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Trends in Pennsylvania 8th and 11th Grade Student Test Performance Since the Common Core Implementation

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by

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Abstract

Trends in Pennsylvania 8th and 11th Grade Student Test Performance Since the Common Core Implementation

The purpose of this research study was to explore trends in student test performance since the Common Core implementation in 8th and 11th grades in Pennsylvania. After receiving failing grades for the Pennsylvania State Standards when compared with other states, legislators adopted the Pennsylvania Common Core Standards in 2013. Much of this decision was grounded in the belief that with new standards, Pennsylvania student test scores would move from 35-45% proficiency levels in Reading and Math to 100% proficiency (Hamilton, 2007).

Research questions focused on the trends in students' scores over time as reported by the PSSA and Keystone exams, administered each year. A quantitative analysis was performed with repeated measures for 8th grade from 2015-2017 and for 11th grade from 2013-2017 looking for statistical significance in the general population, the "Historically Underperforming" population, and in locales- urban, suburban, rural, and towns. Where significance was found, correlations were run between the covariates of Black/Hispanic and poor student populations.

Results showed significant growth in 8th grade math scores over time, with negative correlations from race and poverty which also affected 8th grade ELA scores in the "Historically Underperforming" population. Eleventh grade scores showed no significance except negative correlations associated with race in the "Historically Underperforming" reading students. When drilling down to locales, significance was found in growth made by city and rural schools in 8th grade math and short term gains in 11th grade math.

Key Words: COMMON CORE, STATE OF PENNSYLVANIA, PSSA, KEYSTONE

Dedication

"She believed she could, therefore she did." I have been blessed to have been raised in a family where faith and trust in God is at the forefront of everything we do. As a young girl, I attended my father's graduation from Villanova University alongside my eight siblings and mother. My father, Joseph Henry Torchiana Jr., instilled in me the belief that I could accomplish anything if I worked hard enough, which leads me to this piece of work. I am eternally grateful for my husband, Joe's sacrificial love, and for his support and guidance, without which I would not be writing this dedication. I am also grateful to my six children who have offered their cheers when I needed them, and to whom I offer this thought: Grit and determination opens every window you seek. Never give up!

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Chapter 1. Introduction

Since Terrel Bell, Secretary of Education under President Ronald Reagan, presented *A Nation at Risk: The Imperative for Educational Reform*, the move toward Common Core Standards has been constant. Full of criticism for the public school system in the United States, with its declining test scores, short school week, and quality of teachers, the report outraged many groups, the least of which was taxpayers. In the Fourteenth Annual Gallup Poll of the Publics Attitudes Toward the Public Schools (1982) lack of proper financial support [was seen as] a major problem for schools. Twenty-two percent of those interviewed said it was one of the biggest problems in their communities, a rise of 10% from the previous year (edweek.org). Seven years later, the next administration, under George H. W. Bush, diverted its attention to governors across the nation in a summit from which a list of educational reforms was established all of which focused for the first time on results rather than processes (gov.info.library). Between 1987 and 1997, the National Assessment Governing Board developed student achievement benchmarks in reading, writing, mathematics, civics, history, and geography. These benchmarks established mastery levels for students and expected improvement measures for each year. In 2001, with the adoption of the No Child Left Behind Act, that board was dissolved, and proficiency levels on assessments were developed for testing students in grades three to eight, to be repeated once again in high school.

Bellanca (2010) states that in response to the No Child Left Behind Act of 2001, educators and leaders realized that “at such times, we can no longer just carry on as before: we must consider whether fundamental changes may be in order” (p. 39). The country’s leaders began searching for ways to align curriculum standards and assessments across states, and as a result, state boards of education looked to the Common Core to fulfill this need. In 2008, the

National Governors Association, the Council of Chief State School Officers, and Achieve, Inc., created a template of benchmarks to drive student achievement based on the educational programs/systems of countries with highly successful students. Their five action plan steps and the recommendations from the report that recommended federal financial support were as follows:

> Action 1: Upgrade state standards by adopting a common core of internationally benchmarked standards in math and language arts for grades K-12 to ensure that students are equipped with the necessary knowledge and skills to be globally competitive.
>
> Action 2: Leverage states' collective influence to ensure that textbooks, digital media, curricula, and assessments are aligned to internationally benchmarked standards and draw on lessons from high performing nations and states.
>
> Action 3: Revise state policies for recruiting, preparing, developing, and supporting teachers and school leaders to reflect the human capital practices of top-performing nations and states around the world.
>
> Action 4: Hold schools and systems accountable through monitoring, interventions and support to ensure consistently high performance, drawing upon international best practices.
>
> Action 5: Measure state-level education performance globally by examining student achievement and attainment in an international context to ensure that, over time, students are receiving the education they need to compete in the 21st century economy.

Of greatest concern to the association was that what America lacked in the number of students as compared to other countries, it must make up for in the quality of the student coming out of its schools. This could only be accomplished with rigorous standards in all subjects. The tool to drive this incentive would be a Common Core Standard Initiative.

In order to gain states' commitment to this educational road map, President Obama established the American Recovery and Reinvestment Act, better known as the "Race to the Top Grant," a $4.35 billion federal investment in school reform. Its purpose was to incentivize states to create strategies for improving student outcomes in specific areas of reform while also rewarding states who took the initiative in doing so. Specific areas of reform were as follows:

• Adopting internationally benchmarked standards and assessments to prepare students for success in college and the workplace;

• Recruiting, developing, retaining, and rewarding effective teachers and principals, especially where they were needed most;

• Building data systems that measure student success and inform teachers and principals about how they can improve instruction; and

• Turning around our lowest-achieving schools. (www2.ed.gov)

States were encouraged to apply for a grant in one of two rounds of competition that ran from January to April, 2010, and from June to September, 2010. States who applied for the grant were scored on the following criteria:

Table 1. Phase 1 and Phase 2 Race to the Top Point Allocation

Dividing Up the Points (Table 1)

Applications in Phase 1 and Phase 2 of Race to the Top were evaluated on education policy priorities spanning six major scoring categories and one competitive preference category.

Policy Category	Category Description	Point Allocation
State Success Factors	Articulating State's education reform agenda and LEA [local education agency] participation; building strong statewide capacity to implement, scale up, and sustain proposed claims; demonstrating significant progress in raising achievement and closing gaps; advancing standards and assessments.	125 points
Standards and Assessments	Developing and adopting common core standards; developing and implementing common, high-quality assessments; supporting the transition to enhanced standards and high-quality assessments.	70 points
Data Systems to Support Instruction	Fully implementing a statewide longitudinal data system; accessing and using state data; using data to improve instruction.	47 points
Great Teachers and Leaders	Providing high-quality pathways for aspiring teachers and principals; improving teacher and principal effectiveness based on performance; ensuring equitable distribution of effective teachers and principals; improving the effectiveness of teacher and principal preparation programs; providing effective support to teachers and principals.	138 points
Turning around the Lowest-Achieving Schools	Intervening in the lowest-achieving schools and LEAs; turning around the lowest-achieving schools; demonstrating other significant reform conditions.	50 points
General	Making education funding a priority; ensuring successful conditions for high-performing charter schools and other innovative schools.	55 points
Competitive Preference Priority 2	Offering a rigorous course of study in mathematics, sciences, technology, and engineering (STEM); cooperating with industry experts, museums, universities, and other STEM-capable community partners to provide support to educators in integrating STEM content; providing applied student learning opportunities with particular emphasis on underrepresented groups and girls/women.	15 points

NOTE: Competitive Priorities 1, 3, 4, and 5 did not award points.

SOURCE: U.S. Department of Education

Only Tennessee and Delaware were awarded grants in the first phase; two of 40 states that had applied. During the second phase of grant allocation, 35 states either reapplied or applied for the first time, ten of which were selected to receive funding. At that point, all funds originally designated for the Race to the Top were depleted (educationnext.org). At the request of President Obama, Congress appropriated an additional $230 million dollars to offer grants for states who had applied in Phase 2 but were rejected. The sum of funding allocated in Phase 3 was much lower than the previous two phases (educationnext.org). Winning states entered into a strict monitoring process. However, perhaps the most defining aspect of the grant was its demand for the "development and adoption of common core standards" (www2.ed.gov).

Driven by this requirement, the Common Core Curriculum was developed with two intentions: to prepare students for college and their careers, and to establish sound K-12 educational standards. The National Governors Association (NGA) and the Council Chief State School Officers (CCSSO) elicited input from various constituencies during this developmental period. According to the Common Core website, that input influenced the final version of the standards that were adopted. Since each state had its own unique system anomalies specific to themselves, individual states chose to adopt the standards in their entirety or to adopt a version that better suited their students.

The Common Core State Standards website suggested that the development of a new assessment tool to measure students' success in accessing and understanding the new standards was key to the success of this initiative (www.corestandards.org). In response, many states adopted PARCC or TerraNova exams. However, in PA, the Pennsylvania System of School Assessment (PSSA) was developed and administered in commonwealth classrooms in grades three through eight, in English Language Arts and mathematics. When in 2010, Pennsylvania joined 40 other states in adopting the Common Core State Standards, it did so in part to address the failing grade that the Pennsylvania Standards had been given when compared to other states (Carmichael et al., 2010). Prior to the Common Core Initiative, Pennsylvania reported scores for 8^{th} and 11^{th} grade Black, Hispanic, and Economically Disadvantaged students as below basic in mathematics and reading, with averages in the range of 21%, 22%, and 19% respectively.

Pennsylvania completed its full implementation of the PA Core Standards in late 2013, and the 2015 PSSA marked the first time the assessment was fully-aligned to the standards (education.pa.gov). The PSSA counterpart for high school students, developed in 2012-2013, are the Keystone Exams, which are assessments given at the end of the 11th grade to assess proficiency in the subject areas of Algebra I, Algebra II, Geometry, Literature and English Composition, and are one part of Pennsylvania's new system of high school graduation requirements. The Keystone Exams are intended to help school districts to evaluate student progress and, where necessary, attend to areas of need to help students meet proficiency in state standards (education.pa.gov). The effect that the Common Core has had on student achievement needs to be examined.

Several studies have been completed since the adoption of the Common Core State Standards that evaluate the Common Core from various perspectives. Some have focused on perceptions of administrators, while others have concerned teachers' perceptions. A 2014 study found that teachers did not believe the standards would be adopted nationwide, nor would they persist. Most believed the new standards were merely another round of mandates that would not take hold (Kannenberg, 2014).

Sanchez, in her study completed in 2016 sought to better understand teachers' perceptions about the Common Core. Her research confirmed what the developers of these new standards had sought to achieve: the standards benefited students because of the questions structured to elicit interpretations of real-world scenarios in which students were expected to explain their answers, proving they were critical thinkers and problem solvers. Similarly, a study completed by Taylor in 2017, found teachers to be cognizant of the fact that the Common Core Standards were appropriate for students, regardless of the growing belief that they were designed for the more successful students, and challenged students would be not be able to gain proficiency in them. Furthermore, Taylor's study reported some teachers' perception that the Common Core Standards were more rigorous than some previous standards, while others perceived that compared to some state standards, there was little difference in content mastery objectives (p. 72, 74). In a limited study by Loading (2015) on Common Core State Standards (CCSS) and students with disabilities, teachers reported their belief that the Common Core improved their instructional practices by requiring them to differentiate more and to provide more scaffolding to students. (pp. 78-79). In many studies, teachers shared concerns about the implementation, district support, and states' expectations.

Teachers in Kannenberg's 2014 study shared concerns over the shift from the traditional teacher-centered classroom to a student-centered classroom, which was a novel idea to many teachers (p. 94). In this new setting, teachers were challenged with a much more robust classroom, where passive learning was no longer acceptable. With this change, some adjustments to classroom management were necessary (p. 79, 66). Furthermore, teachers cautioned that some students were not ready for the rigor presented by the new standards, and that the Common Core seemed to be designed more for students who were preparing for college (Taylor, 2017, p. 77).

Concerning the implementation itself, teachers had different experiences. In California, Sanchez (2016) found teachers to be grateful for the early adoption of the new standards. Most teachers in her study found the district leaders had done an acceptable job of explaining the CCSS, even though those same leaders clearly may not have understood the standards themselves (p. 75). Despite their own lack of knowledge, the California district leaderships improved teachers' confidence in themselves by providing professional development training, professional learning communities, peer collaboration, and the use of instructional coaches for guidance (p. 76). However, teachers in Southern Mississippi indicated their district had not provided what they considered to be adequate professional development training to assist them in implementing the new standards (Smith, 2014, p. 65). For those fortunate enough to be well-trained, they found the positive collaborative effort offered some confidence that teachers would be successful in this important work. However, once the training was over, many teachers felt they were left with too little time to develop lesson plans and to find the necessary resources (p. 77). This was a common complaint among various studies, with teachers reporting to have felt "left on [their] own" to find resources from neighboring districts or online (Sanchez, 2016; Smith, 2014; Kannenberg, 2014). Studies completed examining administrators' perceptions further illuminate the level of preparedness in the adoption.

Administrators in Kannenberg's study (2014) considered the Common Core Standards to be beneficial, stating that the shift from the historically accepted "teacher as sage on the stage" model to a more "coaching" role for teachers would benefit students (p. 96). They were also excited about the problem-solving aspect of the CCSS, as it is required as the basis of all mathematics instruction (p. 95). Administrators cautioned that districts should deliver a common message, with sufficient time to train teachers, offer additional planning time, and send clear and concise messaging to parents (p. 86). Similarly, Squires found in her 2015 study that administrators' personal lack of understanding was the cause of increasing debate about the viability of the standards (p. 158). Their lack of understanding often trickled down to the teachers, whose lack of confidence – specifically in teaching the special needs and English Language Leaners (ELL) community – resulted in those populations not getting the appropriate support they required (p 168). What Squire's study brought to the forefront was the absolute necessity of transparency, authenticity, and constant and clear communication as the implementation unfolded (p. 173).

The Brown Center Report on Education cautioned readers and researchers that in order to determine whether a policy has worked, one must know when it began (February, 2015, p. 19). Different states adopted the Common Core at different times and with different levels of professional development and materials. In its 2011 survey, the Brown Center developed an implementation index that evaluated states' implementation on a scale of non-adopters to strong adopters, the latter being determined by the use of three strategies: professional development, new instructional materials, and membership in a testing consortium. Furthermore, strong adaptors were committed to completing implementation by 2012-2013. Nineteen states were considered to be "strong," 27 were medium and four were non-adopters (February 2015, p. 21). In the same report, 4th grade reading test scores were studied to determine whether any relevant changes had been reported among the three groups. From 2009-2013, the strong adopters' students' scores increased slightly, while the medium adopters performed as well as or better than strong implementers over the four-year period of 2009-2013 (p. 22). A follow-up study on 8th grade mathematics scores of strong adopters in 2014 showed a 1.27% increase in scores; still minimal, but favorable. According to the report, a threshold of 0.20 SD (five times larger than the increased mathematics scores) was the minimum size for test score change to be worthy of any attention (p. 23).

A study of self-reports (highly subjective), completed by senior staff members and submitted to The Council of the Great City Schools, a coalition of 67 of the nation's largest urban public school systems, was conducted using results from 2013-2014 test scores to evaluate year three progress in the CCSS' implementation. The survey was sent to curriculum directors, research directors, ELL directors, special education directors, and communication directors. In any given district, schools from the same district responded quite differently to the same questions, evidencing a variety of perceptions within districts. An overall evaluation of the implementation via survey rated only 40% of teachers and principals as either "prepared" or "very prepared" to implement the CCSS, and that district progress in implementing the CCSS was either "good" or "very good" (p. 1). In terms of measuring the implementation itself, the majority of respondents found their district had been excellent in providing necessary data to administrators (p. 2). It is important to note that 75% of respondents stated that informal observations rose 25% in one year, and found improvement in the quality of student work being produced (p. 10). The increase in informal observations replacing formal observations seemed to be more suitable to the teacher accountability measures put in place as part of the Common Core Implementation (p. 41). Of grave concern was the perceived lack of mathematics instructional materials necessary to teach the CCSS; 75% of respondents reported the deficiency in ongoing professional development, while only 40% felt teachers understood how the mathematics standards progressed across grade levels (p. 21). According to the report, overall, districts instituted efficient planning cycles for the Common Core implementation, but much more was required of them before they could witness the outcomes expected, particularly in the country's largest urban schools (p. 43).

Few studies have examined the Common Core Standards' effect on student outcomes quantitatively. One such study, conducted by Hamilton (2007) in West Tennessee, looked for statistically significant differences in mathematics scores in the ACT exams in 2013 and 2014, before and after Common Core implementation. In the first test, using a samples t-test, Hamilton compared the ACT mathematics scores of 5,659 students from 2013 to those of 8,083 students from 2014. Hamilton found statistical significance in increased test scores of 13,742 11th graders on the ACT exam when race was added as an independent variable, particularly in Hispanic students' scores, who scored significantly higher. However, scores of African American and White students showed no significant change. In addition, Hamilton found no statistical significance when accounting for gender in scores from 2013 and 2014 ACT tests. Finally, when he combined CCSS, race and gender as independent variables, he determined there was not any significant interaction among the three variables.

A study that compares scores across Pennsylvania before and after the CCSS' implementation, not only in urban, but also suburban, town and rural settings, will help to test claims that the Common Core State Standards address the poor scores historically reported in reading and mathematics across the state.

Statement of Problem

The governors of the United States with support of several presidents concluded that to ensure American students had a place in the global economy in future years, dramatic changes had to be made to our education system. Citing a reduction in blue-collar jobs by almost 20% between 1969 and 1999, the U.S. recognized students must be prepared in the global economy with more education and the ability to complete more sophisticated tasks. These tasks, which include problem-solving skills, higher order thinking, and the ability to innovate, were thought to define the workforce of the future. In the last 30 years, programs have been adopted to move American students in that direction, which include standard-based reforms, benchmarks for mastery of content, and standardized tests to gauge that mastery. Despite those efforts, according to the National Governor's Association's interpretation of the 2006 PISA scores, students in 22 other nations outperformed American students. Furthermore, American students began to lag behind the students of nations whom they had historically outperformed, i.e., in South Korea, Brazil, Denmark, Estonia, Finland, Singapore, and Taiwan (Craig, 2008, p. 16). With the 2010 Race to the Top federal grants requiring the development and adoption of common core standards, states quickly transitioned to the CCSS (educationnext.com).

The belief took hold among proponents of the CCSS, that if the standards were implemented as they should be, American students would achieve their long-term goals, placing the U.S. back in the lead internationally in standardized testing (Linn, 2014, p. 35). By 2014, 30 states were using a Common Core State Standards-aligned curriculum, 14 of which chose the new PARCC exams and 21 of which chose the SBAC exams to measure their success. Twenty states reported challenges with a lack of sufficient funding, while another 26 encountered issues in finding the necessary resources. Only nine states reported to have sufficient funding and resources. In 2013 and 2014, five states passed legislation to adopt different standards: Indiana, North Carolina, Oklahoma, and South Carolina (ncsl.org, p. 7).

Benchmarking is important in the evaluation of the success of the CCSS. The International Benchmarking Advisory Group has stated that if the U.S. fulfills its commitment to increasing student excellence in mathematics and science through 2025, the country's GDP could rise by as much as 36% over the next 75 years (Jerald, 2008). Furthermore, the group strongly recommends the U.S. should not delay its efforts to develop skilled workers with all the necessary skills to compete internationally (Jerald, 2008).

In Pennsylvania, the legislature believed that by implementing the Common Core Standards, benchmarked mathematics and reading scores in the state – which historically reported proficiency levels of 35-40% – would drastically increase. Furthermore, they adopted a common test to be administered across the state to calculate these proficiency levels. However, to date, they have not studied the veracity of the claim that the CCSS would resolve the state's underperformance problems.

If the state of Pennsylvania places all its faith in the Common Core Standards as the solution to underperformance in schools, then follow-up studies are necessary to determine whether the implementation of the standards has had such an effect. The problem this study addresses is specifically whether or not student outcomes across Pennsylvania were improved by the implementation of the CCSS, as measured by PSSA and Keystone scores. The results of the study will provide information to educators in rural, urban, town, and suburban communities across the state on how their students' scores compare. Based on that outcome, administrators and school districts might revisit their own implementations and the instructional programs they use to ensure students are provided with the best opportunities to succeed.

Purpose of the Study

The purpose of this study was to determine what influence the CCSS have had on student achievement, as determined by PSSA and High School Keystone Exams in grades 8 and 11 in mathematics and English Language Arts at the school level in all urban, suburban, town, and rural districts across the state. Additionally, this study analyzed the trend in exam pass rates since the Common Core Standards' adoption as measured on the PSSA and High School Keystone Exams in grades 8 and 11 in mathematics and English Language Arts/Reading.

Since the creation and ultimate adoption of the CCSS, numerous studies have been conducted about the standards themselves and their implementation, which has provided extensive discourse for and against any value added in the adoption of the CCSS. However, little research has been completed to date that explores the relationship between the standards and student performance using state testing data.

Significance of the Study

The results of this study benefit all stakeholders in public school mathematics and ELA education, particularly in the state of Pennsylvania, by allowing them to better understand how the implementation of the CCSS has affected student scores on standardized tests. As policy makers and districts reflect on their own implementation of the standards, they may recognize that adherence to the state's planned implementation or any divergence from that plan may have affected student outcomes. School districts have taken steps to align their schools' curricula with the CCSS and by analyzing the relationship between the implementation and the PSSA and Keystone Exams, they can better gauge where more attention might be warranted.

Since analysis suggests that a successful implementation of the Common Core Standards would yield significant performance gains (including on PISA Exams), this study's results will contribute additional knowledge with regard to the validity of such claims (OECD, 2013). The findings will provide information that might encourage schools in strengthening standards alignment, professional development, and overall instructional programs, recognizing that if standards are not implemented well in particular schools, districts or states, then failure or ineffectiveness as determined by standardized tests should not be blamed on the standards (Heck, Weiss, and Pasley, 2011).

As school districts continue to face scrutiny over test scores, especially among the underperforming students, research that assists administrators in understanding the effects of the Common Core on test scores is valuable.

Research Questions

Research Question 1: How does the trend in student test performance as measured by the PSSA and Keystone Exams in grades 8 and 11 mathematics and ELA/English vary over time for all students?

Research Question 2: How does the trend in student test performance as measured by the PSSA and Keystone Exams in grades 8 and 11 mathematics and ELA/English vary over time for the “Historically Underperforming Students”?

Research Question 3: How does the trend in student test scores as measured by PSSA and Keystone Exams in grades 8 and 11 mathematics and ELA/English from 2012 to 2017 vary based on the type of district; urban, suburban, town and rural?

Independent Variables

Using a one-way repeated measure ANOVA test, the researcher observed school PSSA and Keystone Exams in districts across the state since the Common Core Standards Implementation. She then focused on other independent variables, including school communities (rural, urban, town, and suburban) and Historically Underperforming Student status. Student and school information was retrieved from pa.edu.org.

Dependent Variables

The dependent variables for this study were the Pennsylvania System of School Assessment (PSSA) and the Pennsylvania Keystone Exams. The Pennsylvania Department of Education data files were retrieved from pa.edu.org.

Limitations

This study was conducted using 50% randomly selected elementary and high schools across the state of Pennsylvania that have 8^{th} and/or 11^{th} grades. The results of this study may not accurately represent a realistic perspective of all school districts in the state of Pennsylvania.

A further limitation of this study was its assumption that schools in districts across the state of Pennsylvania followed the Common Core Curriculum implementation map and timeline as directed by the education office of the state.

Delimitations

A delimitation of this study was that it was restricted to grades 8 and 11 across the state, as the student outcomes on report cards and on standardized testing at grade 8 determine high school placement for 9^{th} grade, and at grade 11 they determine college placement.

Definition of Terms

Common Core Standards: The Common Core is a set of high-quality academic standards in mathematics and English language arts/literacy (ELA). These learning goals outline what a student should know and be able to do at the end of each grade.

Pennsylvania Standards: The Pennsylvania academic standards are benchmark measures that define what students should know and be able to do at specified grade levels, beginning in grade

3. As such, they must be used as the basis for curricula, instruction and assessment in Pennsylvania's public schools. The standards are a part of the Chapter 4 regulations (Academic Standards and Assessment).

No Child Left Behind (NCLB): President George W. Bush signed this legislation into law on January 8, 2002. NCLB mandated states must meet the goal of 100% proficiency for all students in ELA and mathematics by the year 2014 (Darnell, 2015).

Pennsylvania System of School Assessment (PSSA): The Pennsylvania System of School Assessment (PSSA) is a standardized test administered to public schools in the state of Pennsylvania. Students in grades 3-8 are assessed in ELA skills and mathematics.

Keystone Exams: The Keystone Exams are standardized tests administered to the public schools of Pennsylvania. Since 2012-2013, the General Keystone Knowledge Test in Literature, Biology, and Algebra I VHS Exams have been available.

Historically Underperforming Students: "Historically Underperforming Students" are defined as a non-duplicated count of students with disabilities, economically disadvantaged students, and English Language Learners who are enrolled for a full academic year and take the PSSA/PASA/Keystone Exams. If a student is in more than one of the individual groups (e.g., special education and English Language Learner), she/he is only included in the Historically Underperforming Student group once; a non-duplicated count. This group is not a cohort but rather students who are currently in the building and meet the definition during the reported year (http://paschoolperformance.org/FAQ).

Community Designations as Reported by Pennsylvania Partnership for Children:

"The Center for Rural Pennsylvania's definition of rural and urban is based on population density. Population density is calculated by dividing the total population of a specific area by the total number of square land miles of that area. Locale codes are assigned to each school, and a district's status is determined by the location of the plurality of schools. This is still an imperfect system, but with eight separate locale codes that could be assigned to each school, it yields reasonably good results. Therefore, the locale codes were used as a starting point in designating districts and then adjusted as follows":

- **City (Urban)**: (central city of CMSA or MSA, with at least 250,000 people), 2 (central city of CMSA or MSA but not a large city), and 5 (place not within CMSA or MSA but with at least 25,000 people and characterized as urban). This yielded 22 districts. Suburban districts with at least 2,500 people per square mile and aid ratios in excess of 0.6500 were re-designated as urban.
- **Rural**: Generally, areas designated as rural have populations between 2,500 and 25,000; 6 (a place not within CMSA or SMA with a population between 2,500 and 25,000), 7 (a place not within CMSA or SMA and designated as rural), and 8 (a place within CMSA or MSA and designated as rural). This yielded 248 districts. Suburban districts with fewer than 350 people per square mile and aid ratios in excess of 0.6500 were re-designated as rural.
- **Suburban:** 3 (a place within CMSA or MSA of a large central city) and 4 (a place within CMSA or MSA of a mid-sized central city). This yielded 231 districts. Thus, some districts that are designated as rural or urban actually have the character of suburban

communities in terms of local wealth. Therefore, urban or rural districts with aid ratios below 0.3500 were re-designated as suburban.

- **Town:** An incorporated place or census-designated place with a population equal to or greater than 25,000 (large) or between 2,500 and 25,000 (small) and located outside a Metropolitan Core Based Statistical Area (CBSA) or inside a Micropolitan CBSA.

Organization

The remainder of this dissertation is organized in the following manner. Chapter II provides a literature review of pertinent materials that address the CCSS, the PA State Standards, NCLB, the importance of critical thinking skills in today's global economy; and studies conducted that compare PA State Standards with Common Core Standards. Chapter III details the research methodology, Chapter IV is a presentation of the data collected in the study, and Chapter V summarizes the findings and offers some recommendations for future studies.

Chapter II

Significance of the Literature

A brief search on Seton Hall's databases, using only Ebsco Host, delivers 2,369 articles and studies completed on the CCSS since 2013. The same search on Google Scholar delivers 18,300 articles for the same time period. This alone emphasizes the public and scholarly attention that has been devoted to the CCSS. One could argue that their adoption is one of the most controversial topics in education since 2013. Many promises were made by proponents of the standards, one of which was that the new standards would improve student achievement in reading and mathematics. This promise drove Pennsylvania State Legislators to mandate the adoption of the CCSS. The purpose of this study is to determine whether student outcomes, as determined by PSSA and Keystone Exams in ELA/reading and mathematics in grades 8 and 11, have changed since the adoption of the Common Core Standards. These grades were chosen because they are critical school years in the state of PA, as outcomes of these grades are heavily influential in determining placement/acceptance in high schools and colleges. The literature review that follows examines research and pertinent articles about the creation of educational standards, their adoption in the state of Pennsylvania, and the evolution and transition to the CCSS. This review assesses the motives behind the adoption of the CCSS in PA and the expected outcomes of their use. Through this research and analysis of student scores before and throughout the implementation of the Common Core, a primary goal was to determine whether replacing the PA State Standards with the Common Core Standards increased students' acquisition of reading and mathematics skills. A further goal was to determine whether the implementation of the Common Core helped "Historically Underperforming" Students to improve, thus eliminating that designation. The literature review consists of the following sections: The Road to the CCSS, The Pennsylvania State Standards, and the Common Core Standards' adoption and implementation.

Literature Search Procedures

The researcher used several methods of data collection for this study. She began with the literature that concerned the introduction of the Common Core Standards, particularly the Center on Education Policy Study of 2014, and then reviewed some of their references, and the sources of those that followed. This enabled her to develop a broad scope of data from various publications, books, and articles. When questions arose within that research, the researcher used Google Scholar, JSTOR, and the Seton Hall library databases, which included ERIC, ProQuest, and online articles. She also used the dissertation of Byron Darnall (2015) to help guide the writing process.

Inclusion and Exclusion Criteria for the Literature Review

The researcher began with a search of the history of curricula to gain a better sense of what came before and led to the adoption of the PA State Standards and then the CCSS. Articles, studies, or books that helped to develop that timeline were of particular interest. She then included further research into the two different sets of standards themselves, to understand why one was perceived as better than the other. In her search for studies already completed on the Common Core, the researcher quickly determined that all but one was concerned with the implementation of the standards; particularly with regard to the perceptions surrounding their adoption, the challenges they represented, and the progress of the implementation. To date, despite extensive research, the researcher found very few studies that concerned the measurable progress of students after school districts had fully implemented the standards in their curricula.

The Road to the Common Core

As early as the 1930s, educators began looking at what schools were doing to provide students with a balanced education. An eight-year study conducted by 30 high schools began by defining the primary purpose of education. Most determined it to be “to lead our young people to understand, to appreciate, and to live the kind of life for which we as a people have been striving throughout history” (Aikin, 1942, p. 18). These schools quickly began to understand that students learned material and information that added meaning to their lives much more efficiently than information that had little or no meaning to them. Therefore, the delivery of instruction had to change to meet the changing culture. In 1933, changes were made that brought teachers together in planning, in the hope that by modeling intentional learning, students would learn that cross curricular knowledge exists and has purpose. Educators began to understand that the curricula must be diversified to meet the ever-changing world of the 1930s, and that doing so would better prepare students to attend college, an idea not prevalent before this time. The belief among researchers and legislators that schools and the outside world must work together in preparing their students for real world experiences began to take hold. As a result of the study, a new criterion was formed to address the function of the school, and was defined as follows:

> The chief function of the school in a democracy is to conserve and improve the democratic way of life by making the life concerns of pupils the central theme of the curriculum; recognizing that individual concerns and social concerns are interdependent; making functional guidance an integral part of all educational activities; evaluating the school program in terms of the personal and social growth of the pupils; organizing the school program to reveal the relationship of learning; and providing a close, direct, working relationship with the community (Aikin, 1942, pp. 33-34).

These ideas were groundbreaking at the time, and over the eight-year study were reevaluated and modified as necessary, while teachers and principals "continued to study, plan, work, and evaluate co-operatively" (Aikin, 1942, p. 34). From this study grew a belief that education can have a very serious effect on the lives of students, even outside the classroom, by increasing their sense of self-worth, helping to build their civic responsibility, and encouraging their intellectual stimulation. From this study, the term, "Core Subjects" was born.

Between the 1930s and 1960s, testing was almost eliminated, but it returned in the 1960s when it became the "arms supplier for a new generation of school reformers" (Resnick, 1980). Much of this return was a result of the Civil Rights Movement, as equity among students and schools came to the forefront. By 1972, because of *Robinson v. Cahill,* states such as New Jersey began to implement student performance standards. Since then, 50 states have implemented measurements for competency testing in their schools. Local school districts "were no longer the exclusive agents of the evaluation process. The state and federal governments began to share these responsibilities, including creating policy and mandates, but without the necessary funding to make them work" (Resnick, 1980). It is important to note that between 1930 and 1980, state funding of schools rose by 37% while the traditional local funding decreased; the only increase was a minimal 10% in federal funding (Resnick, 1980). So, while a movement began to increase the quality and outcomes of the educational system, no additional funding was supplied to support those efforts. In 1980, there was an increasing belief that "the growing acceptance of standardized tests in our society at the local level has established a base of support for the present minimum competency testing movement" (Resnick, 1980). "Standards-based reform efforts in the United States accelerated dramatically during the 1980s […] to provide greater direction to schools and districts" (Dingman et al., 2013, p. 541).

When considering the drive toward common standards, one must look back to 1983 when Terrel Bell, the Secretary of Education at the time, presented *A Nation at Risk: The Imperative for Educational Reform*. Concerned that "the foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people," the report claimed the education system had "lost sight of the basic purpose of schooling." Citing declining test scores, lower international rankings, and fewer students with higher order thinking skills, the report insisted change must be brisk and broad. In further support of this, the report mentioned a Gallup Poll from 1982 which emphasized the public's perception "that public education should be the top priority for additional federal funds" and that the public had no "patience with undemanding and superfluous high school offerings." The report went on to suggest that all students should provide evidence of mastery in subject matter and be able to pass "rigorous" graduation exams before they receive a diploma. Criticizing the short school week and the quality of teachers in the system at the time, the report made recommendations with regard to content, standards, time, leadership, teaching, and fiscal support. In short, "the student's educational or work objectives (and) knowledge of the New Basics is the foundation of success for the after-school years and, therefore, forms the core of the modern curriculum." Finally, the report recommended the development of a National Commission on Excellence in Education to help resolve the issues that it had found in education.

A political storm followed, as President George H. W. Bush engaged governors across the country – leaders who took up the mantle of education reform – at the first National Education Summit held in 1989. From that summit came a list of reforms to be institutionalized, and it is important to note that all were focused on results:

1. All children will start school ready to learn.
2. The high school graduation rate will increase to at least 90%.
3. All students will become competent in challenging subject matter.
4. Teachers will have the knowledge and skills that they need.
5. U.S. students will be first in the world in mathematics and science achievement.
6. Every adult American will be literate.
7. Schools will be safe, disciplined, and free of guns, drugs, and alcohol.
8. Schools will promote parental involvement and participation.

"Over the [next] ten years, the nation […] witnessed an unprecedented level of effort at the national, state, and local levels to set more rigorous academic standards and design more challenging assessments" (gov.info.library). At the same time, the National Assessment Governing Board established student achievement levels for NAEP in reading, writing, mathematics, science, civics, history, and geography. The anticipated levels of mastery that students would have to achieve developed from these goals. The National Education Goals Panel's (NEGP) oversight of student performance assessed state and national progress and reported on improvements made from year to year. This panel was a "bipartisan and intergovernmental body of federal and state officials" (gov.info.library). The panel was later dissolved when the NCLB Act became law in 2001.

President George W. Bush's "No Child Left Behind Act" of 2001 required students in grades 3-8 and again in high school be tested each year in efforts to make all students "proficient." Designed to close the gap in achievement, the act had four basic pillars:

1. Accountability: Ensures students who are disadvantaged achieve academic proficiency.
2. Flexibility: Allows school districts flexibility in how they use federal education funds to improve student achievement.
3. Research-based education: Emphasizes educational programs and practices that have been proven through scientific research to be effective.
4. Parent options: Increases the choices available to the parents of students who attend Title I schools.

From this law, states developed mandatory standards and assessments to test students' acquisition of their state-specific standards. However, each state determined their own standards and the levels they deemed to indicate proficiency. This lack of uniformity, which led to some states appearing to be less successful in meeting the requirements of NCLB than others, may have been the strongest argument for the set of national standards that would follow.

With the release of *A Nation at Risk* and "the lackluster performance by U.S. students on international assessments," many states developed policies and procedures that "included creating curriculum guides that specified the objectives for what students should know and be able to do at distinct levels of schooling" (Dingman et al., 2013, p. 542). Internationally, when the U.S. was compared to the countries with the most outstanding education systems during the Third International Mathematics and Science Study (TIMSS), the U.S. was shown to be on a "downward trend of performance relative to other countries from 4th through 12th grade" (Schmidt & Houang, 2012).

Since its inception in 2000, the Program for International Student Assessment (PISA) – an international test of reading, mathematics and science – has shown that American 15-year-olds perform more poorly, on average, than 15-year-olds in many other developed countries. This finding is generally consistent with the results from another international assessment of 8th graders, the TIMSS (Carnoy et al., 2015, p. 3). PISA results for 2012 testing found that:

> Among the 34 OECD countries, the United States performed below average in mathematics in 2012 and is ranked 27th (this is the best estimate, although the rank could be between 23 and 29 due to sampling and measurement error). Performance in reading and science were both close to the OECD average. The United States ranked 17th in reading (range of ranks: 14 to 20), and 20th in science (range of ranks: 17 to 25). There has been no significant change in these performances over time" (OECD, 2013).
>
> Furthermore, as noted in the same report,
>
> Students in the United States have particular strengths in cognitively less-demanding mathematical skills and abilities, such as extracting single values from diagrams or handling well-structured formulae. They have particular weaknesses in items with higher cognitive demands, such as taking real-world situations, translating them into mathematical terms, and interpreting mathematical aspects in real-world problems (OECD, 2013).

Given the fact that American students learn in one of the most stable countries in the world, a country whose influence is felt around the globe, clearly the education system needed to be reformed to ensure the next generation of students can take up that mantle. Despite being in a country that spends more per student than any other country, American students continue to lag behind other countries. The fact that American mathematics students display such a weakness in higher cognitive demands certainly indicates a weakness in the curriculum, one the Common Core Standards claims to address and amend. In fact, "the analysis suggests that a successful implementation of the Common Core Standards would yield significant performance gains also in PISA" (OECD, 2013).

However, it should be noted that critics of this critique stated "in 2013, the Economic Policy Institute published a comprehensive report," in which the interpretation what the CCSS could accomplish was:

> "oversimplified, exaggerated, and misleading. It ignores the complexity of the content of test results and may well be leading policymakers to pursue inappropriate and even harmful reforms that change aspects of the U.S. education system that may be working well and neglect aspects that may be working poorly" (Carnoy and Rothstein, 2013, p. 7).

Pennsylvania State Standards

Prior to the 1990s, Pennsylvania did not have a set of standards by which to gauge student achievement, and education was under local control with limited to no state testing (Hamilton, 2007). Pennsylvania began to develop standards-based education in the mid-1990s, first in mathematics and reading, and eventually in writing, speaking and listening when they were finally adopted in 1999 (PDE, 2013). With the No Child Left Behind Law of 2001, political thinking began to change, as PA legislators realized that the state was "far from compliant with NCLB" and "the procedures for determining the alignment of curriculum standards and assessments […] gained the increased attention of state departments of education, the federal government, and the measurement community" (Webb, 2007; Hamilton, 2007). The state projected in 2002 that with the appropriate standards, it could set a measurable annual objective to move reading scores from 45 to 100 percentiles and mathematics scores from 35 to 100 percentiles by 2014 (Hamilton, 2007).

In 2004, efforts to develop a "Common Core" began in earnest, as a "need was illustrated by demands from the business community and higher education officials for more rigorous academic standards to produce high school graduates immediately ready to succeed in the workforce or college" (PDE, 2013). The state created the Pennsylvania Performance Index (PPI) as a means by which to measure academic growth. The standards that were created specified what a student should know at the end of a particular school year but included information that the student would have learned in previous years (Hamilton, 2007). They were intended to "influence classroom practice but were not intended to indicate what material would be tested at the end of each grade" (Hamilton, 2007). In light of NCLB, and instead of rewriting the standards completely, in 2004-2005, PA adopted a "supplemental concept," with Assessment Anchors to clarify what would be tested at the end of each year. When PA adopted the Common Core in 2013, the process "began as a states-led initiative with support from NGA and CCSSO (organizations that represent state officials) and continues to be a state-led process" (PDE, 2013). In July 2010, a research study conducted by Carmichael et al. considered the "State of State Standards" across the U.S., and rated each state's standards against the proposed Common Core Standards. Carmichael et al.'s conclusion was that Pennsylvania standards, although well organized, "frequently fail to outline a clear progression of rigor from grade to grade" (Carmichael et al., 2010 p. 273). Furthermore, the researchers rated the PA ELA standards as "among the worst in the country," with a grade of D, indicating a lack of clarification, guidance, clear progression, and provisions for delivery or evaluation of several requirements (2010, p.

275). The same researchers scored the PA standards for mathematics as also “among the worst in the country,” with a grade of F, primarily resulting from a lack of specificity in the high school content, a lack of priority to arithmetic (some of which was not covered at all in specific grades), and weaknesses in the geometry standards (Carmichael et al., 2010, pp. 277-278). Said of most U.S. standards, they are “a mile wide and an inch deep” (TIMSS, 1995), and in the case of PA, they “do not have intended topics specified for grades 1 and 2” and therefore would affect “the coherence of later grades’ standards” (Schmidt & Houang, 2012, p. 302).

The Common Core

The development and adoption of the CCSS for the U.S. has met with conflict since its inception. On one hand, proponents applaud consistency in curricula across state lines as students move from school to school. Publishers also prefer the common standards, finding it far easier to develop valuable tools that meet the needs of students across the country (Dingman et al., 2013, p. 543). Critics, on the other hand, believe that common standards “stifle teacher and curricular activity” (Dingman et al., 2013, p. 543). The suggestion by critics that it would lead to a National Curriculum driven by a National Test was refuted by the Department of Education in Pennsylvania (PDE, 2013). Instead, claims that the CCSS would move education “toward a greater emphasis on higher order cognitive demand” were reported (Williamson et al., 2011). Williamson et al. added that although other countries place a higher emphasis on “performance procedures,” this “runs counter to the widespread call in the United States for a greater emphasis on higher order cognitive demand,” a demand the Common Core supposedly meets. The CCSS are designed “to be robust and relevant to the real world, reflecting the knowledge and skills that our young people need for success in college and careers” (Gamson et al., 2013). “They set a controversial, aspirational, quantitative trajectory for text complexity exposure for readers throughout the grades, aiming for all high school graduates to be able to independently read complex college and workplace texts" (Williamson et al., 2013, p. 59). Created to reduce the gap between the high school achievement levels and college and workplace achievement levels, the CCSS intentionally increased complexity in most grades (Williamson et al., 2013, p. 59). In a study predicting the long-term effects if the Common Core was adopted, the Brown Center Report on American Education concluded, "the empirical evidence suggests the Common Core will have little effect on American students' achievement," while another study by Schmidt and Houang (2012) suggested that from the CCSS, "mathematical achievement […] once appropriately implemented is encouraging." Overall,

> The rapid adoption of the CCSS has outstripped the kind of serious scrutiny that might normally attend the launch of such a major reform effort. Although most states have embraced the CCSS, the initial analyses conducted of these new standards to date are mixed, especially those that assess whether they represent an advance over current state standards (Loveless, 2012; Porter, McMaken, Hwang, & Yang, 2011; Schmidt & Houang, 2012).

In terms of ELA, the CCSS "set a challenging goal for all students to be able to 'comprehend *texts' steadily increasing complexity* [emphasis added] as they progress through school [so that by graduation, they can] read and comprehend independently and proficiently the kinds of complex texts commonly found in college and careers'" (Williamson et al., 2013 p 59). According to Hiebert and Mesmer, "text complexity in the CCSS contains much more specific language than previous standards" (Hiebert, E., Mesmer, H., 2013, p. 44). Hiebert, in a different study, also claims the CCSS suggest that texts for primary level students should be much more complex; at least one grade level higher (Hiebert, 2012, p. 26). Concerns over this unfolded when results from standardized tests in these grade levels showed that two-thirds of students in 3rd grade alone "fail to attain proficiency standard with *current* levels of text complexity" (Hiebert, 2012, p. 27). Hiebert's third study suggests that in order to raise this complexity level, teachers and publishers will have to rely on both qualitative and quantitative data to better understand how "text features can influence comprehension," so as to not hinder the progress of at-risk readers (Hiebert, 2012). However, since then, further studies have been conducted that counter that claim. According to Fitzgerald et al. (2016), "while even the youngest of students are expected to read more complex texts than in the past, the (CCSS) standards are nearly silent on text complexity factors for early-grades texts."

With regard to the mathematics standards, in addition to government representatives, the standards were developed by "teams of mathematicians, mathematics educators and school representatives," whose shared point of view culminated in the new standards (Dingman et al., 2013, p. 543). In developing the previous state standards, input could have been generated by any, all, or none of the above, creating standards that looked very different. Some state standards were driven by expectations, some by content, and some by assessment standards, which led to great inconsistency across state lines (Dingman et al., 2013, p. 542). In a study that compared reasoning strands in 35 state standards compared to the Common Core reasoning, most closely aligned in their definition of complexity, which identified students' ability, to (among other things) "make conjectures or hypotheses; test conjectures, hypotheses, predictions, conclusions, and conjectures; develop arguments; prove or disprove/refute and to evaluate claims, hypotheses, predictions" (Dingman et al., 2013, p. 554). The results of this study suggest that "explicit reasoning for verification standards connected to content standards is reduced (in the CCSS), and reasoning (as a) focus in standards for mathematical practices" was found in only four of the eight expected standards in the K-8 document, but which "suggest students should be engaged in reasoning across all strands and grade levels" (Dingman et al., 2013, pp. 555-556).

Nationwide Common Core Implementation

The implementation of the CCSS may differ between states and in some cases, between districts. Karta (2015) explained that "CCSSO has released a draft of new model teaching standards that are aligned to the CCSS to guide state policy in areas such as program approval and teacher certification and licensure." According to the Common Core State Standards website, "states retain sole authority over which CCSS-aligned curriculum to adopt. The CCSS Initiative does not ask states to yield that authority" (p. 5). The American Association of Colleges of Teacher Education (AACTE) called for the creation of teacher performance assessments and professional development programs linked to the CCSS:

> Professional development can no longer just be about exposing teachers to a concept in a one-time workshop or giving teachers basic knowledge about a teaching methodology. Instead, professional development in an era of accountability requires a fundamental change in a teacher's practice that leads to increases in student learning in the classroom (centerforpubliceducation.org).

"Teacher expertise accounts for 40% of student learning, [which] means that successful implementation of the standards hinges on educator mastery and delivery of CCSS-aligned curriculum" (ncsl.org).

In addition to professional development, states were expected to make investments in other parts of their programs to ensure fidelity in implementation. Among those investments were what some considered to be one-time costs associated with increased technological infrastructure, and investment in CCSS-aligned assessments and CCSS-aligned curricula. Each of these actually entail recurring costs, as states need to maintain school networks, update assessments, appropriate funds annually for curriculum enhancement, and provide ongoing professional development (ncsl.org).

According to sources, costs associated with the CCSS implementation varied for the state of Pennsylvania. The Independent Regulatory Review Commission (IRRC, 2013) stated "the [PA] state's education department indicated the proposed regulations would not impose any new costs on school districts" (MacDougall, 2004, p. 3). However, a study completed by the University of Pennsylvania stated that the Common Core Standards would, in fact, "bring additional costs to schools" (Izumi, 2012).

Most states developed or altered their standardized tests to align with the new standards, and perhaps most importantly, teachers' continued employment became tied to the test as well. Heck, Weiss, and Pasley (2011) explained that if standards were not implemented well in particular schools, districts or states, then failure or ineffectiveness as reported using standardized tests should not be blamed on the standards.

In response, states placed responsibility on the teachers, regardless of the amount of professional development supplied to them. In 2015, The National Council on Teacher Quality (NCTQ) reported the following:

- 43 states required objective measures of student achievement to be included in teacher evaluations; an increase from only 15 states in 2009.
- 16 states, including PA, included student achievement and growth as the "preponderant criterion" in teacher evaluations; an increase from only four states in 2009.

- 19 states included growth measures as a “significant criterion” in teacher evaluations. Eleven of those states explicitly defined what “significant” means for the purposes of including student achievement in teacher evaluations. Seven states required that schoolwide achievement data be used in individual teacher performance.

Reporting for PA, the NCTQ stated:

> Pennsylvania Student performance must count for fifty percent of a teacher’s evaluation score. This half must be based on multiple measures of student achievement and be comprised of the following: building-level data (15), which must include student performance on assessments, value-added assessment system data, grad rates, promotion rates; teacher specific data (15%), including student achievement attributable to a specific teacher as measured by student performance on assessments, value-added assessment system data, progress in meeting student goals; and elective data (20%), including measures of student achievement that are locally developed.

As such, a researcher might expect to find teachers’ preparation for the CCSS implementation to have been a priority in districts and states. However, in the state of PA teachers were asked to consider the following instructions and discern their own individual needs: “for a smooth transition to the new standards, teachers can make changes to instruction that will prepare students for PA Core Standards while helping them succeed on current state assessments and:

- Inform colleagues and parents of the PA Core Standards.
- Learn how your school is transitioning to the PA Core Standards and assume an active role in the transition.

• Review instructional materials and curriculum for alignment to the PA Core.

• Assess your professional development needs and begin to seek out and participate in such opportunities."

Pennsylvania Common Core Implementation

In the state of Pennsylvania, the implementation timeline began in the 2010-2011 school year. In this initial year, the state began to provide professional development through their online website, the PA Standards Aligned System Institute (SAS), "a comprehensive, researched-based resource to improve student achievement. SAS identifies six elements that impact student achievement: Standards, Assessments, Curriculum Framework, Instruction, Materials & Resources, and Safe and Supportive Schools" (pdesas.org). In 2010-2011, the state provided Intermediate Unit training online through the Standards Aligned Institute. Unlike in previous years, assessments were listed on the implementation of the CCSS website by subject area, namely reading and mathematics in grades 3-8, and writing in grades 5, 8, and 11. As the timeline progressed into the 2012-2013 school year, Pennsylvania provided Standards Crosswalks: "useful as a reference tool when aligning curricula to PA Common Core, educators should view the alignment in terms of content – as rigor must be an important consideration" (pdesas.org). The first crosswalk, made available in September of 2012, provided help to educators in understanding the new K-8 mathematics standards by listing all the standards and comparing the language of the PA standard with the Common Core Standard and the adopted PA Core Standard, so teachers and administrators could more easily distinguish among the three. Almost unilaterally in the mathematics standards, the language used in the PA Academic Standards and Common Core Standards was reduced in the adopted PA Common Core standard. For example, in Table 2. for 8th grade, the standards can be compared as follows:

Table 2. Comparison of PA Academic and Common Core Standards with adopted PA Common Core Standards

PA Common Core Standard	Common Core State Standard	PA Academic Standard
CC.2.3.8. A.1 Understand and apply congruence and similarity using various tools.	8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	2.9.8.B Predict and describe the result of a translation (slide), rotation (turn), or reflection (flip) of a 3-dimensional shape.
CC.2.1.8. E.4 Estimate irrational numbers by comparing them to rational numbers	8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π2). For example, by truncating the decimal expansion of √2, show that √2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	2.2.8.D Estimate the values of irrational numbers and the results from calculations with basic operations of fractions and percent and check the reasonableness of those estimates.

(PA Department of Education, 2013).

In addition, in 2012-2013, both the Eligible Content Crosswalks and the ELA Crosswalk for grades K-12 were made available. However, unlike the mathematics standards of the previous year, not all standards were listed, and most maintained the integrity of the previous standards. For example, Table 3, shows for the 8th grade, the following comparison can be made:

Table 3. Examples of Grade 8 PA Academic and Common Core Standards with adopted PA Common Core Standard

PA Common Core Standard	Common Core State Standard	PA Academic Standard
CC.1.2.8.A Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.	RI.8.2Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.	1.2.8.A Evaluate text organization and content to determine the author's purpose, point of view, and effectiveness according to the author's theses, accuracy, thoroughness, and patterns of logic.
CC.1.2.8.C Analyze how a text makes connections among and distinctions between individuals, ideas, or events.	RI.8.3 Analyze how a text makes connections among and distinctions between individuals, ideas, or events (e.g., through comparisons, analogies, or categories).	1.2.8.D Draw inferences and conclusions based on a variety of information sources, citing evidence from multiple texts to support answers.

(PA Department of Education, 2013).

Continued professional development began to include emphasis on standards' alignment and framework with additional content crosswalks. Finally, in 2013, the state of Pennsylvania adopted the Keystone Exams, an end-of-year assessment to measure student knowledge in Algebra I, Biology and Literature for students in grade 11.

In the pivotal year of 2013-14, the state of Pennsylvania fully adopted the PA Aligned Curriculum in mathematics and ELA, and made available the PA Core Voluntary Model Curriculum (VMC), "a series of unit and lesson plans that incorporate learning progressions and content resources aligned to the Pennsylvania standards within the Curriculum Frameworks" (pde.sas.org). In addition, mathematics crosswalks for grades 9-12 were made available in May of 2013. As in the previous standards, not all were listed in the crosswalk and descriptions were reduced considerably across the board. Table 4 shows the reduces decriptives.

Table 4. Examples of Crosswalks and Descriptions of Adopted PA Common Core Standards

PA Common Core Standard	Common Core State Standard	PA Academic Standard
CC.2.1. HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems. Polynomials, products/quotients of exponential terms and product of binomial times a trinomial; solve and graph linear equations and inequalities.	N.RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.	2.2. A1.C Evaluate numerical expressions that include the four basic operations and operations of powers and roots, reciprocals, opposites, and absolute values. 2.8. A1.B Evaluate and simplify complex algebraic expressions. 2.1.A1.A Model and compare values of irrational numbers. 2.1.A1.B Use factoring to create equivalent forms of polynomials. 2.1.A1.E Apply the concepts of prime and composite monomials to determine Greatest Common Factors (GCFs) and Least Common Multiples (LCMs) of monomials.
CC.2.1. HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays.	N.Q. 1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. 2. Define appropriate quantities for the purpose of descriptive modeling. 3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.	2.1. A1.F Extend the concept and use of inverse operations to determine unknown quantities in linear and polynomial equations. 2.8. A1.E Use combinations of symbols and numbers to create expressions, equations, and inequalities in two or more variables, systems of equations, and inequalities, and functional relationships that model problem situations.

(PA Department of Education, 2013).

Chapter III

Methodology

Introduction

This quantitative study examined the influence of the CCSS at the 8th and 11th grade levels on the PSSA and the Keystone Exams in reading and mathematics in Pennsylvania public schools across the state. In selected schools, community designations were added to the PSSA database.

Method and Design

This study used a longitudinal approach to track growth in PSSA/Keystone testing results after the implementation of the CCSS. The use of a non-experimental research design is most suitable to identify causal relationships between dependent variables and their predictors, which in this case were students' outcomes and their location in the state (Belle, 2008). The longitudinal approach allowed the researcher to observe student progress over time instead of at one particular moment. In this study, the researcher took into account the time period from when the new standards should have been fully implemented with fidelity to testing in 2017.

The first set of 8th grade scores used was from 2015 when the state tests were adapted to the Common Core, and the study followed scores for each year through 2016-2017, noting that full implementation should have occurred by 2015. For 11th grade, the first set of scores used was from 2013, when the standards were adopted and followed through 2014-2017. The researcher investigated the correlation between variables, understanding that a high correlation does not necessarily indicate that one causes the other, but that a relationship exists.

By including schools from across the state and in various community structures, the researcher looked for a statistical relationship between the implementation of the CCSS and PSSA results in 96 urban schools, 104 rural schools, 56 town schools and 110 suburban school districts. For 11th grade, the researcher looked for statistical differences in 48 urban schools, 77 rural schools, 38 town schools, and 99 suburban schools.

Population and Sampling

This study examined all schools across the state of Pennsylvania that have classes in 8th and 11th grades. The researcher added community designation variables (urban, suburban, town and rural) to the PA Education Department's PSSA and Keystone databases. The Pennsylvania Partnership for Children reviewed the criterion used by the Center for Rural Pennsylvania to specify community designations, and determined it was not sufficient for the many characteristics encompassed within districts. Therefore, it considered three federal government criteria, of which it rejected two and accepted one, with some clarification. From that emerged the following coding matrix.

Locale Codes are assigned to each school, and a district's status is determined by the location of the plurality of schools. This is still an imperfect system, but with eight separate locale codes that could be assigned to each school, it yields reasonably good results. Therefore, the locale codes were used as a starting point in designating districts:

a. Some districts thus designated as suburban really have the character of rural communities in terms of population density and local wealth. Therefore, suburban districts with fewer than 350 people per square mile and aid ratios in excess of .6500 were re-designated as rural.

b. Some districts thus designated as rural or urban really have the character of suburban communities in terms of local wealth. Therefore, urban or rural districts with aid ratios below .3500 were re-designated as suburban. (www.papartnerships.org/pdfs/methodology.pdf)

For the purposes of this study, the designations assigned by the Pennsylvania Partnership for Children were used. For each of these independent variables, the co-variant of Historically Underperforming was added.

> This category replaces the various subgroups previously identified for purposes of Annual Yearly Progress AYP. *Historically Underperforming Students* are defined as a non-duplicated count of students with disabilities, economically disadvantaged students, and English Language Learners enrolled for a full academic year taking the PSSA/PASA/Keystone Exams. If a student is in more than one of the individual groups (e.g., special education and English Language Learner), she/he is only included in the Historically Underperforming Student group one time; a non-duplicated count. This group is not a cohort but rather students currently in the building meeting the definition during the reported year. (paschoolperformance.org)

Sampling

Scores from schools in the state of Pennsylvania that have grades 8 and 11 and were opened between 2012 and 2017 were included in this study. This totaled 918 schools with grade 8 data and 704 schools with grade 11 data. Fifty percent of the schools were randomly selected from the databases to be included in the study.

Instrumentation

The PSSA is a standardized test administered to public schools in the state of Pennsylvania. Students in grades 3-8 are assessed in ELA skills and mathematics. The scores from this database were used to compare 8th grade scores from 2015 to 2017. The Keystone Exam is a Pennsylvania standardized test administered to the public schools of Pennsylvania. Since the 2012-2013 school year, the General Keystone Knowledge Tests in Literature, Biology, and Algebra I have been available. Scores from this database were used to compare 11th grade scores from 2013 to 2017.

Reliability and Validity

Reliability

The PSSA test is divided into various sections. The researcher was concerned with two of those areas; specifically, reading and mathematics. Within those content areas, there are test questions pertaining to domains as stated in the Pennsylvania Core Standards for reading and mathematics. The domains covered in the 8th grade PSSA reading assessment include the following:

- Reading Informational Text
- Reading Literature

The domains used in testing 8th grade mathematics include the following:

- The Number System
- Expressions and Equations
- Functions
- Geometry
- Statistics and Probability

Reliability, which concerns the quality of the measurement, and validity, which measures the ability to be repeated with consistency, was obtained by using data from PDE in the public domain, and test scores with exam manuals affirmed test reliability and validity. The Human Resource Research Organization (HumRRO) conducted a series of studies for the Pennsylvania State Board of Education to test the validity of the PSSA. The results confirmed the

> PSSA items represent the academic content specified with a reasonable set of items per academic content area. Sub-standards are too numerous to be reported separately. Content was consistently represented across forms and item difficulty. Item difficulty was very different by item type. PSSA relies heavily on performance-task items to differentiate students at the upper end of the distribution. internal consistency reliability statistics are very high in the PSSA (http://www.stateboard.education.pa.gov).

Validity

> Test content validity evidence for the PSSA rests greatly on establishing a link between each piece of the assessment (i.e., the items) and what the students should know and be able to do as required by the Assessment Anchors, Eligible Content, and/or the Academic Content Standards. The PSSA tests are intended to measure students' knowledge and skills described in the Assessment Anchors as defined by the Eligible Content for mathematics, ELA, and science (www.education.pa.gov).

According to the PDE website, "a strong link can be established between each PSSA item and its associated eligible content," strengthening the validity of the assessment.

Data Collection

Student outcomes were obtained from the PSSA database where standards-based, criterion-referenced scores were provided online from the year 2012 to the present. The researcher accessed scores for schools with grade 8 through the PSSA website for 2015, 2016 and 2017, and for schools with grades 11 for 2013, 2014, 2015, 2016 and 2017. The researcher downloaded data files containing test scores and pertinent student data, which included students who were designated as “Historically Underperforming”. The researcher randomly selected 50% of schools with 8th and 11th grades, and then consulted each school’s report card to ascertain school-level characteristic data, which included wealth and ethnicity. The researcher then used the Pennsylvania Partnerships for Children’s website to ascertain which schools were considered to be in an urban, suburban, rural, or town community and added that designation to the database. The researcher combined scores for “Proficient” and “Advanced” and renamed them to “Passing” for each group and each year of the study.

Variables

Student exam performance was the continuous dependent variable used. Covariates included ethnicity and wealth. Additional studies were performed using four qualifications at school-level urban, rural, town and suburban locales. “The Center for Rural Pennsylvania’s definition of rural and urban is based on population density. Population density is calculated by dividing the total population of a specific area by the total number of square land miles of that area” (www.rural.palegislature.us/rural_urban.html). Underperforming students, as defined below, were used as an additional independent variable.

The researcher made the following assumptions:

1. Use of a continuous variable: exam performance.

2. School characteristics are categorical, related, or matched pairs.
3. There are no significant outliers, or SPSS will detect them.
4. The standard deviation is normally distributed.
5. Sphericity: the variance of difference between all combinations of related groups equals zero.

Table 5. Description of Variables

Variable	Definition	Measurement	Status
Reading Performance	PA School Code State Board of Education approved "specific criteria for advanced, proficient, basic and below basic levels of performance." Advanced level: thorough comprehension of standards. Proficient level: comprehension of standards. Basic level: limited comprehension of standards. Below Basic level: inadequate understanding of standards.	Results are based on PA recommended scale score ranges. Results reflect the percentage of students who took the test and achieved the designated level of performance.	**Dependent**
Mathematics Performance	PA School Code State Board of Education approved "specific criteria for advanced, proficient,	Results are based on PA recommended scale score ranges.	**Dependent**

	basic and below basic levels of performance." Advanced level: thorough comprehension of standards. Proficient level: comprehension of standards. Basic level: limited comprehension of standards. Below Basic level: inadequate understanding of standards.	Results reflect the percentage of students who took the test and achieved the designated level of performance**.**	
Historically Underperforming	Non-duplicated count of students with disabilities, economically disadvantaged students, and English Language Learners.	Results reflect the percentage of these students who achieved the designated score.	**Covariate**
Race	Race is reported via family self-determination upon student enrollment in public school.	Percentage of students' race was accessed from each individual report card of schools randomly selected in the study.	**Covariate**
Poverty	Used in this study, the "economically disadvantaged"	Percentage of students' considered	**Covariate**

	measurement was developed by the PA Department of Education, and is reported annually by LEAs through the PA Information Management System (PIMS). “To determine whether a student is economically disadvantaged, LEAs may use poverty data sources, such as TANF cases, census poor, Medicaid, children living in institutions for the neglected or delinquent, or those supported in foster homes” (education.pa.gov).	“Economically Disadvantaged” was accessed from each individual report card of schools randomly selected in the study.	
Urban	A principal city of a Metropolitan CBSA; any incorporated place, census-designated, or non-place territory within a CBSA of a mid-size city and defined as urban by the Census Bureau.	Designation is a combination of Large City, Mid-size City, Urban Fringe of Large City, Urban Fringe of Medium City, and Town Fringe (nces.ed.gov).	**Covariate**

Rural	Inside or outside CBSA: Any incorporated place, Census-designated place, or non-place territory not within a Metropolitan CBSA nor within a Micropolitan CBSA and defined as rural by the Census Bureau.	Designation is a combination of Rural metro-centric codes ((nces.ed.gov)	**Covariate**
Suburban	Territory outside a principal city and inside an urbanized area with population greater than 25,000.	Designation combining Suburb: Large, Mid, and Small; and Town: Distant and Remote (nces.ed.gov)	**Covariate**
Town	An incorporated place or Census-designated place with a population greater than or equal to 25,000 (large) or between 2,500 and 25,000 (small) and located outside a Metropolitan CBSA or inside a Micropolitan CBSA.	Designation combined small and large.	**Covariate**

Data Analysis

A General Linear Model with repeated measures was run using school data reported on the PSSA/Keystone websites. Initial models were run on the sampled general population in 8th grade and then in 11th grade. Where statistical significance was found, additional models were run to identify the correlations of each of the covariates: poverty, Historically Underperforming, and race. Models were run using estimated scores in mathematics and then ELA for each grade.

The researcher input this information into SPSS using repeated measures to examine mean scores over time, looking for any statistically significant change. Where statistical significance occurred, the researcher used bivariate measures to identify the correlation of the variables: race and poverty on the dependent variable PSSA/Keystone test scores. Additional repeated measures were run to observe trends in the dependent variable (scores), based on school locale: city, suburban, town, and rural.

Chapter IV

Analysis of Data

Introduction

The purpose of this study was to determine the trend in student achievement in 8th and 11th grade mathematics and English performance across the state of Pennsylvania since the Common Core implementation of 2012. Achievement was measured by performance on the PSSA for grade 8 and the Keystone Exams for grade 11. Recognizing that the PSSA test changed in 2015, comparisons were made for the 8th grade from 2015 to 2017.

Of additional interest was how the school-level data of "Historically Underperforming" and Black and Hispanic students' performance changed over this period. Furthermore, a closer observation was made of students' performance in various community designations as defined by the state of Pennsylvania. The research sought to explore whether student performance trends can be explained by demographic factors, such as the "Historically Underperforming" status, ethnicity, socio-economic factors, and community locale. A general linear model with repeated measures was used with performance data for 8th grade students from 2015 to 2017 and for 11th grade students from 2013 to 2017.

After an extensive review of the literature, questions arose as to the validity of claims that with the implementation of the Common Core curriculum, students' performance would improve. The three research questions that drove the study were as follows:

Research Question 1: How does the trend in student test performance as measured by the PSSA and Keystone Exams in grades 8 and 11 mathematics and English vary over time for all students?

Research Question 2: How does the trend in student test performance as measured by the PSSA and Keystone Exams in grades 8 and 11 mathematics and English vary over time for the "Historically Underperforming Students"?

Research Question 3: How does the trend in student test scores as measured by PSSA and Keystone Exams in grades 8 and 11 mathematics and ELA from 2012 to 2017 vary based on the type of district; urban, suburban, town and rural?

This repeated measure study used the PSSA and Keystone Exams as the dependent variables, and a summary of mathematics and English performance were considered when paired with the following independent variables:

- Percentage of Economically Disadvantaged
- Percentage of Black and Hispanic Families combined
- Percentage of students living in various types of communities

The original database for the state of Pennsylvania contained over 700 schools with grade 8 data, the number of which was reduced by 50% using random sampling, resulting in 376 schools used in the study. For grade 11, the state provided data on over 500 schools, which was also reduced by 50% using random sampling, ending with a total of 271 schools used.

8th Grade School Demographics

Descriptive statistical analysis was used to describe the overall characteristics of the sample population in each grade and the school locale, as defined by city, suburban, town, or rural communities.

In Table 6, the descriptive analysis of the 8th grade demographics in the 376 randomly selected schools demonstrates that the student population comprised 65% who identified as White and 28% who identified as Black or Hispanic. The remaining 7% was a mixture of ethnicities. Furthermore, 49% of students in the state were considered to be Economically Disadvantaged, as defined by the state of PA as “one who is identified by Direct Certification or is a member of a household that meets the income eligibility guidelines for free or reduced-price meals (less than or equal to 185 percent of Federal Poverty Guidelines) under the National School Lunch Program (NSLP)” (pashoolperformance.org).

Table 6. Descriptive Statistics: 8th Grade Student Demographics

Demographics	Mean	Standard Deviation	Number
Black/Hispanic	27.78	33.83	376
White	65.37	36.01	375
Econ. Disadvantaged	49.12	23.38	376
Special Education	16.48	5.57	376
Eng. Lang. Learners	3.08	5.97	376
Female	48.32	4.26	376
Male	51.68	4.26	376

Table 7 shows the frequency of schools across the state, identified as urban, suburban, town, and rural. This data demonstrates that the highest frequency of schools (30%) were located in the suburbs, followed closely by 28% in rural areas across the state. Schools located in urban areas represented 26% and the smallest percentage, 15%, were located in towns.

Table 7. 8th Grade Frequencies: Urban Locale Codes

Code	Frequency	Percentage of Total
Urban	96	26.2
Suburban	110	30.0
Town	56	15.3
Rural	104	28.5
Total	366	100

11th Grade School Demographics

In Table 8, the descriptive analysis of the 11th grade demographics in the 271 randomly selected schools demonstrate that the student population comprised 74% who identified as White and 21% who identified as Black or Hispanic. The remaining 5% was a mixture of ethnicities. Furthermore, 46% of 11th grade students in the state were considered to be Economically Disadvantaged.

Table 8. Descriptive Statistics: 11th Grade Student Demographics

Demographics	Mean	Standard Deviation	Number
Black/Hispanic	21.35	30.00	271
White	73.62	31.412	269
Econ. Disadvantaged	45.96	21.036	270
Special Education	2.09	5.304	270
Eng. Lang. Learners	15.31	5.728	270
Female	49.14	5.175	270
Male	50.89	5.195	270

In Table 9, the geographical distribution across the state of the schools with 11th grade is presented. About a third of the schools (34%) were located in the suburbs, followed closely by 29% in rural districts. Approximately 18% were located in urban areas and 16% in towns.

Table 9. 11th Grade Frequencies: Urban Locale Codes

Code	Frequency	Percentage of Total
Urban	48	18.1
Suburban	95	34.0
Town	44	16.7
Rural	77	29.2
Total	264	100

Research Question 1:

How does the trend in student test performance as measured by the PSSA and Keystone Exams in grades 8 and 11 mathematics and English vary over time for all students?

8th Grade "All Students" Math/ELA Performance

Table 10. Repeated Measures Analysis on 8th Grade Math Performance

Repeated Measures Analysis of Variance Race (Black/Hispanic) and SES (Econ. Disadvantaged)

Effect	MS	df	F	P	Observed Power
Race	1129.783	1.819	7.863	0.001	0.938
SES	667.891	1.819	4.648	0.012	0.754

In an unadjusted repeated measures analysis, the researcher examined whether the average passing rate in mathematics performance for "All Students" differed over time from 2015 through 2017. Because the assumption of sphericity was violated by Mauchly's test (W =

0.886 $C^2 = 43.548$ $p = .000$), the Huynh-Feldt correction test was used. These results indicated that there was a significant change in the passing rates between 2015 and 2017 for the schools with an F value of 12.909 (df 1.819, 656.599) $p < 0.000$. In 2015, the passing rate was 25.55%; in 2016, it was 27.57%; and in 2017, it was 47.92%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other.

In the second analysis, the researcher adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. The findings indicate that when we adjusted for these two school characteristics, there continued to be a significant difference in mathematics performance after the Core. There was also a significant interaction between both covariates and performance. For the percentage of minority students, the F value of 7.863 was significant at 0.001 (df 1.819, 656.599) and for the percentage of economically disadvantaged students, the F value of 4.648 was significant at 0.012 (df 1.819, 656.599).

To fully understand the interaction, the researcher examined the correlation between these two covariates and the passing rates for each year. These correlations are reported in Table 5A. For the percentage of minority students, the correlation coefficients were -0.585, -0.446 and -0.771 for 2015, 2016 and 2017 respectively. The passing rates were increasingly negatively associated with the percentage of students who were Black or Hispanic. For the socio-economic characteristic variable, the coefficients were -0.725, -0.535 and -0.733 for 2015, 2016 and 2017 respectively. The passing rates for each year were lower for schools with Black and Hispanic students, and were even lower for those in high poverty, with slightly less effect for both groups in 2016.

Table 10a. 8th Grade Math Bivariate Correlations for "All Students"

Race (Black/Hispanic) and SES (Econ. Disadv.)

Pearson Correlation…….	MathPass 2015…..	MathPass 2016……	MathPass 2017-------
Black/Hispanic	-0.585	-0.446	-0.771
Econ. Disadvantaged	-0.725	-0.535	-0.733

Table 11. Repeated Measures Analysis on 8th Grade ELA Performance

Repeated Measures Analysis of Variance Race (Black/Hispanic) and SES (Econ. Disadv)

Effect---------	MS----------	-df-----------	-F----------	P-------	Observed Power------------
Race	257.728	2	4.412	0.012	0.760
SES	371.412	2	6.358	0.002	0.900

Like with the mathematics performance, the researcher again ran an unadjusted repeated measures analysis, in which we examined whether the average passing rate in ELA varied over time from 2015 through 2017. As the test for equal sphericity was not violated ($W= 1.00$ $C^2 = 0.021$, $p = 0.989$), sphericity was assumed. These results indicated that there was not a significant change in the passing rates between 2015 and 2017 for the schools with an F value of 0.340 (df 2,738), $p < .712$.) In 2015, the passing rate was 53.89%; in 2016, 54.02%; and in 2017, 55.03%. A Bonferroni test indicated that the 2015 and 2017 pairwise means were significantly different from each other.

In the second analysis, the researcher again adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. The findings indicate that when we adjusted for these two school characteristics, a significant difference in ELA performance became evident. There was a significant interaction between both covariates and performance. For the percentage of minority students, the F value of 5.858 was significant at 0.003 (df 2,738) and for the percentage of economically disadvantaged students, the F value of 3.689 was significant at 0.025 (df 2, 738).

To fully understand this interaction, the researcher again examined the correlation between these two covariates each year. These correlations are reported in Table 6A. For the percentage of minority students, the correlation coefficients were -0.693, -0.701 and -0.741 for 2015, 2016 and 2017 respectively. The passing rates were increasingly negatively associated with the percentage of students who were Black or Hispanic. For the socio-economic characteristic variable, the coefficients were -0.805, -0.812 and -0.804 for 2015, 2016 and 2017 respectively. The passing rates for each year were even lower for schools with high poverty, with slightly less effect in 2017.

Table 11a. 8th Grade ELA Bivariate Correlations for "All Students"

(Race (Black/Hispanic) and SES (Econ. Disadv)

Pearson Correlation…….	ELAPASS 2015…..	ELAPASS2016……	ELAPASS-2017-------
Black/Hispanic	-0.693	-0.701	-0.741
Econ. Disadvantaged	-0.805	-0.812	-0.804

11th Grade "All Students" Math/ELA Performance

Table 12. Repeated Measures Analysis on 11th Grade Math Performance

Repeated Measures Analysis of Variance Race (Black/Hispanic) and SES (Econ. Disadv)

Effect---------	MS----------	-df-----------	-F----------	P-------	Observed Power--------------------
Race	128.938	3.353	1.846	0.130	0.511
SES	104.223	3.353	1.492	0.211	0.422

Table 13. Repeated Measures Analysis on 11th Grade Reading Performance

Repeated Measures Analysis of Variance Race (Black/Hispanic) and SES (Econ. Disadv)

Effect---------	MS----------	-df-----------	-F----------	P-------	Observed Power--------------------
Race	162.586	3.341	2.334	0.054	0.621
SES	62.966	3.341	0.904	0.447	0.263

Like with the 8th grade, the researcher used an unadjusted repeated measures analysis for the 11th grade and again examined the average passing rate in mathematics performance for "All Students" over time from 2013 through 2017. Because the assumption of sphericity was violated by Mauchly's test ($W = 0.707$ $C^2 = 91.116$ $p = 0.000$), the Greenhouse-Geisser correction test was used. These results indicated that there was a significant change in the passing rates between 2013 and 2017 for the schools with an F value of 2.570 df (3.353, 885.07), $p < 0.047$. The passing rate in 2013 was 62.71%; in 2014, 63.11%; in 2015, 64.15%; in 2016, 67.64%; and in 2017, 63.40%. A Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, 2015 and 2016, and the 2016 and 2017 pairwise means were significantly different from each other.

In the second analysis, the researcher again adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. The findings indicate that when we adjusted for these two school characteristics, there was no longer a significant difference in mathematics performance after the Core. The passing rates were not affected by the percentage of students who were Black, or Hispanic or Economically Disadvantaged.

The researcher then used an unadjusted repeated measures analysis for the 11th grade and examined whether the average passing rate in reading performance for "All Students" varied over time from 2013 through 2017. Because the assumption of sphericity was violated by Mauchly's test ($W = 0.685$ $C^2 = 98.896$, $p = 0.000$), the Greenhouse-Geisser correction test was used. These results indicated that there was no significant change in the passing rates between 2013 and 2017 for the schools with an F value of 0.785 (df 3.341, 878.744) $p < 0.514$. The passing rate in 2013 was 74.45%; in 2014, 73.54%; in 2015, 72.86%; in 2016, 76.27%; and in 2017, 71.28%. Although overall, the effect of time on the performance was not statistically significant, A Bonferroni test indicated that the 2013 and 2016, 2013 and 2017, 2014 and 2016, 2014 and 2017, 2015 and 2016, and the 2016 and 2017 pairwise means were significantly different from each other.

In the second analysis, the researcher adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. The findings indicate that when adjusted for these two school characteristics, there continued to be no significant difference in mathematics performance after the Core. The passing rates were also not affected by the percentage of students who were Black, or Hispanic or Economically Disadvantaged.

Research Question 2.

How does the trend in student test performance as measured by the PSSA and Keystone Exams in grades 8 and 11 mathematics and English vary over time for the "Historically Underperforming Students"?

8th Grade Historically Underperforming School Demographics

Descriptive statistical analysis was used to identify the frequencies and percentages of the "Historically Underperforming" population in each grade. These statistics identified the racial composition of the schools and their poverty status.

Table 14. Descriptive Statistics: 8th Grade Math, "Historically Underperforming"

Year	Mean	Standard Deviation	Number
2015	15.33	11.01	364
2016	15.87	10.55	364
2017	39.99	15.64	364

As with the "All Students" analysis, the researcher first ran an unadjusted repeated measures analysis, in which we examined the average passing rate in mathematics performance for 8th grade "Historically Underperforming" students over time from 2015 through 2017. Because the assumption of sphericity was violated by Mauchly's test ($W = 0.868$ $C^2 = 50.992$, $p = 0.000$), the Huynh-Feldt correction test was used. These results indicated that there was a significant difference in the passing rates between 2015 and 2017 for the schools with an F value of 62.696 (df 1.789, 644.035) $p < 0.002$. In 2015, the passing rate for Historically Underperforming Students was 15.33%; in 2016, 15.87%; and in 2017, 39.99%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other. In the second analysis, the researcher adjusted the effects by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates.

The findings indicate that when adjusted for these two school characteristics, a significant difference persisted in mathematics performance after the Core. Although there was a significant interaction between race and performance, there was no such interaction between poverty and performance. For the percentage of minority students, the F value of 6.562 was significant at 0.002 (df 1.789, 644.035). To fully understand the interaction, the researcher examined the correlation between race and performance each year. These correlations are reported in Table 9A. For the percentage of minority students, the correlation coefficients were -0.401, -0.503 and -0.605 for 2015, 2016 and 2017 respectively. The passing rates were increasingly negatively related to the percentage of students who were Black or Hispanic. Lower passing rates for each year for schools were associated with higher percentages of Black or Hispanic students.

Table 14a. 8th Grade ELA Bivariate Correlations for "Historically Underperforming Students"

Race (Black/Hispanic) and SES (Econ. Disadv.) Pearson Correlation…….	HUMathPASS 2015…..	HUMathPASS 2016…	HUMathPASS 2017-------
Black/Hispanic	-0.401	-0.503	-0.605

Table 15. Descriptive Statistics: 8th Grade ELA, "Historically Underperforming"

Year………………………	Mean-----------	Standard Deviation--------	Number
2015	40.19	15.34	364
2016	40.39	15.59	364
2017	41.08	15.35	364

Similar analyses were conducted for the average passing rate in ELA performance. The first was an unadjusted analysis for performance from 2015 through 2017. Because the assumption of sphericity was not violated by Mauchly's test ($W = 0.996$ $C^2 = 1.552$, $p = 0.460$), sphericity was assumed. These results indicated that there was no significant change in the passing rates between 2015 and 2017 for the schools with an F value of 1.179 (df 2,720) $p < 0.308$. In 2015, the passing rate was 40.19%; in 2016, 40.39%; and in 2017, 41.08%. A Bonferroni test indicated that pairwise means were not significantly different from each other.

In the second analysis, the researcher again adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. Unlike performance over time, the findings indicate that when adjusted for these two school characteristics, there was a significant interaction between race and performance, and poverty and ELA performance after the Core. For the percentage of minority students, the F value of 4.412 was significant at 0.012 df (2,720), while for the percentage of economically disadvantaged students, the F value of 6.358 was significant at 0.002 df (2,720).

To fully understand the interaction, the researcher examined the correlation between these covariates and performance each year. These correlations are reported in Table 10A. For the percentage of minority students, the correlation coefficients were -0.490, -0.500 and -0.549 for 2015, 2016 and 2017 respectively. For the percentage of economically disadvantaged students, the correlation coefficients were -0.544, -0.549 and -0.518 for 2015, 2016 and 2017 respectively. The passing rates were negatively related to the percentage of students who were Black, or Hispanic and/and/or Economically Disadvantaged. However, the negative effect made by poverty was reduced in 2017. The passing rates for each year were lower for schools with Black, Hispanic and/or Economically Disadvantaged students.

Table 15a. 8th Grade ELA Bivariate Correlations for "Historically Underperforming Students"

Race (Black/Hispanic) and SES (Econ. Disadv.)

Pearson Correlation…	HUELAPASS 2015…..	HUELAPASS 2016…	HUELAPASS 2017-----
Black/Hispanic	-0.490	-0.500	-0.549
Econ. Disadvantaged	-0.544	-0.549	-0.518

11th Grade Historically Underperforming School Demographics

Descriptive statistical analysis was used to identify frequencies and percentages of the "Historically Underperforming" population in each grade, represented by Black, Hispanic, and Economically Disadvantaged students

Table 16. Descriptive Statistics: 11th Grade Math, "Historically Underperforming"

Year	Mean	Standard Deviation	Number
2013	46.17	15.80	250
2014	47.37	17.17	250
2015	48.74	18.01	250
2016	52.53	17.20	250
2017	49.55	17.72	.250

Table 17. Descriptive Statistics- 11th Grade Reading, "Historically Underperforming"

Year	Mean	Standard Deviation	Number
2013	59.77	15.91	253
2014	59.54	16.66	253
2015	59.12	16.77	253
2016	63.17	15.27	253
2017	58.43	16.30	253

Tables 13 and 14 present the descriptive statistics of the "Historically Underperforming" 11th grade population over the years 2013-2017.

Table 18. Repeated Measures Analysis on 11th Grade, "Historically Underperforming" Math Performance

Repeated Measures Analysis of Variance Race (Black/Hispanic) and SES (Econ. Disadv.)

Effect	MS	df	F	P	Observed Power
Race	132.700	3.693	1.521	0.198	0.453
SES	119.373	3.693	1.368	0.246	0.411

An additional unadjusted repeated measures analysis was run using the average passing rate in mathematics performance for 11th grade "Historically Underperforming" students over time from 2013 through 2017. Because the assumption of sphericity was violated by Mauchly's test ($W = 0.848$ $C^2 = 40.331$, $p = 0.000$), the Huynh-Feldt correction test was used. These results indicated that there was a significant change in the passing rates between 2013 and 2017 for the schools with an F value of 5.470 (df 3.802, 935.324) $p < 0.000$. In 2013, the passing rate was

46.17%; in 2014, 47.37%; in 2015, 48.74%; in 2016, 52.53%; and in 2017, 49.55%. A Bonferroni test indicated that the 2013 and 2015, 2013 and 2016, 2013 and 2017, 2014 and 2016, 2015 and 2016, and the 2016 and 2017 pairwise means were significantly different from each other.

In the second analysis, the researcher adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. The findings indicate that when adjusted for these two school characteristics, there was no longer a significant difference in mathematics performance after the Core. The passing rates were not affected by percentage of students who were Black, or Hispanic or poor.

Table 19. Repeated Measures Analysis on 11th Grade, "Historically Underperforming" Reading Performance

Repeated Measures Analysis of Variance Race (Black/Hispanic) and SES (Econ. Disadv.)

Effect---------	MS----------	-df------------	F----------	P-------	Observed Power---------------------
Race	297.868	3.686	3.017	0.020	0.777
SES	133.358	3.686	1.351	0.252	0.405

A similar unadjusted repeated measures analysis was run using the average passing rate in reading performance for 11th grade "Historically Underperforming" students over time from 2013 through 2017. Because the assumption of sphericity was again violated by Mauchly's test ($W = 0.841$ $C^2 = 42.863$, $p = 0.000$), the Huynh-Feldt correction test was used. These results indicated that there was not a significant change in the passing rates between 2013 and 2017 for the schools with an F value of 1.244 (df 3.793, 944.432) $p < 0.291$. In 2013, the passing rate was 59.77%; in 2014, 59.54%; in 2015, 59.12%; in 2016, 63.17%; and in 2017, 58.43%. A

Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, 2015 and 2016, and the 2016 and 2017 pairwise means were significantly different from each other.

In the second analysis, the researcher adjusted the effects over time by introducing the percentage of minority students and the percentage of students considered to be economically disadvantaged as covariates. The findings indicate that when adjusted for race, a significant change occurred in test performance; however, there was no significant difference in reading performance when adjusted for economically disadvantaged students. For the percentage of minority students, the F value of 3.793 was significant at 0.019 (df 3.017, 944.4320). To fully understand the interaction, the researcher examined the correlation between race and performance each year. These correlations are reported in Table 10A. For the percentage of minority students, the correlation coefficients were -0.187, -0.218, -0.227, -0.302 and -0.331 for 2013, 2014, 2015, 2016 and 2017 respectively. The passing rates after the Core were affected by the percentage of students who were Black or Hispanic.

Table 19a. 11th Grade Reading Bivariate Correlations for "Historically Underperforming Students"

Race (Black/Hispanic) and SES (Econ. Disadv.)

Pearson Correlation…HUReadPass	2013	2014	2015	2016	2017
Black/Hispanic	-0.187	-0.218	-0.227	-0.302	-0.331

Research Question 3

How does the trend in student test scores as measured by PSSA and Keystone Exams in grades 8 and 11 mathematics and ELA scores from 2012 to 2017 vary based on the type of district; urban, suburban, town and rural?

8th Grade Performance by Locale

The researcher closely examined the school locales to determine whether the findings varied across different types of communities. The results were mixed for the 8th grade. Overall, rural and urban schools appeared to have undergone the most change. In these school settings, significant changes in the mathematics performance of all students and the "Historically Underperforming" students were evident. Among suburban schools, significant change in the larger population was detected, but was not for the "Historically Underperforming" sub-group. There were no significant changes in ELA scores from any one locale across the state's 8th grade students.

Table 20. Passing Rates in Math for 8th Grade Students

Year	Mean	Standard Deviation	Number
2015	12.41	15.37	96
2016	14.71	16.22	96
2017	28.78	17.56	96

Table 21. Passing Rates in Math for 8th Grade, "Historically Underperforming Students": Urban

Year	Mean	Standard Deviation	Number
2015	10.66	13.13	94
2016	9.54	12.21	94
2017	27.58	16.90	94

An adjusted repeated measures analysis was run using the average passing rate in mathematics performance for 8th grade students in urban schools. Because the assumption of sphericity was violated by Mauchly's test ($W = 0.831$ $C^2 = 17.364$, $p = 0.000$), the Huynh-Feldt correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for the urban schools with an F value of 41.364 (df 1.740, 165.268) $p < 0.000$. In 2015, the passing rate was 12.41%; in 2016, 14.71%;

and in 2017, 28.78%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other.

When the same analysis was run for 8th grade mathematics performance in the "Historically Underperforming" population in urban schools, a significant difference persisted. Mauchly's test was again violated ($W = 0.658$ $C^2 = 38.453$, $p = 0.000$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the passing rates between 2015 and 2017 for the urban schools with "Historically Underperforming" students with an F value of 129.157 (df 1.491, 138.639) $p < 0.000$. In 2015, the passing rate was 10.66%; in 2016, 9.54%; and in 2017, 27.58%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other. There was a slight decline in 2016, but the rate increased in 2017, and the passing rate doubled that of 2015.

Table 21a. Urban Schools' 8th Grade Math Performance

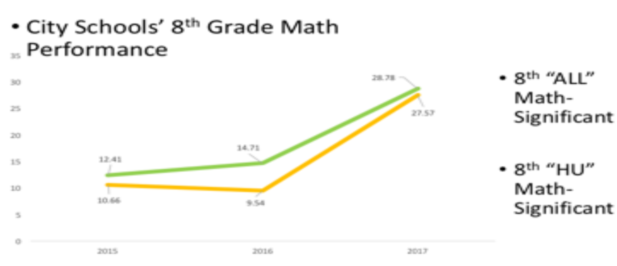
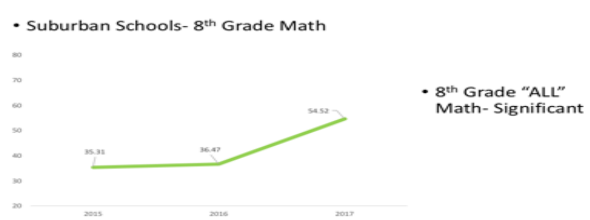


Table 22. Passing Rates in Mathematics for 8th Grade Students: Suburban

Year	Mean	Standard Deviation	Number
2015	35.31	16.59	110
2016	36.47	17.88	110
2017	54.52	12.89	110

A repeated measures analysis was run using the average passing rate in mathematics performance for 8th grade students in suburban schools. Because the assumption of sphericity was violated by Mauchly's test (W = 0.903 C^2 = 11.059, p = 0.004), the Huynh-Feldt correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for the suburban schools with an F value of 98.742 (df 1.852, 201.862) $p < 0.000$. In 2015, the passing rate was 35.31%; in 2016, 36.47%; and in 2017, 54.52%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other. Passing rates increased each year, with a 33% increase in 2017.

Table 22a. Suburban Schools' 8th Grade Math Performance



The final locale that demonstrated significant difference in mathematics performance in 8th grade was in rural schools, which did so in both the general student population and the "Historically Underperforming" student population.

Table 23. Passing Rates in Math for 8th Grade Students: Rural

Year	Mean	Standard Deviation	Number
2015	27.27	13.40	104
2016	28.99	15.31	104
2017	54.77	13.21	104

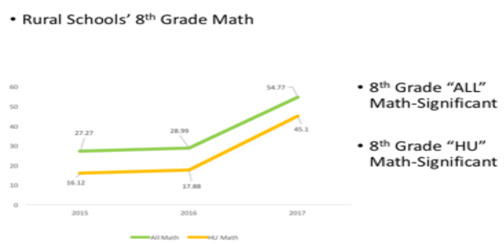
Table 24. Passing Rates in Math for 8th Grade "Historically Underperforming Students": Rural

Year	Mean	Standard Deviation	Number
2015	16.12	9.07	101
2016	17.88	8.80	101
2017	45.10	14.02	101

An adjusted repeated measures analysis was run using the average passing rate in mathematics performance for 8th grade students in rural schools. Because the assumption of sphericity was violated by Mauchly's test ($W = 0.896$ $C^2 = 11.165$, $p = 0.004$), the Huynh-Feldt correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for the rural schools, with an F value of 208.087 (df 1.843, 189.800) $p < 0.000$. In 2015, the passing rate was 27.27%; in 2016, 28.99%; and in 2017, 54.77%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other. The trend in increased mathematics scores continued in rural schools with a slight increase in 2016 and a much larger (47%) increase in 2017.

When the same analysis was run for 8th grade mathematics performance in the "Historically Underperforming" population, a significant difference persisted. Mauchly's test was again violated ($W = 0.813$ $C^2 = 20.466$, $p = 0.000$), so the Huynh-Feldt correction was used. These results indicated that there was a significant change in the passing rates between 2015 and 2017 for the rural schools with "Historically Underperforming" students with an F value of 351.564 (df 1.711, 171.095) $p < 0.000$. In 2015, the passing rate was 16.12%; in 2016, 17.88%; and in 2017, 45.10%. A Bonferroni test indicated that the 2015 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other. Once again, passing rates increased in 2016, in this case by 10%, followed by an additional 60% in 2017.

Table 24a. Rural Schools' 8th Grade Math Performance



11th Grade Performance by Locale

The 11th grade results across the state were markedly different to those of the 8th grade, as all locales, with the exception of town schools, showed significant changes in both mathematics and reading performance over the five-year period from 2013 to 2017 in their 11th grade students.

Table 25. Passing Rates in Math for 11th Grade Students: Urban

Year…………………	Mean-----------	Standard Deviation--------	Number	
2013	51.53	27.65	48	
2014	52.33	28.01	48	
2015	50.44	28.85	48	
2016	53.02	27.62	48	
2017	46.61	28.40	48	…..

Table 26. Passing Rates in Mathematics for 11th Grade "Historically Underperforming Students": Urban

Year…………………	Mean-----------	Standard Deviation-------	-Number
2013	45.06	23.80	48
2014	45.30	25.14	48
2015	44.68	25.67	48
2016	47.11	23.91	48
2017	41.34	24.82	48 …..

In an adjusted repeated measures analysis run using the average passing rate in mathematics performance for 11th grade students in urban schools, the assumption of sphericity was violated by Mauchly's test (W = 0.421 C^2 = 39.303 p = 0.000), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for urban schools, with an F value of 5.444 (df 2.827, 132.851) $p < 0.002$. In 2013, the passing rate was 51.53%; in 2014, 45.06%; in 2015, 45.30%; in 2016, 53.02%; and in 2017, 46.61%. A Bonferroni test indicated that the 2016 and 2017 pairwise means were significantly different from each other, with performance dropping in 2017. Although passing rates showed some improvement from 2013 to 2015, they decreased by 12% from 2016 to 2017.

Similarly, the urban "Historically Underperforming" mathematics students demonstrated significant change. Mauchly's test was again violated (W= .443, C^2 = 36.934, p = 0.000), so the Greenhouse-Geisser correction was use. Results again indicated a significant change in this population, with an F Value of 3.208 (df 2.769, 130.146) p=0.029. In 2013 the passing rate was 45.06%; in 2014, 45.30%; in 2015, 44.68%; in 2016, 47.11%; and in 2017, 41.34%. A Bonferroni test produced the same results as the general population, indicating the 2016 and 2017 pairwise means were significantly different from each other, with performance dropping by 12% between 2016 and 2017.

Table 26a. Urban Schools' 11th Grade Math Performance

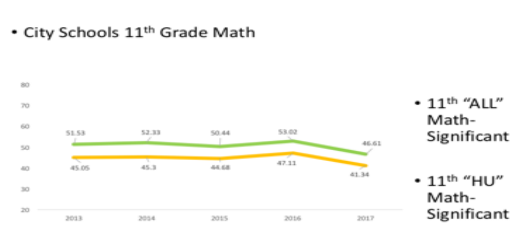


Table 27. Passing Rates in Reading for 11th Grade Students: Urban

Year	Mean	Standard Deviation	Number
2013	65.03	24.49	48
2014	64.31	25.25	48
2015	61.49	25.47	48
2016	64.41	23.21	48
2017	56.88	25.62	48

Table 28. Passing Rates in Reading for 11th Grade Historically Underperforming Students: Urban

Year	Mean	Standard Deviation	Number
2013	59.12	22.83	48
2014	57.76	23.81	48
2015	55.85	24.32	48
2016	58.90	22.01	48
2017	52.40	23.15	48

Similarities continue in the adjusted repeated measures in reading performance in the 11 grade urban schools. The assumption of sphericity was violated by Mauchly's test ($W = 0.423$, $C^2 = 39.036$, $p = 0.000$), so the Greenhouse-Geisser correction was again used. These results indicated that there was a significant change in the reading passing rates between 2015 and 2017 for the urban schools, with an F value of 7.897 (df 2.858, 134.347) $p < 0.000$. In 2013, the passing rate was 65.03%; in 2014, 64.31%; in 2015, 61.49%; in 2016, 64.41%; and in 2017, 56.88%. A Bonferroni test indicated that the 2013 and 2017, 2014 and 2017, and the 2016 and 2017 pairwise means were significantly different from each other, with performance dropping each year except for 2016, when it rose 4.5% from the previous year, ending in 2017 12.5% lower than in 2013.

The "Historically Underperforming" student performance also exhibited significant positive change. Again, sphericity was violated by Mauchly's test ($W = 0.575$, $C^2 = 25.132$, $p = 0.003$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the reading passing rates between 2015 and 2017 for the urban schools, with an F value of 4.599 (df 3.072, 144.386) $p < 0.004$. In 2013, the passing rate was 59.12%; in 2014, 57.76%; in 2015, 55.85%; in 2016, 58.90%; and in 2017, 52.40%. A Bonferroni test indicated that the 2016 and 2017 pairwise means were significantly different from each other, with performance dropping in 2017. The Historically Underperforming Students followed the same trend as their classmates, decreasing in passing rate each year except for 2016, and finishing 11% lower in 2017 when compared to passing rates in 2013

Table 29. Passing Rates in Math for 11th Grade Students: Suburban

Year	Mean	Standard Deviation	Number
2013	65.66	16.35	99
2014	65.05	17.71	99
2015	66.44	18.18	99
2016	71.08	16.83	99
2017	67.19	17.12	99

Table 30. Passing Rates in Math for 11th Grade, "Historically Underperforming Students": Suburban

Year	Mean	Standard Deviation	Number
2013	45.87	13.59	94
2014	46.43	15.05	94
2015	48.07	16.48	94
2016	53.56	15.22	94
2017	51.08	14.31	94

In an adjusted repeated measures analysis that was run using the average passing rate in mathematics performance for 11th grade students in suburban schools, the assumption of sphericity was violated by Mauchly's test ($W = 0.801$, $C^2 = 21.421$, $p = 0.011$), so the Huynh-Feldt correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for the suburban schools, with an F value of 11.937 (df 3.803, 372.677) $p < 0.000$. In 2013, the passing rate was 65.66%; in 2014, 65.05%; in 2015, 66.44%; in 2016, 71.08%; and in 2017, 67.19%. A Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, 2015 and 2016, and 2016 and 2017 pairwise means were significantly different from each other, with 2016 passing rates increasing by 7.6% from 2013, but then dropping in 2017 to finish at only 2% higher than the passing rates of 2013.

Similarly, the "Historically Underperforming" mathematics students in suburban schools exhibited significant change. Mauchly's test was again violated (W= 0.825, $C^2 = 17.622$, p = 0.040), so the Huynh-Feldt correction was used. Results again indicated a significant change in this Historically Underperforming population, with an F Value of 13.650 (df 3.872, 360.140), p = 0.000. In 2013, the passing rate was 45.87%; in 2014, 46.43%; in 2015, 48.07%; in 2016, 53.56%; and in 2017, 51.08%. A Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, 2015 and 2016, 2013 and 2017, and the 2014 and 2017 pairwise means were significantly different from each other with an increase each year that amounted to 14% by 2016 and then reduced to end with a 10% increase over 2013 scores.

Table 30a. Suburban Schools' 11th Grade Math Performance

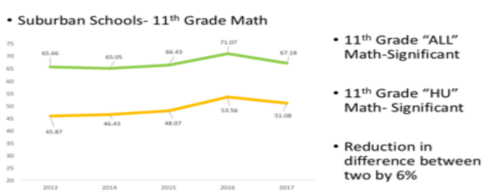


Table 31. Passing Rates in Reading for 11th Grade Students: Suburban

Year…………………	Mean-----------	Standard Deviation--------	Number
2013	74.46	15.23	99
2014	74.94	16.11	99
2015	75.12	16.13	99
2016	79.41	13.84	99
2017	74.61	14.87	99 …..

Table 32. Passing Rates in Reading for 11th Grade "Historically Underperforming Students": Suburban

Year	Mean	Standard Deviation	Number
2013	58.55	15.69	95
2014	58.42	16.78	95
2015	59.32	15.98	95
2016	64.48	13.47	95
2017	59.87	13.06	95

Like the urban schools, students in suburban schools performed better in reading than in mathematics in the 11th grade. In an adjusted repeated measures analysis that was run using the average passing rate in reading performance for 11th grade students in suburban schools, the assumption of sphericity was violated by Mauchly's test ($W = 0.700$, $C^2 = 34.430$, $p = 0.000$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the reading passing rates between 2015 and 2017 for the suburban schools, with an F value of 8.480 (df 3.484, 341.455) $p < 0.000$. In 2013, the passing rate was 76.46%; in 2014, 74.94%; in 2015, 75.12%; in 2016, 79.41%; and in 2017, 74.61%. As with the mathematics scores, A Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, 2015 and 2016, and 2016 and 2017 pairwise means were significantly different from each other, with 2016 performance increasing by 3.7% from 2013 rates, and then dropping to end with rates that were 2% lower than in 2013.

Similar results were found in the "Historically Underperforming" reading students in suburban schools, where the assumption of sphericity was violated by Mauchly's test ($W = 0.764$, $C^2 = 24.855$, $p = 0.003$), so the Greenhouse-Geisser correction was again used. These results indicated that there was a significant change in the passing reading performance rates between 2015 and 2017 for the "Historically Underperforming" students in suburban schools, with an F value of 6.546 (df 3.602, 338.576) $p < 0.000$. In 2013, the passing rate was 58.55%; in

2014, 58.42%; in 2015, 59.32%; in 2016, 64.48%; and in 2017, 59.87%. Like the general population's reading scores, A Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, 2015 and 2016, and 2016 and 2017 pairwise means were significantly different from each other in the Historically Underperforming population, with 2016 performance increasing by 9% from 2013 rates, to then falling to end 2% higher than in 2013.

Table 33. Passing Rates in Math for 11th Grade Students: Rural

Year	Mean	Standard Deviation	Number
2013	64.82	15.27	78
2014	65.06	16.47	78
2015	67.55	14.64	78
2016	70.72	15.45	78
2017	65.57	18.60	78

Table 34. Passing Rates in Mathematics for 11th Grade "Historically Underperforming" Students: Rural

Year	Mean	Standard Deviation	Number
2013	46.21	12.28	71
2014	49.21	14.98	71
2015	50.25	15.50	71
2016	54.58	14.33	71
2017	50.21	16.52	71

Finally, rural schools also exhibited significant trends in performance in both mathematics and reading in the general population in the 11th grade. In an adjusted repeated measures analysis that was run using the average passing rate in mathematics performance for 11th grade students in rural schools, the assumption of sphericity was violated by Mauchly's test ($W = 0.479$, $C^2 = 55.447$, $p = 0.000$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for rural schools, with an F value of 5.886 (df 2.877, 221.492) $p < 0.001$. In 2013, the passing rate was 64.82%; in 2014, 65.06%; in 2015, 67.55%; in 2016, 70.72%; and in 2017, 65.57%. A Bonferroni test indicated that like the other locales, the 2013 and 2016, 2014 and

2016, 2015 and 2016, and 2016 and 2017 pairwise means were significantly different from each other, with 2016 performance increasing by 8% from 2013 rates, to then drop in 2017, ending 2% higher than 2013 rates.

The same trend was found for the "Historically Underperforming" population in rural schools, whose mathematics performance in 11th grade exhibited significant changes. In an adjusted repeated measures analysis that was run using the average passing rate in mathematics performance for 11th grade "Historically Underperforming" students in rural schools, the assumption of sphericity was also violated by Mauchly's test ($W = 0.688$, $C^2 = 25.596$, $p = 0.002$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for the rural schools, with an F value of 6.346 (df 3.312, 231.811) $p < 0.000$. In 2013, the passing rate was 46.21%; in 2014, 49.21%; in 2015, 50.25%; in 2016, 54.58%; and in 2017, 50.21%. A Bonferroni test indicated that the 2013 and 2016, 2014 and 2016, and 2015 and 2016 pairwise means were significantly different from each other, with an increase in scores through 2016 (15%), and then dropping in 2017, ending 8% higher than the 2013 passing rates.

Table 35. Passing Rates in Reading for 11th Grade Students: Rural

Year	Mean	Standard Deviation	Number
2013	76.81	11.62	77
2014	75.87	12.84	77
2015	74.76	12.18	77
2016	79.00	12.31	77
2017	72.99	15.30	77

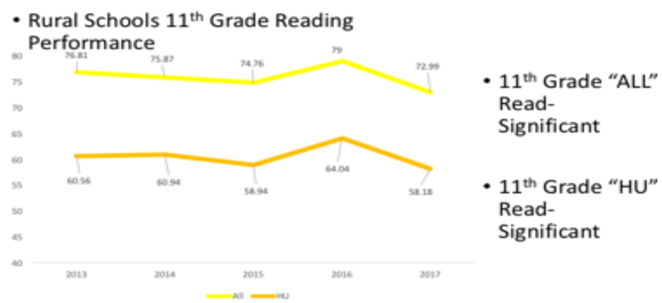
Table 36. Passing Rates in Reading for 11th Grade, "Historically Underperforming Students": Rural

Year	Mean	Standard Deviation	Number
2013	60.56	10.64	71
2014	60.94	13.07	71
2015	58.94	13.48	71
2016	64.04	11.37	71
2017	58.18	16.00	71

The trend continued with the rural school performance in reading exhibiting significant changes. In an adjusted repeated measures analysis that was run using the average passing rate in reading performance for 11th grade students in rural schools, the assumption of sphericity was violated by Mauchly's test ($W = 0.480$, $C^2 = 54.647$, $p = 0.000$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for rural schools, with an F value of 5.708 (df 2.837, 215.649) $p < 0.001$. In 2013, the passing rate was 76.81%; in 2014, 75.87%; in 2015, 74.76%; in 2016, 79.00%; and in 2017, 72.99%. A Bonferroni test indicated that the 2015 and 2016, and 2016 and 2017 pairwise means were significantly different from each other, with scores increasing through 2016 (2.8%) and then dropping, ending with rates that were 5% lower than in 2013.

The same was found in the "Historically Underperforming" students in rural schools, whose reading performance in 11th grade showed significant changes. In an adjusted repeated measures analysis that was run using the average passing rate in reading performance for 11th grade "Historically Underperforming" students in rural schools, the assumption of sphericity was also violated by Mauchly's test ($W = 0.725$, $C^2 = 21.984$, $p = 0.009$), so the Greenhouse-Geisser correction was used. These results indicated that there was a significant change in the mathematics passing rates between 2015 and 2017 for rural schools, with an F value of 3.773 (df 3.459, 242.149) $p < 0.008$. In 2013, the passing rate was 60.56%; in 2014, 60.94%; in 2015, 58.94%; in 2016, 64.04%; and in 2017, 58.18%. A Bonferroni test indicated that like the general population scores, the 2013 and 2016, 2014 and 2016, and 2016 and 2017 pairwise means were significantly different from each other, with performance increasing in 2016.

Table 36a. Rural Schools' 11th Grade Reading Performance



Chapter V

Results

Introduction

Chapter V offers a short introduction, an overview and summary of the major findings in relation to the current literature, and concludes with recommendations for future research, policy and practice. The purpose of this study was to determine the influence the CCSS had on Pennsylvania student performance in the 8th and 11th grades. The analysis was longitudinal over three years for 8th grade and five years for 11th grade and used a repeated measure design.

The findings for the first research question, which involved observing trends in 8th and 11th grade student performance for all students in mathematics and ELA/reading, demonstrated that passing rates for 8th grade mathematics had increased in each of the three years studied since the Core's implementation, with a dramatic increase in 2017. No significant changes were found for the 8th grade in ELA; however, the researcher found race and poverty to be negatively associated with 8th grade ELA scores. The findings for 11th grade mathematics from 2013 to 2017 showed a consistent increase in passing rates from 2013 to 2016, which then dropped in 2017. Reading scores in the 11th grade did not change significantly over the five years for any groups, and race and poverty showed no significant relationship to the 11th grade passing rates in either subject.

In the findings for the second research question, the researcher observed trends in mathematics and ELA/reading scores over time in the "Historically Underperforming" population. The performance of 8th grade "Historically Underperforming" mathematics students followed the trend that was evident for the general 8th grade population, increasing each year since 2015, with a dramatic increase in 2017, but in this sub-group, race negatively affected the mathematics scores of the schools. For these students' ELA performance, there was no significant change over this period; however, the racial and socio-economic composition of the schools were found to be negatively associated with the schools' ELA performance in each year. "Historically Underperforming" students' 11th grade mathematics performance increased each year following the Core implementation until 2017, when it declined. These passing rates were not significantly affected by race or poverty. The 11th grade reading performance showed no significant change from 2013 to 2017, but was significantly associated with a school's racial composition.

In the final set of findings, the researcher looked at trends in mathematics and ELA/reading scores across the state in different locales; urban, suburban, town, and rural schools. This study found significant changes in mathematics performance trends since the Common Core adoption, particularly from 2015 to 2017, when the 8th grade general population in urban schools and "Historically Underperforming" students in rural schools reported the largest gains. By 2017, the difference between the mean mathematics passing scores of the 8th grade general population and the 8th grade "Historically Underperforming" students in Pennsylvania had fallen by 10% in urban schools. However, 11th grade mathematics and reading passing rates in both populations in urban schools' scores fluctuated across all four years, leaving us with little evidence of any effect of the Core on performance at this grade level.

Passing mathematics scores for the 8th grade were highest in the suburban general population, whose passing rates consistently increased over the three years studied. The 11th grade mathematics and reading scores in suburban schools' populations also increased each year from 2014 through 2016, but declined in 2017. However, there was a reduction in the net difference between the passing rates of the general population and the "Historically

Underperforming" students since the Core's implementation. Town schools did not show any consistency in their performance. Rural schools' 8^{th} grade mathematics passing scores increased consistently over the years since the Core's implementation in both populations. By 2017, the difference between the mean mathematics passing scores of the 8^{th} grade general population and the "Historically Underperforming" students in Pennsylvania had reduced significantly in rural schools. In 11^{th} grade mathematics, rural schools reported consistent increases in all students' scores from 2013 to 2016, which then dropped in 2017. Due to the gains made before 2017, the difference between the mean mathematics passing scores of the 11^{th} grade general population and the "Historically Underperforming" students in Pennsylvania was still reduced in rural schools. Reading scores in 8^{th} and 11^{th} grades in rural schools exhibited no consistent trends.

Summary of Findings

In July 2010, a research study conducted by Carmichael et al. considered the "State of State Standards" across the U.S., and concluded that Pennsylvania standards were "among the worst in the country," with a grade of "D" for the ELA standards and a grade of "F" for the mathematics standards (Carmichael et al., 2010, p. 273-278). The state of Pennsylvania projected in 2002 that with the appropriate standards, they could set a measurable annual objective to move reading scores from 45 to 100 percentiles. As this study reveals, by 2017, PA had made progress toward this goal by raising 8^{th} grade reading scores to 55.03%. The same can be said of 8^{th} grade mathematics scores, which Hamilton cited in 2007 as expected to increase from 35 to 100 percentiles by 2014. This study found these scores to have increased to 48.19% in 2017. Prior to the Common Core initiative, Pennsylvania reported scores for 8^{th} and 11^{th} grade Black, Hispanic, and Economically Disadvantaged students to be below basic in mathematics and reading, with averages in the range of 21%, 22%, and 19% respectively. Pennsylvania was successful in increasing passing rates over the years of the study. By 2017, 8th grade Historically Underperforming Students' reading scores had risen to 41.05% and their mathematics scores to 39.97%. However, race and poverty in schools in the state of Pennsylvania still require attention, as evidenced by their effect on 8th grade mathematics and ELA, and 11th grade reading passing rates. With regard to locales, a self-reporting study by *The Council of the Great City Schools* stated that much more would be required of city schools before they would witness the outcomes expected, particularly in the country's largest urban schools (p. 43). According to the results of this study, urban schools in the state of Pennsylvania reported the largest increases in 8th grade mathematics scores, and reduced the difference in scores of the general population and the "Historically Underperforming" students in 8th grade mathematics by 10%. Although this is a laudable achievement, the 11th grade schools in Pennsylvania cities reported reductions in both mathematics and reading scores, while still minimally reducing the difference in scores of the general population and the "Historically Underperforming" students. The challenge for these schools becomes to continue that momentum, particularly in light of the NCTQ statement found in the literature, which ties half of a teacher's evaluation score to student performance on these assessments.

Recommendations for Further Research

The findings of this study could prompt several additional conversations and studies in a variety of ways. One of the primary reasons for adopting the Common Core Curriculum Standards was to address the poor performance of students in the state, reported to be in the 35-40% range. Therefore, a serious examination of the lack of success in creating any statistical difference in ELA performance in 8th grade across the state over the three years is imperative.

Passing ELA scores among “Historically Underperforming” students remain around 40%. Although the state of Pennsylvania reported slightly higher averages in 8th grade ELA than in mathematics, the lack of significant increases can be partly explained by the increasing English Language Learner population in the state (Latino students increased by 6% in 2016-2017). Policies and practices that address these learners are necessary to improve their performance.

Mathematics performance in the 8th grade has increased significantly over the last three years, but continues to remain below 50%. When comparing the significant improvement in mathematics scores among 8th graders in urban and rural schools compared to town schools, two important factors should be considered: firstly, urban mathematics scores were the lowest at the start of the study, providing much more room for growth, and secondly, the schools that were randomly selected in the study resulted in 50% more urban and 50% more rural schools than town schools.

In either case, poverty continues to be an obstacle to student improvement. There have been many studies and proposals for overcoming this obstacle, and perhaps a close analysis of particular elements addressed by schools that have successfully turned impoverished schools around should be considered. Dr. Cantor et al. suggest intentional and prescriptive attention to accountability, leadership, teaching, positive culture, extended learning time, and an added service component are critical aspects of successful and effective turn-around (Cantor et al., 2010).

Although 11th grade performance in 2017 returned to that of 2013, in 2016, improvements were reported across the state in reading performance in every group studied and in every locale. A close analysis of the actions that resulted in these improvements, which were then eliminated in the following year, resulting in scores becoming lower than in 2013, could be a high priority for all educators.

Reading performance in the 11th grade demonstrated the same results, with a significant increase in 2016 across the state in the populations studied, and decreases in 2017, without exceptions. A study into what practices used in 2016 would be useful. Furthermore, the literature that led to this study "suggests that a successful implementation of the Common Core Standards would yield significant performance gains also in PISA" (OECD, 2013). A study into the validity of this statement is in order.

Recommendations for Policy

It should come as no surprise to the reader that poverty and ethnicity play an important role in student test scores. In fact, according to Magnuson and Waldfogel (2008), "the gap (between whites and Black/Hispanics) remains sizeable and pervasive." Urban policy makers should look beyond test performance to economic development and equitable allocation of resources in order to impact the Black/Hispanic and poor students in the state of Pennsylvania. Suburban schools should adopt programs to enhance the education of their students of color. As this population grows as families move from underperforming city schools to the suburbs, it is critical that they share in the growth their counterparts in other locales are experiencing.

Conclusion

In a study that predicted the long-term effects if the Common Core was adopted, the Brown Center Report on American Education concluded "the empirical evidence suggests the Common Core will have little effect on American students' achievement," while another study by Schmidt and Houang (2012) suggests the CCSS would afford "mathematical achievement […] once appropriately implemented."

The intention of this study was to test these assumptions by determining the trend of 8th and 11th grade student performance in mathematics and ELA/reading since the Common Core was adopted in 2013 in Pennsylvania. Of particular interest was the trend in the performance of the "Historically Underperforming" students across the state, and whether the location at which a student attends school may have an effect on that performance. In the tumultuous environment in which the Common Core was adopted, there were many skeptics of the value added by the CCSS, as there may still be.

This study demonstrates that despite the many opposing views on the CCSS, many students in Pennsylvania performed better after the standards' adoption than before. Unfortunately, some of those improvements were short-lived. If educators in the state perform a deeper analysis of the practices and programs that facilitated the temporary improvements, perhaps the success can be reproduced. The students in Pennsylvania deserve such introspection.

In light of the improvement in performance over time at some grade levels and in some content areas, this study can be eloquently summarized by a statement made by Heck, Weiss, and Pasley (2011), explaining that if standards are not implemented well in particular schools, districts or states, then failure or ineffectiveness as reported using standardized tests should not be blamed on the standards.

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