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The Common Core State Standards for Mathematics

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Abstract

The Common Core State Standards for Mathematics (CCSSM) was published in 2010 and includes a complete collection of standards that are published and reviewed as a 'common core' in which math skills have been extensively adopted. The recommendations provided have been entirely or partially adapted by more than 47 states of the US. Authorities have commited and incredible amount of time, money and resources in creating these new standards and additional effort will be required to implement these standards The new math standards address two established issues in US education, the ordinary quality of mathematics learning and equal opportunity in U.S. schools. It is a fact that deprived students are most likely to have inexperienced or under qualified teachers, and children from impoverished families are much less likely to have the same kind of supports or enrichment opportunities than their more fortunate peers. It is important for the authorities to produce and adapt material for the development of children in such a way that it can clearly address the content and practice of math for the CCSSM and this material should be able to give learning and teaching methods which are in line with CCSSM. It is concluded from this research that there are challenges that have emerged for implementation of CCSSM in which basic challenges include issues of quality, equality, challenges for math teachers, and teaching CCSSM to disabled students.

Key words: Educational policy; Common core; CCSSM

Introduction

The Common Core State Standards for Mathematics (CCSSM) was published in 2010 and this includes a complete collection of standards that are published and reviewed as a 'common core' in which mathematics skills have been extensively adopted (Gewertz, 2012). National efforts in the past for enhancing education have been directed by the federal government and have concentrated on organizational structure or resources (Gifford, 2004). The initiative is sponsored by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO) and it supported by different associations and councils, such as the National Council of Teachers of Mathematics (NCTM), the American Council on Education, and the State Higher Education Executive Officers (SHEEO). Forty-three states, the District of Columbia, four territories, and the Department of Defense Education Activity (DoDEA) have adopted the Common Core State Standards. Also Minnesota has adopted the English Language Arts standards but not the Mathematics Standards. The Common Core State Standards in mathematics and language arts, in contrast, were made under the state government's leadership for enhancing the content of teaching (Gewertz, 2012). For creating these new standards, an incredible commitment of time, the authorities have expended money, and human resources and more effort will be required in implementing these standards. The standards were shaped to guarantee that all students graduate from school with the necessary skills and knowledge to achieve in school, profession, and life, regardless of where they live. The Common Core State Standards Initiative mandate that eight principles of mathematical practice be taught:

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning (CCSSI, 2014).

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If the Common Core initiative objectives are realized, nearly every public school student in the US for the first time will be exposed to the same content, particularly in grades 1–8. The new math standards will address two venerable issues in US education, the ordinary quality of mathematics learning and equal opportunity in U.S. schools. To be precise, the Common Core State Standards have the capability to improve both quality and equality in mathematics education (Gifford, 2004).

Challenges for Implementing CCSSM

There is widespread evidence that mathematics education in the US is insufficient and inadequate for the students and that only 26% of 12th grade students are able to reach the threshold of expertise in the mathematics required by National Assessment of Educational Progress (NAEP). The requirement for enhancing learning of mathematics in the US has been the most important driver in efforts made in education reform that include a Common Core initiative (Wiggins, 2011). Even though proper effects of this policy cannot be stated, empirical research suggests reasons for optimism related to the Common Core standards. In a recent study, the possibility that the new mathematics standards would advance student achievement was examined and this study involved three factors (Saunders et. al, 2010). The first factor is comparing the Common Core State Standards in mathematics with the mathematics standards of the countries with the highest mathematics achievement on international assessments. The second is how close each state's previous math standards were to the Common Core standards and the third is to explore whether states with standards similar to Common Core standards did better in mathematics (Saunders et. al, 2010).

In International Mathematics and Science Study (TIMSS), trends established that the mathematics standards of the highest-achieving nations have three main features; rigor, focus, and coherence. The rigorous curriculum covers topics at the suitable grade level; the focused curriculum concentrates on a few key topics at a time while a coherent curriculum holds on to the fundamental logic of mathematics, which moves from simple to more complex topics (Burns, 2013). The Gewertz study compared the sequence and duration of topic coverage across grades in 'A+' standards with the CCSSM after recognizing the common features of the standards of those countries are best on the TIMSS. It was revealed in this comparison that there was an overlap of about 90 percent and if the standards of the world's top-achieving nations are any guide, then the new standards of math are of high quality (Gewertz, 2012).

Comparing the present standards of state mathematics with the Common Core standards revealed wide variation in the quality of state standards and many states will have to implement major changes in which they are implementing their curriculums (Rothman, 2012). Statistical analysis of the relationship between the closeness of a state's standards to the Common Core standards and a state's average performance on the NAEP uncovered a positive relationship between the quality of a state's curriculum standards and the performance of state's 8th grade mathematics. An example is that every state has its own standards and its own assessments and cut scores as well (Wiggins, 2011). The States having low cut scores undervalue the worth of strong standards and once proficiency cut scores are accounted for, there is a statistically significant and positive relationship between the similarity of state standards to the Common Core State Standards and average student achievement. One of the aims of the common assessments currently under development is to establish a common proficiency cut point across states that should decrease the probability that states will devalue the new standards similar to previous standards (Wiggins, 2011).

Most of the debates regarding the Common Core State Standards have given focus on their potential for enhancing the overall quality of U.S. education, but there is not enough attention paid to their capacity to ensure greater equality in content coverage among students (Schmidt & Burroughs, 2012). The inequality of education has been compared with resource inequality that is available to unequal education outcomes on student assessments and poorer school districts. It is a fact that deprived students are more likely to have inexperienced or under-qualified teachers, and children from impoverished homes are much less likely to have the same kind of supports or enrichment opportunities that their luckier peers have. All these inequality aspects are critical for policymakers to address. The education system of the US is prevalent to curricular inequalities, which means that there are inequalities in the opportunity to learn challenging content. When the students are never exposed to a topic, then it is not possible for them to learn it and this issue especially increases in mathematics. The content of mathematics in which students get an opportunity to learn varies across schools, districts, and states (Schmidt & Burroughs, 2012). The state's ongoing variations efficiently invalidate a widespread criticism declaring that since existing state standards have had no apparent effect on student achievement, Common Core standards should not be expected to have an effect either (Chen & Wang-ting, 2009). It is assumed in this claim

that the content, which is taught at a particular grade in any given year, is basically the same in any classroom in the state. The chance for students to learn will be based on what community they live in and what school they attend. It is a fact that mathematics content, which is offered in low-income districts, is more similar to low-income districts in other states as compared to middle and high-income districts in a similar state (Chen & Wang-ting, 2009).

There are a number of mathematics teachers who are teaching students at a level of low grades and high grades. It has been suggested in the findings that when there is full implementation of the new standards, then there are numerous teachers of math that can face a high shift to what they will teach to the students (McNeil, 2009). Schmidt (2012), found out that typical coverage of the topics in common-core standards lags two to three years behind the grades envisioned in the common core and persist longer. For instance, main topics introduced in the 2nd grade in the common standards are currently introduced between the 1st and 3rd grades. The study also indicated that this variance was even wider in middle school and topics that the common core introduces in 6th grade are now introduced between 3rd and 8th grades. The research findings suggest that teachers appear to be reluctant to shift the grade at which topics are taught. Only one-quarter teachers said they would drop a topic if the common standards indicate that it can be taught at another grade level (McNeil, 2009).

Math teachers overwhelmingly supported the standards in responding to surveys and discussing the standards in focus groups that emerged two years ago from a project led by the CCSSO. Out of 10 teachers, 9 teachers reported that they had heard of the standards, and 7 teachers said that they had read them since 90% said they liked the new learning guidelines. Nine out of 10 of the K-6 teachers said that they liked and would teach the standards, but this figure slipped to 85% in grades 7 and 8, and 82% in high school. Approximately 8% of the teachers surveyed in grades 1-3 said they did not like the standards however, they would teach them anyway (Reborn, 2013). Around 90% teachers in grades 4-6 said the same thing. More than 13% of the math teachers in grades 7 and 8 said they did not like the standards but would go ahead and teach them. This figure was more than 16 percent in high school and less than 1% of teachers at all grade levels said they do not like and want to teach the standards. The data suggest that most teachers do not recognize the level of difficulty that they have to face when they will move from former standards to the new standards of their states (Reborn, 2013).

Since few teachers of mathematics working with struggling students are finding ways to adapt their instruction to the common standards, they still need additional training and professional development in the field. According to a teacher, it is difficult to teach this way instead of only teaching algorithms and steps as it forces them to go deeper and teachers have to get better at math in the end (McNeil, 2009). Another teacher said that he feels fortunate that his school switched to a common-core-like math approach several years ago, smoothing the transition by hiring an on-site math coach and providing regular job-embedded professional development. Another teacher noted that he has jumped at every common-core-oriented professional-development opportunity that has come his way, but still feels he needs additional training to break old habits and become more skillful at helping his students adjust to new methodologies (Sawchuk, 2008).

When inequality of education becomes a subject for public discussion, then there is a strong preference to suppose that the inequality is restricted to minority and low-income children (Silver, 2003). But previous data revealed that the greatest variation in opportunity to learn mathematics content was in the middle-income districts because there was greater inconsistency in what topics were covered at what grade level amongst districts. These districts had neither high nor low Socio Economic Status (SES) as compared to more homogenous high and low SES districts. The inequality of opportunity towards learning is a major issue for every student and for the United States as well (Chen & Wang-ting, 2009).

The curricular inequality issue goes much deeper rather than differences among schools or districts and more source of variation in opportunity for learning mathematics is, in fact, between the classrooms (McNeil, 2009). The students who live in the same district, attending similar schools, and enrolled in the similar grade can have very different experiences in the classroom. This issue is apparent in a number of ways and classes with mostly identical course titles and textbooks have different instructional content. The level of teacher preparation as well as teacher expectations for the student will vary. There is also an extensive usage of tracking and it is a process in which students are assigned to classrooms on the basis of perceived ability. When students are assigned to a lower track, they will almost never move up to higher ones. The practice of tracking remains common despite the fact that many scholars, policymakers, and activists have roundly criticized tracking. McNeil mention that different surveys conducted by school administrators and teachers suggested that three-quarters of 8th graders are assigned to mathematics classrooms on the basis of their ability therefore; many students have their long-term academic futures determined for them when they are only 9 or 10 years old (2009). One justification for teaching the CCSSM is that demands for mathematical competence have increased greatly and this is true for

students with moderate and severe disabilities who will face expectations in jobs and daily living. When teaching the CCSSM to students with moderate and severe disabilities, it will be important to incorporate real-life examples in daily instruction (Beckmann & Fuson, 2008).

However, teaching the content-rich CCSSM can seem discouraging as research shows that students with moderate and severe disabilities often lack the most basic of mathematical skills. It was found out in a study that about one quarter of this population could count with one-to-one correspondence to 10 and only a small percentage, 4% to 8%, of this population can apply computational procedures. The CCSSM, in comparison, needs a fifth-grader for resolve real-world issues by using addition and subtraction of fractions, and student in high school not only to examine an association between two quantities, but also make graph as a linear equation (Gewertz, 2012).

There is some recent research suggesting that students with moderate and severe disabilities can learn content aligned with standards of grade level whereas continuing to work on basic numeracy. Some past studies demonstrated that high school students with moderate intellectual disability could learn to solve a linear equation when task analytic instruction and manipulation were used. Another study demonstrated that middle and high school students with moderate and severe intellectual disability can learn a broad range of state standards from the grade level connected with their chronological age if a task analysis, graphic analyzer, and math story were used. A large framework of evidence-based practice was built in these studies in mathematics for students with moderate and severe disabilities that support using systematic instruction procedures such as task analysis and prompt fading (McNeil, 2009).

Pros and Cons of CCSSM

An opportunity is represented in the Common Core State Standards for Mathematics for wider access to accurate educational content having a common set of standards positively promotes higher-quality assessments and textbooks, and makes it easier for students moving between states to fit into their new schools. But, the greater effect of the standards may be that they alter the approach to teaching mathematics as the new math standards offer the possibility of a common curriculum within different schools, districts, and states. The main mission of the Common Core initiative is that teachers will collaborate in classrooms and grades to determine the way in which they will teach math so that there is a clear and logical progression as a student moves through school. If it is implemented efficiently, then the new standards could reduce the inequalities within the state in content instruction (Saunders et. al, 2010).

The fresh math standards allow teachers to expand their teaching and this new focus should shift the teaching of mathematics from a twisted curriculum approach, where too many topics are covered each year and a small number of significant topics are mastered at every grade level. An example is that the Common Core Standards identify focused instruction on fractions in grades 3 to 5 and linear equations in grade 8. Since teachers will have more time to teach every topic, they should be more able to ensure that their students understand the material rather than their students will figure things out afterward. Tracking is discouraged by new math and the Common Core Mathematics Standards are also in direct conflict with the concept of tracking as it insists on common content for all students at each grade level and in every community (Reborn, 2013).

The teachers are not held responsible for new math standards for the poor math performance of the students and it is a fact that the maximum source of variation to learn in the classroom does not mean that teachers are to blame for curricular inequality. Presently, the teachers are flooded with competing signals regarding content to teach and state standards, state assessments, and textbooks provide conflicting guidance and teachers receive neither the preparation nor the support they require to make effective curricular decisions. One of the key objectives of the Common Core movement is easing this situation. The new math standards do not end the autonomy of local schools or teachers and, under the current system, teachers and school districts are expected to decide both the content of instruction and the best means for helping students learn that content. The new standards help schools and teachers focus their efforts on their core competencies and work out the best means for helping students accomplish standards instead of teachers having to spend time inventing which content to teach and in what sequence (Wiggins, 2011). The new standards of math are not part of education reform that is market based and few people advocate that Common Core standards also support a range of other education reform policies. Even though there is no factual contradiction between such reforms and the Common Core State Standards, it would be a mistake to lump them together. The initiative of Common Core is not only to introduce market mechanisms in education, but also to establish premium standards that promote equality of opportunity for the learning of all students (Burns, 2013).

A recent survey was conducted for the Study of Curriculum, which reveals both positive signs and possible pitfalls in efforts to comprehend the new standards. In this survey, more than 12,000 mathematics teachers in the 40 states that had adopted the new math standards were selected. More than 90% of the teachers in this survey said that they liked the idea of having Common Core State Standards for mathematics because these standards provide a clear and consistent understanding of what students are expected to learn. Almost 100 percent of the teachers said they would teach the new math standards. The challenges teachers identified were little different from the educators and they said that lack of supporting curriculum materials and lack of parental support were the main challenges. In a sample of more than 6,000 parents of K-8 students, most viewed math as the most important subject for their children and nearly 70% thought that the Common Core State Standards for mathematics was a good idea. More than 90% endorsed the idea that math is important for the success of their children and that there children should take math every school year, including all four years in high school (Gewertz, 2012).

Few areas of concern were also suggested in the survey and teachers may not have a clear understanding of the new math standards or the way in which new standards are different from the status quo. Many teachers believe that the new standards may require them to add new topics to their current math curriculum and instead, the Common Core standards identify greater focus on fewer topics at every grade level. Teachers should be better prepared for effectively implementing the Common Core State Standards for Mathematics. Less than half of elementary teachers in the survey felt themselves well prepared for teaching math topics of Common Core at their grade level as compared to 60% middle school teachers and 70% high school mathematics teachers (Schmidt & Burroughs, 2012).

Conclusion and Recommendations

Ahtohrities should place more emphasis on CCSSM material and teachers of mathematics should be required to practice so that they can engage in practices of CCSSM and content of CCSSM in an integrated and focused manner. Authorities should emphasize that teachers become experienced with practices and content of CCSSM on priority basis, and time and resources should be allocated for the teachers so that they can reflect and discuss on the progressions of CCSSM standards. The educational authority in the US should also offer an organize developmental program for the teachers, which is focused on particular progression of content standards, and also focus on integrating practices and content of mathematics.

It is important for authorities to produce and adapt material for the development of children in such a way that it can clearly address content and practice of math for the CCSSM and this material should be able to give learning and teaching images which are in line with CCSSM. The objects, such as lesson plans and tasks, should also be collected from the teachers, which emphasize on the CCSSM aspects, which can be domestically used to connect with the practices of teachers. The authors of development material should create directories, which can recognize ways in which practices and content of math from CCSSM are made important in present materials. The funding agencies should also allocate a specific fund so that the educational authorities operating in different states of the US can further enhance activities of CCSSM.

It should be determined whether experiences of professional development that have been selected for the CCSSM support are able to concentrate on significant characteristics of efficient development and only options of professional development should be selected which are related with known features that maintain teacher math learning. The funding agencies should allocate funds for performing research regarding effective use of CCSSM with the students so that these standards can further be strengthened and knowledge can be utilized to improve standards in the future. The CCSSM programs can give a coherent and consistent set of experiences therefore, it is important to build rational and coherent CCSSM programs. The leaders of the schools should communicate and clarify priorities of school improvement in line with CCSSM, which will help to design rational CCSSM programs. The State authorities should select development opportunities for the teachers which can be sustained for a period and which can help these authorities to build rational CCSSM programs.

State authorities should consider the teaching and learning expertise of math both in and outside the current educational system. The facilitators of math should be prepared and supported by the authorities who are working in the current educational system and who have ability to teach students according to CCSSM. Expertise and knowledge should be recognized so that it can be used to facilitate development of students and they can be prepared regarding the standards of mathematics. The stakeholders should be educated by State authorities in such a way that they can standardize completion in developing CCSSM so that they can further

educate other people in order to meet their goals. State authorities should also educate State policymakers as well as legislators regarding CCSSM because it will help them to implement this system in more organized and appropriate manner. If stakeholders are not satisfied with CCSSM, then it is evident that it will create problems for educational leaders to implement it in the schools.

State authorities should make sure that CCSSM is accessed on a regular basis so the formative information can be provided which will help in improving and establishing the effectiveness of CCSSM programs. School leaders should use provisional assessments related to CCSSM for informing teachers regarding needed adaptation. Few professional programs of developing teachers should also be selected by the State, which has precise objectives for enhancing and implementing CCSSM in an organized manner. When there is consistent CCSSM access, then the authorities will be able to understand the way CCSSM is working for the students as well as the teachers. Moreover, if authorities do not access CCSSM on consistent basis and no appropriate feedback is taken from the teachers and students, then it is a fact that CCSSM cannot be further improved in the future.

It has been concluded from this research that Common Core State Standards for Mathematics (CCSSM) was designed for the students so that their overall ability to comprehend and recognize mathematics can be enhanced. The US authorities have expended a lot of capital, time, and human resources in order to meet these standards. However, there are some challenges that have emerged for implementation of CCSSM in which some of the basic challenges include issues of quality, equality, and challenges for math teachers and teaching CCSSM to disabled students.

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