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Comparing Science/Technology/Engineering MCAS Scores to Math and English Language Arts in
Different Demographics

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Submitted in Partial Completion of the
Requirements for Departmental Honors in Elementary and Early Childhood Education

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COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

Abstract

In the United States, standardized tests are used to ensure that students are provided with the same essential knowledge their peers are getting. Standardized tests not only show children's academic performance, but also demonstrate how the teachers are performing in comparison to other schools. The No Child Left Behind Act was created to help schools provide adequate resources for both the teachers and students in higher need schools. Massachusetts' standardized tests are called the MCAS (Massachusetts Comprehensive Assessment System). The MCAS allows the Commonwealth to evaluate each school's and district's results in English Language Arts, Mathematics, and Science/Engineering/Technology in the elementary and secondary grades. This thesis assesses and compares the results of the school districts of Dartmouth, New Bedford and Westport's MCAS scores in the English Language Arts, Mathematics, and Science/Engineering/Technology for grade 5, grade 8, and grade 10. I analyzed several different years for each MCAS subject and compared it to demographics of each school district to identify whether or not that has an effect on the students' scores. My goal for this thesis was to find common characteristics of schools that perform better on the Science/Engineering/Technology MCAS.

Introduction

Standardized tests came into practice in the 19th century to help monitor student's improvement in certain school subjects, later leaning towards a test that measures the intelligence of each student. Now, there are different types of standardized tests which measure a student's academic performance in comparison to other schools around the country. By monitoring a school's academic performance, the state can work towards improving the schools that

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are not serving their students well. In order to help the United States' expectations for education, No Child Left Behind (NCLB) was created in 2001 to hold schools accountable for their academic scores on standardized tests. The NCLB act focuses on schools that struggle, with the goal of advancing certain groups of children. There is an updated act called Every Student Succeeds Act (ESSA), which was signed in 2015. The act allows states to create appropriate goals that will benefit each school district. ESSA holds schools accountable for their students' progress with the goal of providing all students an equal opportunity to have a successful education. This is important because it pertains to the entire United States and is a strategy that is trying to improve all school systems.

Standardized test scores are influenced by many factors both in and outside of the classroom. A student's demographic background may have an affect on a their standardized test scores. A student's demographic background includes family income, race, population, and their developed environment.

Another factor that may have an affect on student's standardized test scores is the teacher's performance. Lloyd (2016) found that there were commonalities between teachers whose classroom's standardized test scores were exemplary. When examining these classrooms, Lloyd concluded that within these classrooms there was reinforcement, motivation, scaffolding, and self efficacy.

Standardized tests have the ability to measure a teacher's performance based on the students' scores (Lloyd, 2016).

Literature Review

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

The Every Student Succeeds Act (ESSA)

According to Zinskie (2016), although America requires equal education for all students, there are still many inequalities across students' education. Every Student Succeeds Act (ESSA), created in 2015 and first implemented in 2017-2018, is an attempt to remove the gap in students' education. Zinskie (2016) states that students who are at risk for a gap in education are students who are influenced by poverty and other outside challenges. "At risk" is described as "the inequitable conditions, challenging circumstances, or stressful situations that make it more likely for students, individually or collectively, to have poor or harmful school outcomes" (Zinskie, 2016 pg.1) Poverty should not be a reason students are not obtaining an equal education, so the ESSA helps by giving schools and students support to decrease academic failure among all populations of students.

Zinskie (2016) found that the ESSA bases a child's knowledge on more than just standardized assessments. However, ESSA does include testing on certain subjects because it advocates that the tests are a good way to monitor and compare student scores. In addition, the ESSA requires other methods of measurement to show students' academic success. It monitors student growth in elementary and middle school by providing formative assessments and non-cognitive assessments. The ESSA requires at least one form of non-cognitive assessment which may include, "student engagement, school climate and safety, attendance, postsecondary readiness, or any other that can be categorized as a measure of school quality or student success" (Zinskie, 2016 pg.2). These non-cognitive assessments help the school improve its social environment, safety environment, and readiness for proceeding onto the next grade. These assessments are important because there are a lot of factors which influence a student's success in education.

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

Educators have a big part in implementing ESSA by working toward giving students what they need to excel in their academics regardless of the outside factors which may affect them. To do so, it is important for educators to record what they observe working well in their classrooms and working toward changing the problems they see. As a result, educators may be able to improve their practices based on the evidence found.

No Child Left Behind (NCLB) Act

The No Child Left Behind Act (NCLB) was implemented in 2001 to help public schools improve their education. Ametepee (2014) addressed that the NCLB Act has affected many sub levels of the school system such as school culture, school district spending, teachers, and classroom practices. Like any type of act, NCLB had its troubles. The No Child Left Behind Act and the Common Core State Standards were put into place to improve student success and to give students the education they deserve.

Dee (2010) states that The No Child Left Behind (NCLB) Act has had both positive and negative impacts on the public-schooling systems. In conjunction with the NCLB, the Common Core State Standards (CCSS) helped guide schools into a direction of improved education among schools in a district with poverty. There were specific requirements under NCLB that the states had to follow. The districts were given money to help create success within their school community. States had an obligation to educate their students and assess them to make sure their skills were improving. NCLB gave states the opportunity to choose how they would like to go about the process though. That included coming up with a plan that worked specifically for each

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

district and school. The districts had to assess the students to prove their students were improving.

Dee (2010) found that school culture has improved due to the No Child Left Behind Act. For instance, NCLB allowed for schools to do more diagnostic testing to examine student strengths and weaknesses and use that information to help give students the necessary materials and help needed in order to achieve a positive school education. Students responded positively to this focus on a fair education, which led to a higher student engagement in learning in many high-poverty schools. Public schools received increased resources for both the students and the educators under NCLB. There was a greater improvement on math test scores amongst more socioeconomically disadvantaged groups such as Hispanics and colored students as a result. NCLB has helped public schools obtain an increase in the average school district spending per pupil. With this increase, students were able to receive more educational services.

One of the downfalls of the No Child Left Behind Act was that the act mainly focused on reading and math due to the standardized tests that were taken within those subjects. Unfortunately, that led teachers to focus mainly on those subjects, neglecting other subjects such as the social studies, art, music, and sciences. This resulted in neglecting the students' need for education within those subjects. Teachers have been able to recognize this gap and are working to improve. In contrast, NCLB gave schools the programs needed to improve students' test taking-skills, which has helped students succeed on the standardized tests they receive (Dee, 2010).

NCLB required students to achieve proficiency level by a specific time, but that was not always necessarily a realistic goal. All schools and districts are at a different

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

level, which means they are going to need different amounts of time to achieve that requirement. In other circumstances, there were incidents where schools would purposely have their school scores remain low to make sure they were going to receive money from the federal government again for the following year (Dee, 2010).

The Massachusetts Standardized Test (MCAS)

The Massachusetts Comprehensive Assessment System (MCAS) was created in response to the Education Reform Act of 1993, which introduced a curriculum framework and learning standards for each subject the students were learning throughout their education. This act established a solid foundation for education in Massachusetts. A system of standardized tests were created based on the standards and curriculum in each grade. The MCAS tests are given to grades 3-10 in public schools in Massachusetts. Specifically, English Language Arts (ELA) and Mathematics MCAS are given in grades 3-8 and 10, and Science Technology and Engineering (STE) MCAS is given in grades 5 and 8, and Biology is given in grade 10.

When students take the MCAS, they receive a Performance Level for each subject test. The Performance Levels are based on the scaled score the student receives. There are four different Performance Levels: advanced, proficient, needs improvement and warning/failing. For students to receive advanced, the scaled score ranges from 260-280, the proficient scaled score ranges from 240-258, the needs improvement scaled score ranges from 220-238, and the warning/failing scaled score ranges from 200-218. With these test scores, teachers and schools are able to provide students with more help and appropriate goals for both individuals and students as a whole. The state is also able to see different achievements from students, schools, districts, and the state all together.

Demographics

Camara (1999) pointed out that one of the biggest social problems with education is the lack of high-quality education, particularly for certain racial and ethnic groups and socioeconomic statuses. Standardized tests can show the inadequate education that students are receiving because they can be used to compare and analyze how different groups of people do, and whether or not there are underlying factors influencing the scores they are receiving. Students within the same demographic groups tend to test similarly. For example, white students tend to score higher on standardized tests compared to African Americans, Asian Americans, and Hispanics. In cases where schools had students from many different racial groups, whites and Asian Americans performed higher than Hispanics and African Americans. In relation to gender, they found that males performed stronger on standardized test scores than females, although both male and female scores increased as their age increased. More specifically, females scored higher on certain subtypes of questions than males, but overall their scores were lower than males. These scores tend to be modeled throughout a student's full education, including college.

Besides race, a family's financial income and family education has been known to influence scores. Tienken (2016) noticed that students living with higher family income and a history of education among the family members have been identified to have higher scores on standardized tests. This is especially true at the middle school level, when children undergo many changes, both physically and emotionally. Teachers often have to focus on students' academic as well as social well-being to make sure each student can perform at their highest ability. The demographics which can have an effect on a student's results include family income, poverty

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

level, and level of education their parents have. There is a significant decrease in test scores with students from a low socioeconomic class whose parents do not obtain a higher educational degree.

Tienken (2016) explains that these factors not only have an effect on student's standardized test results, but also on the school community. When a school or specific classes do not perform well on their tests, the teachers are often blamed. That is not fair to teachers because teacher performance is not the only influence on scores. The teachers whose students do not perform well and come from a low socioeconomic class are not completely at fault for the results. In contrast, when students whose parents obtain a higher family income and have a higher degree of education perform well, the teachers get rewarded even though demographics come into play and it is not completely due to the teacher's professional abilities.

Despite teachers' struggles to get students from certain demographic groups to achieve high levels on standardized tests, students' success and achievement on standardized tests *are* influenced by certain factors and practices present in the classroom. Lloyd (2016) found that standardized test scores are an indicator of how effective the teachers are at providing students with what they need in order to succeed. There were eight commonalities among teachers with successful standardized test scores. These commonalities were taken from the top classrooms whose scores increased the most. The common instructional practices existing in the classrooms receiving growing standardized achievement scores include reinforcement, higher-order questions, connection to previous learning and other content areas, community of respectfulness, academic language, classroom dialogue, student's demonstration of self-effi-

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

cacy, and print-rich environment. These instructional strategies can be used by teachers working with students from any demographic group to help students gain higher growth and achievement on standardized tests.

To conclude, minorities are less prepared for standardized tests due to underlying factors such as financial circumstances, parental education, and inadequate education in their school systems, all of which have an effect on their ability to score well on tests. Given the literature, the researcher was able to identify performance differences between three very different school systems.

Methods and Methodology

Westport Selected Population

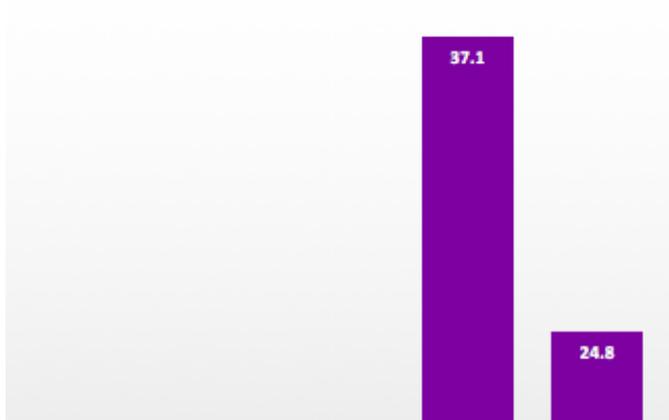


Figure 1: Westport's Selected Population



Figure 2: Dartmouth’s Selected Population

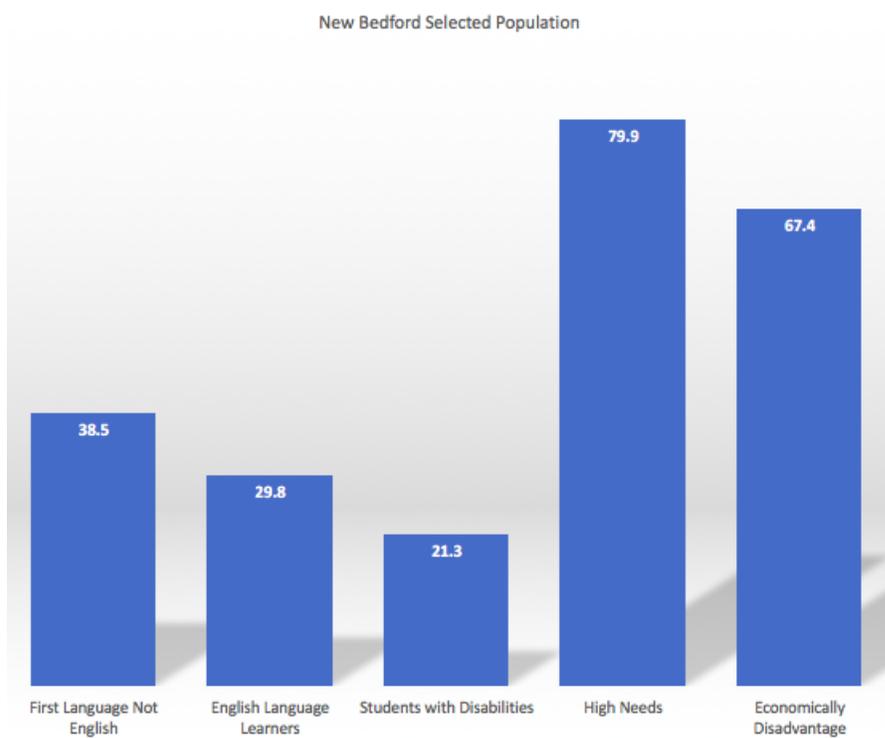


Figure 3: New Bedford’s Selected Population

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

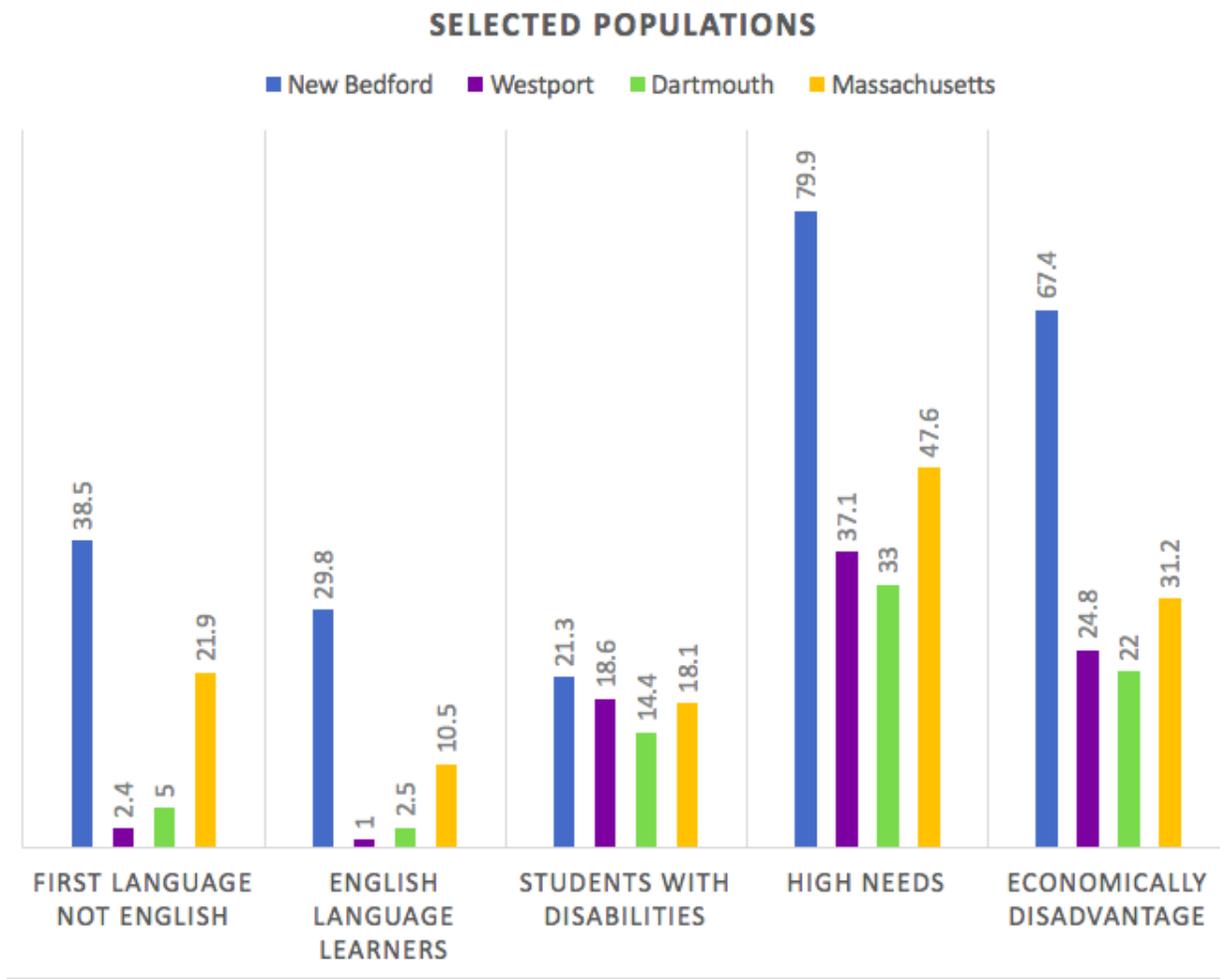


Figure 4: Westport, Dartmouth and New Bedford’s Population Compared to Massachusetts

For this study, I chose to focus on the MCAS scores of three different districts in the south coast area of Massachusetts. I chose the districts based on their demographics. I chose an urban, rural, and suburban district. Specifically, I chose New Bedford, Dartmouth, and Westport.

New Bedford is an urban city and contains the greatest population among the three districts chosen, and had the highest number of students who are at a disadvantage due to their demographic background. Dartmouth is a suburban district with population greater than

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

Westport, but less than New Bedford. In comparison to New Bedford and Westport, Dartmouth is in the middle for number of students who are at a disadvantage due to being an English as a second language (ESL) student and English language learners (ELL). Dartmouth has the lowest number of students who are considered high needs or are at an economic disadvantage. Westport is a rural town with the smallest population of the three districts. Westport is in-between New Bedford and Dartmouth for number of students who are at an economic disadvantage as well as considered high needs, but has the lowest number of students who are considered to be ELL and ESL.

Choosing schools in different areas gave me the ability to see a substantial range of data which supports demographics affecting school systems which may affect MCAS scores in Massachusetts. Growing up in the area, I was able to identify which schools in the south coast area would be beneficial to this study.

When gathering data for each district, I focused on specific grades. I chose grades 5, 8, and 10. I chose these those grades due to the fact that that's when science is tested. The science MCAS is introduced for the first time in grade 5 and then the students are not tested in science again until grade 8. Once the students reach high school, they are tested in grade 10 in biology. More specifically, I chose the years 2013, 2016, and 2018. By choosing those years, I was able to monitor the class of 2020 student's test scores for English, mathematics, and science from their first science MCAS to their last one in high school and compare their scores.

When gathering data for this study, I focused on getting actual test MCAS scores from the Massachusetts Department of Education (<http://www.doe.mass.edu>) website because this website provided me with all of the necessary test scores as well as demographic data for

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

each district for each specific year that I needed. I was able to obtain all ELA, mathematics, and science test scores for each district and year, which then I proceeded to use the data to create graphs and compare amongst the other districts. When gathering data about what affects student's standardized test scores, I started with gathering data on standardized tests and why we have standardized tests in Massachusetts. Once I had that information, I was able to identify what I needed to focus more on in each area. I then obtained information from articles that focused on what can affect schools and student's performances on standardized test scores. More specifically, I found articles on demographics such as socioeconomic status, race and ethnic groups, parental education, and the school environment.

With the use of the Massachusetts Department of Education website and other studies, I was able to come up with a conclusion that identified why certain districts performed worse or better on their MCAS scores in ELA, mathematics and science. In addition, I was able to understand why among the three districts.

Results

Overall, each school district's performance levels were very different. Dartmouth's scores had the greatest percentage of advanced scores in both the 5th grade (2013) and 10th (2018) grades. As a whole, Dartmouth's Science, Technology, and Engineering scores continue to increase over the years. Westport's scores showed that they had the highest percentage of

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

advanced scores in the 8th grade (2016). Their Science, Technology, and Engineering scores have been increasing the most since 5th grade with all improving scores. New Bedford had the highest percentage of students who received a warning and needs improvement performance level, along with the least number of students obtaining an advanced score on their MCAS. Their Science, Technology, and Engineering scores are inconsistent, and not improving greatly, but with improvement in some areas.

District 1: Dartmouth

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

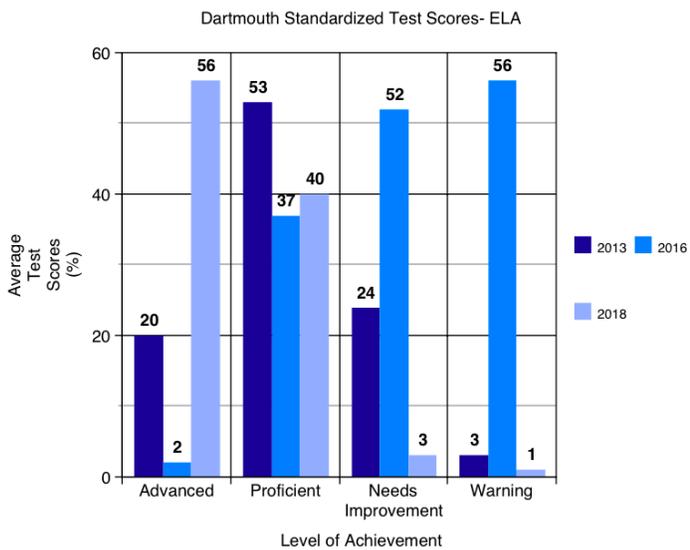


Figure 5: Dartmouth’s ELA Scores

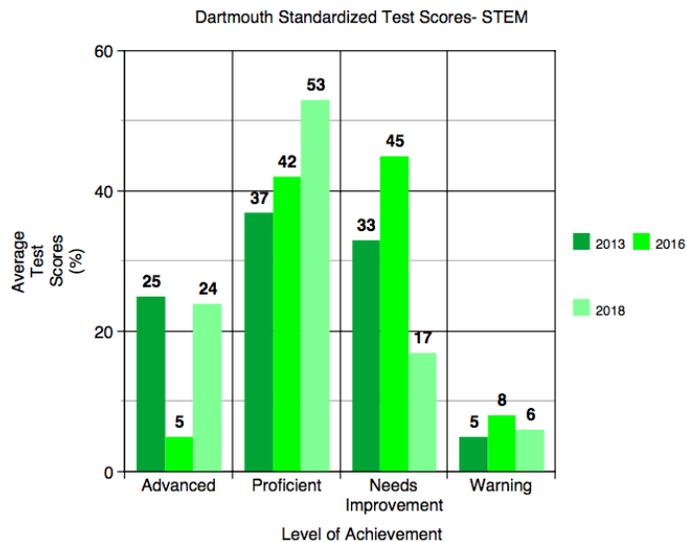


Figure 6: Dartmouth’s STEM Scores

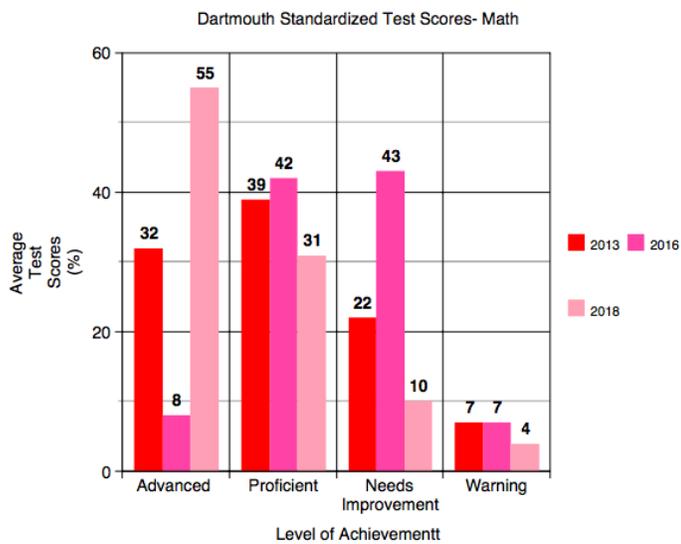


Figure 7: Dartmouth’s Math Scores

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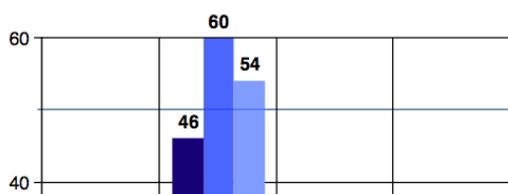
The class of 2020's ELA MCAS scores showed an improvement. In 2016, grade 8, the students had their worst year for test scores. They had the most students at needs improvement and the least number of students at advanced. The number of students at advanced was at a high when the students took their grade 10 ELA MCAS. Their scores improved drastically from 8th grade to 10th grade. The number of students at proficient stayed the same. Most importantly, due to the number of increased advanced scores, the number of students at needs improvement and warning both decreased and were both at the lowest percentage of students once they reached their 10th grade ELA MCAS.

The student's math MCAS scores had a positive outcome by 10th grade. When the students took their 8th grade math MCAS, the students again received their worst test scores, but the scores improved by 10th grade. From 5th grade to 10th grade, the number of students at advanced continued to increase. The number of students at proficient decreased slightly, but the percentage of students at needs improvement and warning were both at their lowest by 10th grade, while the decrease in students at proficient may have been because many students achieved at the higher advanced score.

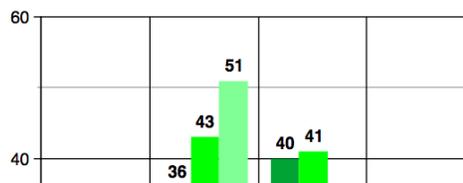
The students' science, technology, and engineering (STE) MCAS scores were not consistent, but by 10th grade the scores were much better. In 8th grade the students seemed to struggle the most, but in 10th grade the percentage of students at advanced and proficient was at its highest, and the number of students at needs improvement and warning was at its lowest.

District 2: Westport

Westport Standardized Test Scores- ELA



Westport Standardized Test Scores- STEM



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Figure 8: Westport’s ELA Scores

Figure 9: Westport’s STEM Scores

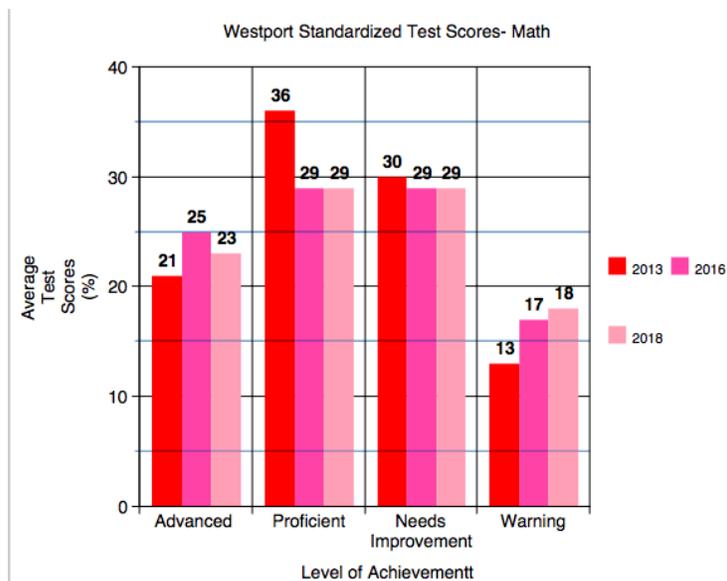


Figure 10: Westport’s Math Scores

The class of 2020’s ELA MCAS scores in Westport fluctuated. The students’ best year was in 2018 during their 10th grade MCAS, but showed great improvement from 2013-2018 overall. The percentage of students at advanced was at its highest in 2018 on their 10th grade

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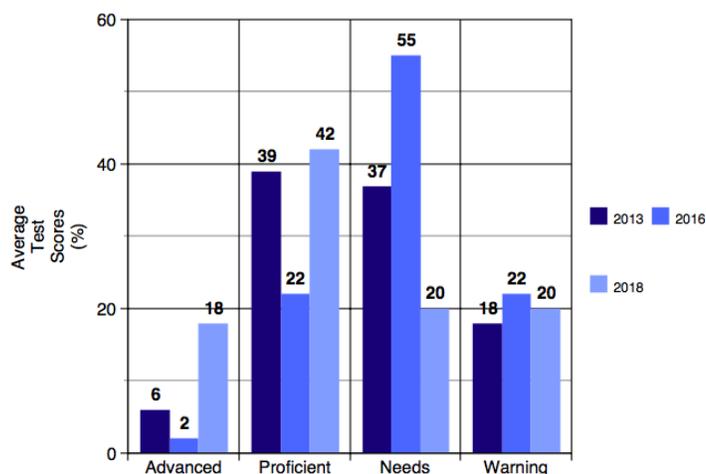
MCAS scores. The percentage of students at proficient was highest in 8th grade and then in 2018 this number decreased, although the percentage was greater than their 5th grade MCAS. The percentage of students at needs improvement continued to decrease and was at a low on their 10th grade MCAS. The percentage of students at warning went from being at a high in 8th grade, decreasing to the lowest in 10th grade.

The students’ math MCAS scores were not as successful. The number of students at advanced increased to a high in 8th grade, but then decreased in 10th grade, but still were an improvement from 5th grade. The percentage of students that received needs improvement stayed just about the same from grades 5, 8, and 10. The number of students at the warning level was at its lowest once the students reached 10th grade.

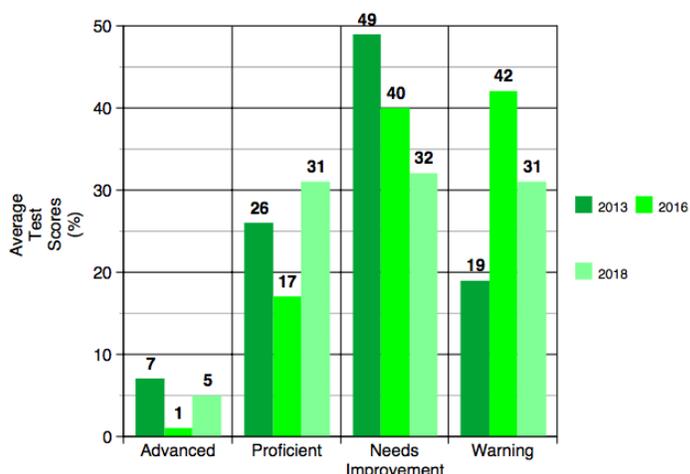
The students’ STE MCAS scores showed an improvement from 5th grade to 10th grade.. The number of students at advanced were at an all time high, with more than two times the number of students from 5th grade to 10th grade. The number of students at proficient increased from 5th grade to 10th grade. The number of students at needs improvement and warning decreased tremendously, being at a low once they were in 10th grade.

District 3: New Bedford

New Bedford Standardized Test Scores- ELA



New Bedford Standardized Test Scores- STEM



COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

Figure 11: New Bedford’s ELA Scores

Figure 12: New Bedford’s STEM Scores

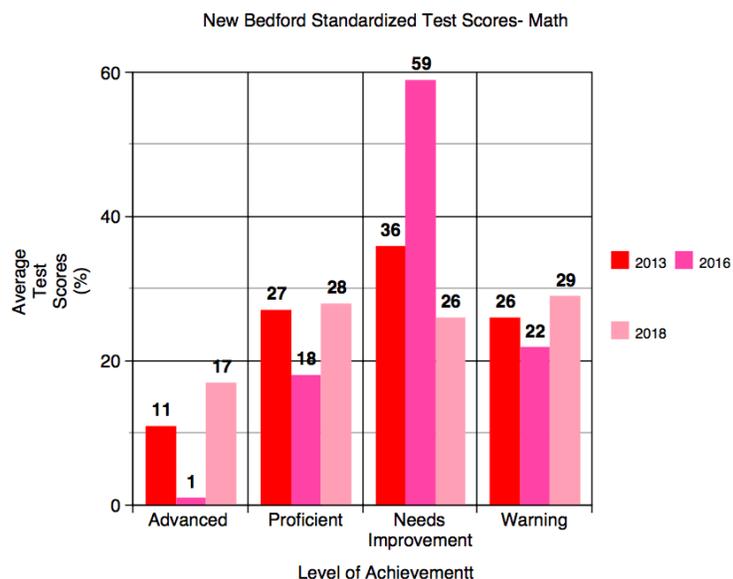


Figure 13: New Bedford’s Math Scores

The class of 2020’s ELA MCAS scores showed an overall improvement over the years. The students seemed to have done the best in 10th grade, and did the worst in 8th grade. The number of students at advanced scores was three times higher when the she students were in 10th grade compared to 5th grade, but dropped to its lowest when the students were in 8th grade.. The number of students at proficient was at its highest when the students were in 10th

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

grade. The number of students who received a needs improvement score was at its lowest in 10th grade, and the number of students at warning stayed about the same for throughout 5th to 10th grade.

The math MCAS scores were sporadic. From 2013 to 2016, the students' overall scores decreased tremendously, but when the students took the MCAS again in 2018, they managed to improve their scores. The number of students at advanced and proficient was at its highest in 2018. The number of students at needs improvement was at a low, decreasing more than twice as much as in 2018. The number of students at warning did increase to a high in 2018, but not significantly.

The students' science, technology, and engineering (STE) MCAS scores varied throughout the years. The number of students who received a score of advanced was at its lowest when the students were in 8th grade, but about the number of students received an advanced scores in 5th grade and 10th grade. Just like the number of advanced scores, proficient had around the same number of students receive a score of proficient, while in 8th grade, the number of students was at its lowest. The number of students who obtained a score of needs improvement decreased from 5th grade to 10th grade. The number of students who received a warning score was at its lowest when the students were in 5th grade, its high when the students were in 8th grade, but then the number of students decreased when they were in 10th grade. **Discussion**

Standardized testing has provided states with an adequate amount of knowledge on how districts are performing in school subjects such as English language arts, mathematics, and science. In Massachusetts, students are given the MCAS standardized tests which is broken up into

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

different subtests. Schools are then given funding, and government help based on each district's scores. This research has shown that there are many factors that come into play that may have an effect on student performance on standardized tests, including demographics such as race, gender, poverty level, and parental educational level.

When comparing an urban, rural, and suburban district, I was able to determine that demographics plays a key role in student performance levels. Of the school districts compared in this study, those that have more students, a higher population of low-income students, a large population of African Americans, and a large number of students whose parents have lower educational experiences tend to do more poorly on standardized tests such as the MCAS compared to smaller suburban or rural districts.

Although this may be the case, there are several ways we can help positively influence these outcomes on the standardized tests. When examining the English language arts, mathematics, and science MCAS scores, I noticed that there was a lack of science MCAS test scores. A lot of schools only focus on the English language arts and mathematics MCAS because they are given to students earlier than the science MCAS. Districts need to perform well on MCAS because if they do not, then they may lose funding from the state. Since the science MCAS is not given until grade 5, schools typically do not focus on the sciences until the upper elementary grades. Although this is not beneficial for the students, it is what districts feel they need to do in order to help their students succeed on the English language arts and mathematics yearly standardized tests.

According to the National Science Teachers Association (NSTA), students need to be given enough time each day to obtain "high-quality science instruction that actively involves them in

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

the processes of science". (National Science Teachers Association, 2018). Although there isn't an exact number of minutes a day students need to be learning science, the NSTA states that students should be given the same amount of time being taught science that they are being taught the other subjects, such as ELA and math (National Science Teachers Association, 2018).

A creative way for schools to spend time on science subjects without taking away from their other subjects that they find more important is to integrate sciences into other subjects. The English language arts MCAS has reading and writing on it, so a way teachers can incorporate science into student's daily routine is by giving them science articles to read or science prompts to write about. That way students are still reading and writing, but they are also learning about science. By 5th grade, students do not have an adequate amount of knowledge in science. Incorporating science into everyday discussions with the students, even while other subjects, students will start to learn what they will need to know for the science MCAS.

In the future, if we spend more time teaching science as well as integrating the sciences into other subjects, we hopefully will see an improvement on standardized testing in the sciences. This is important because in order for schools to obtain funding, they need appropriate test scores. Improving science MCAS test scores will help schools get the appropriate help needed. All of the district's standardized test scores should increase if we take these steps and put them into action. Although large, urban districts tend to have lower standardized test scores, that does not mean they cannot improve. As educators, our goals should be to provide our students with the best education that they can get and the education they deserve no matter what district they are from.

Conclusion

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

By performing this study, I was able to further my knowledge on standardized testing and what factors may have an influence on student performance. Students take MCAS testing each year, but I focused on the class of 2020's grade 5, 8, and 10 MCAS scores in ELA, mathematics, and STEM in three different districts, all with different demographic backgrounds. New Bedford is a highly populated, urban district which encounters mainly economically disadvantaged, and English language learners. New Bedford also experienced receiving the lowest MCAS scores compared to the other two districts. Dartmouth is a suburban area. Dartmouth's standardized test scores have been improving from 5th grade to 10th grade. Lastly, Westport is a rural town with the smallest population. Westport has very little English as a second language students and Westport's MCAS test scores have also improved from 5th grade to 10th grade. Choosing these three districts allowed me to notice that the three different areas experienced different scores, and their scores were able to show the influence on their demographic background.

Although Massachusetts wants teachers to focus on teaching students math and ELA, it is also important to focus on the sciences too. Science should be given the same amount of attention as math and ELA, but that may not always be possible. There are different ways teachers can provide students with science lessons. If teachers do not have time to give students science alone, science can be incorporated into other lessons such as math, writing, and reading. Providing students with more science each day will help increase STEM MCAS scores in grades 5, 8, and 10 in the future.

In order to be the best teacher possible, it is important to know your students. In the future, I hope to work in a high needs school, and after doing this research, I learned that I am going to have to take into consideration my student's demographic background when preparing

COMPARING SCIENCE/TECHNOLOGY/ENGINEERING MCAS SCORES

them for MCAS testing. I also learned that there are ways to help improve student's standardized test scores. Providing students with the proper needs and knowledge will lead to a more successful future for standardized tests.

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