answer is going to be, instead of wanting to jump in and help them because they may not need my help at all.</p>	<p>Questioning</p>

VITA

Brian C. Buckhalter

Education

University of Mississippi, University, MS

Doctor of Education in Curriculum and Instruction with an emphasis in Elementary Education

Dissertation: *An Examination of the Relationship Among the Intentions, Features, Affordances, and Outcomes of Saturday Academy for Math Professional Development for Teachers*

In progress- Anticipated graduation May 2019

University of Mississippi, University, MS

Master of Education in Curriculum and Instruction with an emphasis in Elementary Education, May 2015

Dillard University, New Orleans, LA

Bachelor of Arts in Elementary Education,
June 2006

Experience

- **BuckWildAboutMath, LLC Founder and Consultant** July 2018-present
- **Professional Development Contractor**, North Mississippi Education Consortium, University of Mississippi, University, MS April 2015-present
- **Professional Development Content Specialist**, Mississippi Department of Education, Jackson, MS April 2014-present
- **Graduate Research Fellow**, Center for Mathematics and Science Education, University of Mississippi, University, MS June 2013-January 2018

- **Elementary Mathematics Coach**, Oxford School District, Oxford, MS July 2013-present
- **Sixth Grade Mathematics and Social Studies Teacher**, Oxford School District, Oxford, MS July 2006-June 2013

Presentations

- **“When Love Takes Over”**, Keynote Speaker, Mississippi Economic Computing Association Conference, Jackson, MS February 2019
- **“I’ve Found This Cool App... Now What?”**, with Wendy Raby, Mississippi Economic Computing Association Conference, Jackson, MS February 2019
- **“Number Talks: Literacy Within the Mathematics Classroom”**, Mississippi Literacy Association Conference, Biloxi, MS November 2018
- **“Can We Just Vent For a Second?”**, Mathematics Specialist Conference, Oxford, MS November 2018
- **“Changing the Face of Professional Development Voluntarily”**, with Dr. Johnny Lott, National Council of Teachers of Mathematics (NCTM) Annual Conference, Washington, D.C. April 2018
- **“Secondary Students’ Thoughts: A Scary but Informative Place”**, Mathematics Formative Assessment Conference, Oxford, MS March 2018
- **“When Students Can See the Structure, They Can See the Math”**, Mathematics Specialist Conference, Oxford, MS November 2017
- **“Make It Count”**, Keynote Speaker, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Madison, MS October 2017
- **“When Students Can See the Structure, They Can See the Math”**, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Madison, MS October 2017

- **“Mathematics Specialist Network in Mississippi”**, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Madison, MS October 2017
- **“Saturday Academy for Math (SA4M): From Conceptualization to Celebration”**, Annual Graduate Student Council Research Symposium, The University of Mississippi, Oxford, MS March 2017
- **“Formative Assessment 101”** with Sarah Wildman, Mathematics Formative Assessment Conference, Oxford, MS February 2017
- **“What is Structure? 101”**, Mississippi NASA Space Grant Consortium Annual Teacher Conference, Oxford, MS January 2017
- **“Catch the Fire and Carry the Flame”**, Keynote Speaker, Mathematics Specialist Conference, Oxford, MS November 2016
- **“Math Specialist Network”**, with Dr. Alice Steimle, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Ellisville, Mississippi October 2016
- **“Connecting the Dots”**, Mathematics Specialist Conference, Oxford, MS February 2016
- **“Saturday Academy for Math (SA4M): From Conceptualization to Celebration”**, Association of Mathematics Teacher Educators (AMTE) Annual Conference, Irvine, California January 2016
- **“Linking Us All Together: Exploring the Growth of a Task”**, Mississippi NASA Space Grant Consortium Annual Teacher Conference, Oxford, MS January 2016
- **“Good, Better, Best: Your Manipulative Choice May Make the Difference”**, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Oxford, MS October 2015
- **“Move Over Cindy, Naomi, and Tyson, There’s a New Model in Town: Modeling with Mathematics”**, Mississippi NASA Space Grant Consortium Annual Teacher Conference, Oxford, MS January 2015

- **“Show Me the Money!”**, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Clinton, MS September 2014
- **“Transforming the Instruction of Transformational Geometry”**, Mississippi Council of Teachers of Mathematics (MCTM) Annual Conference, Clinton, MS September 2014
- **“808s and Heart Rates”**, with Efia Mentuhotep, Mississippi NASA Space Grant Consortium Annual Teacher Conference, Oxford, MS January 2014
- **Keynote Speaker**, OHS Future Educators of America Fall Leadership Conference November 2013
- **“Do You D.I.?”**, Mathematics Specialist Conference, Oxford, MS October 2013
- **“Connecting Professional Development to Practice: Creating an Authentic Classroom Environment”**, with Dr. Julie James and Dr. Sidney Margaret Holbert, Association of Mathematics Teacher Educators, Orlando, FL January 2013

Affiliations/Memberships

- Board of Directors- Oxford School District Foundation
- Mississippi Council of Teachers of Math (MCTM)
- President-elect- Mississippi Mathematics Specialist Network
- Association for Supervision and Curriculum Development (ASCD)
- National Council of Teachers of Mathematics (NCTM)
- Regional Team Leader for Mississippi- National Council of Supervisors of Mathematics (NCSM)
- Associate Journal Editor- National Council of Supervisors of Mathematics (NCSM)

Honors and Awards

- National Council of Supervisors of Mathematics (NCSM) Spotlight Member December 2018
- Student of the Month, School of Education, University of Mississippi August 2013
- Inspirational Teacher Award, Oxford Middle School, Oxford, MS 2013
- T.P. Vinson Educator Award, School of Education, University of Mississippi, Oxford, MS 2011
- Oxford School District Teacher of the Year, Oxford, MS 2010
- Oxford Middle School Teacher of the Year, Oxford, MS 2010
- Outstanding First Year Teacher, Oxford School District, Oxford, MS 2007