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# Analysis of MCAS Scores in Massachusetts

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# Abstract

This report analyzed how the school districts of Massachusetts performed in the Massachusetts Comprehensive Assessment System (MCAS) exams for English and Math that are administered in Massachusetts and assessed possible influences on the scores of the individual cities or school districts including Per Pupil Expenditure, Teacher Salary, Per Capita Income and Geographic Location. In this report we assessed if there were improvements from 1998 to 1999 scores and determined possible trends between the different ethnic groups.

## Executive Summary

This project analyzed data to determine factors that may influence how well students score in the statewide MCAS exams for Grade 4, 8 and 10 students in English and Math.

To accomplish this, data specific to each school district was gathered and stored. The data included average scores per school district in Math and English for 1998 and 1999, per capita income, per pupil expenditure and teacher salary. One of this project's goals was to determine whether these factors and student scores had a strong correlation.

Another goal for this project was to determine how students of different ethnicities scored in comparison to one another in 1999. We based our analysis on 6 different ethnicity groups: Asian, Black, Hispanic, Native American, White and Mixed.

Another possibility we researched in this project was to determine if there existed a trend in scores between similar geographic location in terms of how populated and large a city is. We looked at the cities of Boston, Holyoke, Springfield, Worcester, Lowell and Fall River, their suburbs and how they scored in comparison to the rest of Massachusetts.

## Authorship

The Analysis of the MCAS Scores in the Massachusetts and this document represents combined and equal efforts of Tracy Quinteros and Brindha Radhakrishnan.

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# 1. Introduction

When the MCAS exams were first administered in 1998, they caused great controversy. The community was divided; while some students and teachers protested that it was not fair due to many reasons, reasons that will be discussed in further detail later in this report, others felt that the exams were a good way to judge the educational system already established. When the results of the exams were determined, many teachers felt that they and their teaching methods were being judged solely on one exam. Students will in 2003 have to pass this exam as a requirement for graduation. They also feel that one exam should not determine their future.

In this report we will review the Math and English exams that are administered in the $4^{th}$, $8^{th}$ and $10^{th}$ grade and present the data in readable form to the reader. We will also analyze the scores and view any trends that may be present and try to find some factors that we feel could possibly contribute to the MCAS scores.

# 2. Literature Review

## *2.1 1993 Education Reform Act*

The 1993 Education Reform Act was designed to improve the standards of all public schools in the Commonwealth of Massachusetts and was declared an emergency law, thus emphasizing its importance.

This act requires that committees be formed with the sole responsibility to study, analyze and deal with educational issues. The committees are to be established for the following areas:

- Early childhood education
- Life management skills and home economics
- Educational personnel
- Fine art education
- Gifted and talented education
- Math and science education
- Racial imbalance
- Parent and community education
- Technology education
- Vocational-technical education
- Global education
- Comprehensive interdisciplinary health education and human service programs

The act also requires that the members of these councils satisfy certain criteria and they are appointed for a term of three years and that no member should serve for two terms consecutively. The act also states the responsibility of each of the committee. For instance, an advisory committee was to be formed, who's core responsibility is education policy. Under this act, this committee was to study and report the issues facing higher education, public early childhood, elementary, secondary or vocational-technical schools. They were to establish the goals for the improvement of the public

education in the state of Massachusetts. While doing this they had to establish public support and understanding of education, help the increase in standard to be a smooth process from the early childhood education to higher education.

## *2.2 Curriculum Frameworks*

Continuing with the effort to improve public schools systems, Curriculum Frameworks were established by a team of teachers, administrators, parents, students, higher education faculty, and the Board of Education among others. These frameworks were designed with the purpose of being used as 'guides' for teachers of what material should be taught at different grade levels and in different classes along with different teaching methods.

The Curriculum Frameworks that are currently available are:

- Arts
- English Language Arts
- Foreign Languages
- Comprehensive Health
- Mathematics
- History and Social Science
- Science & Technology/Engineering

These frameworks are a work in progress and are considered a very powerful tool because of this - it is never considered a final and completed product. These frameworks will continuously be reviewed and revised as seen necessary. For this project, we have set our focus on the subject areas of Mathematics and English Language Arts.

### 2.2.1 Mathematics Curriculum Frameworks

The Revised Mathematics Curriculum Framework (August 20, 2000) is a set of standards created to continue advancement as per the Educational Reform Act of 1993 in Massachusetts and also Partnerships Advancing the Learning of Mathematics and Science, the statewide Systemic Initiative that was funded by the National Science Foundation. Because the Education Reform Act required all standards documents to be reviewed and revised periodically, in 1998, a Mathematics Revision Panel was appointed.

The curriculum framework for mathematics 'envisions all students in the Commonwealth achieving mathematical competence through a strong mathematics program that emphasizes problem solving, communicating, reasoning and proof, making connections, and using representations'. This set of standards were designed to help acquire these goals that were set forth. They were designed to be clear and concise and a comprehensive guide.

In the Curriculum Frameworks, teachers and faculty members can find Guiding Principles that can aid in the teaching plan of teachers. These guidelines include: Learning, Teaching, Technology, Equity, and Assessment.

The framework also provides specifics as to the material that should be covered by grade or course. The learning standards are organized by two year grade spans. They are Pre-Kindergarten-Kindergarten, 1-2, 3-4, -6 7-8, 9-10 and 11-12. It states specific topics and material that students should be familiar and comfortable with by the time they advance to the next grade level.

### 2.2.2 English Curriculum Frameworks

Adopted in 1997, the English Curriculum Frameworks' goal is to "teach learners how to reason and use language purposefully as they comprehend, construct, and convey meaning." This framework is designed to let educators explore the strengths and weaknesses of different teaching methods or approaches. Ultimately it would be the decision of the teacher to decide when what method is appropriate for teaching.

One very strong goal that is set by the English Curriculum Framework is that 'every child entering Kindergarten or first grade in Massachusetts will be able to read and write at grade level in the English language by the end of the third grade.'

The English Curriculum is divided into three learning standards:

- Language Strand and Learning Standards
- Literature Strand and Learning Standards
- Composition Strand and Learning Standards and
- Media Strand and Learning Standards

The curriculum framework, although not as in depth as the mathematics curriculum, gives sample passages so as to children can compare and see what level of reading they should be at at the end or beginning of each scholastic school year.

## *2.3 MCAS*

MCAS was also implemented in response to the Massachusetts 1993 Educational Reform Act. It was implemented to improve the standard of the educational level throughout Massachusetts. This act requires that the students of grades 4, 8 and 10 be tested on the different major subjects. These tests are based on the material that should be covered according to the Massachusetts Curriculum Framework learning standards. It also states that all $10^{th}$ grade students need to pass this exam in order to obtain their high school diploma as of the year 2003.

Presently MCAS is tested in the following four areas

- English Language Arts
- Mathematics
- Science & Technology
- History and Social Science (grade 8 and grade 10)

The first MCAS exam was given in 1998. Students who attend public school, which includes students in charter schools, institutional school programs, educational collaborative, receiving publicly funded special education in private schools, with disability who either have an Instructional Education Program (IEP) or receiving instructional accommodations, and who have limited English proficient (unless they

have been enrolled in United States schools for a few years and who are ineligible for the Spanish-Language version of MCAS) had to complete these exams.

The exams consist of multiple-choice questions, short-answer questions (only in Mathematics tests), Open-ended questions, and writing prompts (used only in English language Arts tests). The exams were graded using the four performance levels that are defined by the board of education. The four performance levels are:

***Advanced*** – this is the highest grade that a student could obtain. At this level students are known to have an in-depth understanding of the subject and they are able to provide solutions to complex problems.

***Proficient*** – at this level students have the ability to understand challenging matters of the subject and are able to solve variety of problems.

***Needs improvement*** -- means that students demonstrate a partial understanding of the subject matters and are capable of solving simple problems.

***Failing*** – this is the lowest grade that could be obtained and it means that the students demonstrate very minimal understanding of the subject and are unable to solve even simple problems.

Results are generated for individual students, individual schools and school district. The same grading standard (the four performance levels) is used to grade the individual schools and the school districts. These results are used to improve the teaching and the learning standards of the schools. This will help parents to monitor the individual student progress as well as give them the opportunity to track the standard

and the progress of the school. Educators are able to use these results to identify the strength and the weaknesses in the curriculum system and also the teaching methods.

## *2.4 MCAS Controversy*

From the time MCAS were first introduced to the public, parents and teachers criticized MCAS exams. The MCAS exams have been a topic of controversy ever since, especially since it will soon be a requirement for graduation. The following are the commonly hear criticisms of MCAS and their rebuttals:

1) Exams are difficult – The purpose of these test are to improve the standard of the public schools. The exams contain a variety of simple to difficult questions.
2) Results come back late --The results were not provided until early December in 1998. But in 1999 the results were sent to students, item-by-item, in September. The aim of the board of education is sent out the Grade 10 scores first and that all grades to be send out by the beginning of the school year. Besides these, the scoring takes time since about 6 million of the answers need to be individually scored. All the papers need to be optically scanned and about 100's of computers are needed to score the papers. Besides that million of reports need to be printed and sent out. These are the biggest causes for this criticism.
3) Little time to teach and learn standards – These standards have been in place for some years. Grants were given out to get additional help. The board of education provided professional development and other measures were taken to educate the educators and the student to achieve better results in the past seven years.

4) Students with disability are at a disadvantage – accommodations have been made for these students. They are given additional time to finish the exam and other alternate assessments programs are available.
5) Vocational Students are at a disadvantage – It is the belief of the Department of Education that all students should have the basic knowledge of the matters that are covered in the MCAS exams.
6) Students with Limited English are at a disadvantage – These students are not tested for the first three years of their schooling carrier in the United States. Other than the English test, the others are offered in Spanish as well. The department of education is developing an ESL test for these students.
7) Tests are too long – in 1998 the test lasted in the range of 10-13 hours. This has been brought down significantly to a range of 6-11 hours. It is also in consideration that beginning 2001 that elementary students don't take more that two state exams a year.
8) Not fair for the poor students – Grants have been provided by the government to schools to conduct extra tutoring and also the matter are being consider by the department of Education at the present.
9) Wastage of money – another kind of exam like the off-the-shelf test cannot be given as since would not go with the framework also cheating would be more likely. It would not be possibly to diagnose as well. The costs are comparatively cheaper than other exams like SAT.
10) Teacher are teaching to the test – This exams just set the guide lines for the material that needs to be covered.

11) Graduation based on one test – This is a requirement stated in the act. Passing this exam is a requirement for the 10th graders. This would help establish a standard for graduation. Appeal processes have been looked into and will be in place soon.

12) Students who fail – These students are allowed to re-take the exams. Other measures have also been taken like local certificates, assistance, educational assistance plan and Community College Safety Net.

# 3. Methodology

We both decided that in order to successfully complete this analysis, we first should establish the individual steps that needed to be taken and what we wanted to accomplish in each. We were able to break our project up into 4 phases.

1. Definition of Problem & Goal
2. Data Collection
3. Data Organization
4. Data Analysis
5. Report Findings

## *3.1 Definition of Problem & Goal*

Before proceeding with our project, we first finalized our goal for this project. Although these contain an abundance of information on our school systems and communities, we decided to limit our project of MCAS Scores analysis to the following 3 areas:

1. To find whether correlations exist between scores and:
   a. Per Pupil Expenditure
   b. Per Capita Income
   c. Teacher Salary
2. To find possible trends in scores between different geographic regions
3. To find possible trends between different ethnicities

## *3.2 Data Collection*

Before collecting the data needed for these analyses, we first listed the data determined to be essential.

- Listing of School Districts in Massachusetts
- MCAS Scores By School District and Ethnicity
- Per Capita Income, Average Teacher Salary and Per Pupil Expenditure per School District

## *3.3 Data Organization*

After gathering all necessary information, we found that the amount of data was substantially large. We decided the best way to organize the data would be in a spreadsheet. Using Microsoft Excel, we created 6 worksheets, all of which can be found in Appendices 1.1 through 1.6. Each of these sheets contain scores for English or Math for Grades 4, 8 and 10 and all sheets contain information on the city or school district, including Per Capita Income, Per Pupil Expenditure and Teacher Salary. All information that was available was included in these spreadsheets.

Since a number of cities in Massachusetts do not have their own school districts, they form regional schools with neighboring cities or towns. For these cities we have the Per Capita Income but do not have any of the other information and likewise for the regional schools we only have information pertinent to School Department and no the cities that constitute it. To keep a record of city and town makeup of each regional school, we created an additional chart containing the names of the cities and towns that do not have their own school department and the school district they belong to. This chart can be found in Appendix 2.1.

### 3.3.1 To View Results Per School District

To display the data, we chose to plot the data in a bar chart that showed the Math scores and the English scores for each school district per year. This chart helps visualize which subject the school district is stronger in. These charts can be found in Appendix 3 (3.1-3.12).

We found that the easiest way to visualize the improvement or lack of improvement in the MCAS scores would be to graph both 1998 and 1999 scores adjacent to each other on one graph sorted by school district. This will allow us to view both scores simultaneously and thus make it easier to compare (Appendix 4 – 4.1 to 4.6).

### 3.3.2 To Find Correlations

One of the goals of this project was to determine if there was a relationship between the scores and the per capita income, per pupil expenditure, and/or teacher salary. We decided to analyze any possible trends or tendencies for different ethnicities of the students. We found data for some of the cities for their Asian, Black, Hispanic, Native American, White and Mixed students. Other cities did not disclose this information therefore we used the data that we found and tried to find patterns.

To find any possible correlations we used the Data Analysis Tools (available under 'Tools' – 'Data Analysis' from the menu bar) in Microsoft Excel to find the correlations that depicts whether the two variables affect one another.

From the Data Analysis box we selected 'Correlation' and in 'Input Range' we selected the 'City Name' '1998 Score', '1999 Score', 'Per Capita Income', 'Per Pupil

Expenditure', 'Teacher Salary', 'Asian', 'Black', 'Hispanic', Native American', 'White' and 'Mixed' for all cities using one sheet of data at a time. One sheet of data includes information for one grade and one subject (Math or English). We grouped the information by rows and checked the box 'Labels in First Column'. In MS Excel, an error that we came across was 'Correlation – Input range contains non-numeric data'. This error was given because there were some schools on our list that were missing information for any of the above listed data series. In order for Excel to find the correlations we had to purge the data sheets of rows (or cities) that had any of the listed information missing. Unfortunately there were a substantial number of cities that had to be taken out of the data sheets for each set of correlations. Once the data was copied into another sheet and cleaned to meet the requirements of Microsoft Excel, the above procedures were once again executed. The results can be found in Appendix 5 (5.1-5.6).

### 3.3.3 To View Results by Geographic Location

To view possible geographical trends, we decided to color code the scores and color a large map of Massachusetts with the individual cities outlined for $4^{th}$ and $10^{th}$ grade scores. Each score range (Failing, Needs Improvement, Proficient and Advanced) was assigned a color and the cities were colored the corresponding color for 1999 English scores. The cities were also outlined in the corresponding color for their 1998 scores; this allowed for easy comparison or the scores. These two maps also contain the score ranges for Math for the different school districts. We assigned the

different possible combination of ranges (the range for 1998 scores and the range for 1999 scores) a pattern that was used to outline the city or town according to their results.

# 4. Data Analysis

The charts listed In sections 3.1 through 3.12 in the Appendix sections of this report show the scores of individual School Districts per Grade ($4^{th}$, $8^{th}$ or $10^{th}$) for 1998 and 1999. In this section, we will analyze the overall scores.

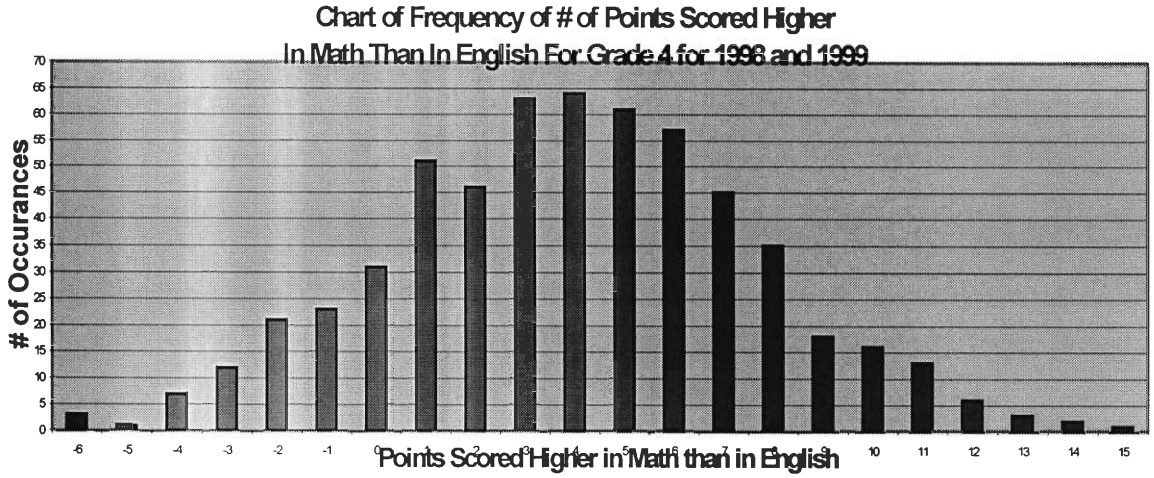
We will then determine if there is any correlation between the scores and Per Pupil Expenditure, Per Capita Income, and Teacher Salary.

We will also determine if scores may be reflected by geographic location and how students of different ethnicities do in comparison to each other.

## *4.1 Overview of Scores*

### 4.1.1 Results for Grade 4

When looking at the overall results of $4^{th}$ graders in the 1998 and 1999 MCAS exams, it was surprising to see that there was a consistent tendency for the Math scores to be higher than the English scores. For English, the scores ranged from 220 to 241 in 1998 and 221 to 242 in 1999; and for Math, the scores ranged from 216 to 252 in 1998 and 271 to 253 in 1999. The range of scores did not change much from 1998 to 1999 for both subjects. On average, students scored about 4 points higher in their Math exams than in their English exams in 1998 and 4.04 points in 1999. The following chart shows the range in score difference between Math and English scores. The positive numbers reflect the points scored higher in Math than in English and how many times each difference occurred throughout 1998 and 1999.



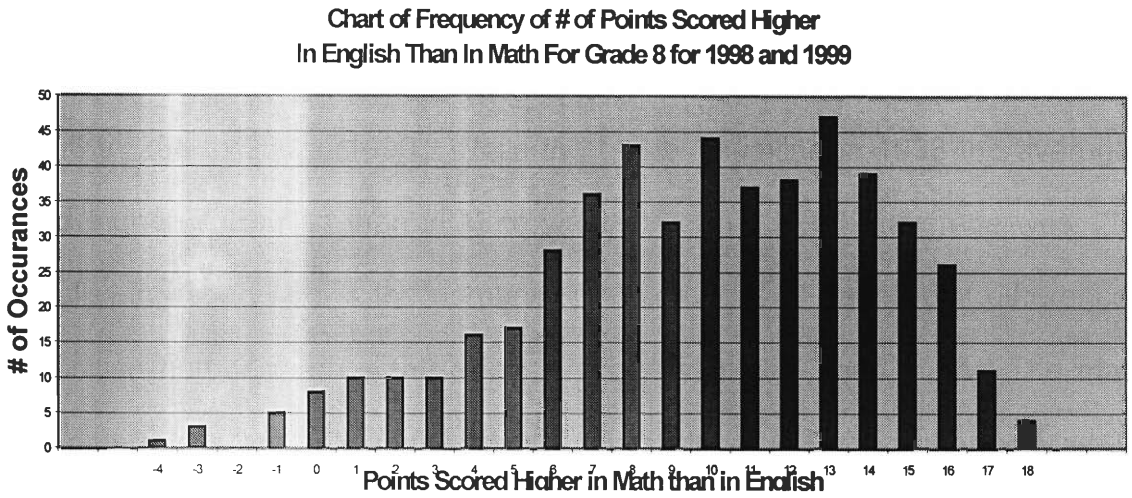

Based on this chart it would be safe to say that students scored generally between 0 and 8 points higher in Math with the minimum being –6 and the maximum being 11.

The first two graphs (Appendix 4.1 & 4.2) shows that the range for the changes in scores is not very high. The variation in scores is minor. Most school districts tend to have improved in their scores for both math and English by a marginal amount. Other than for the few school districts: Whatley, which has improved by 16 points, Leveret, which had improved by 15 points, most school district that have improved has been in the range of 0 to 6. The school districts that have gone down in their standards have been in the range of 0 to –9. Overall, the two graphs for Grade 4 shows that most school district have improved their scores in 1999 both for Math and English.

### 4.1.2 Results for Grade 8

The score results for grades 8 and 10 showed a different trend than grade 4 results. The 1998 and 1999 results show that student generally did better in English than in Math. For 8$^{th}$ grade in 1998, the range for English was between 223 and 251 and did not change for 1999. The range for Math did, however, change from 205 to 254

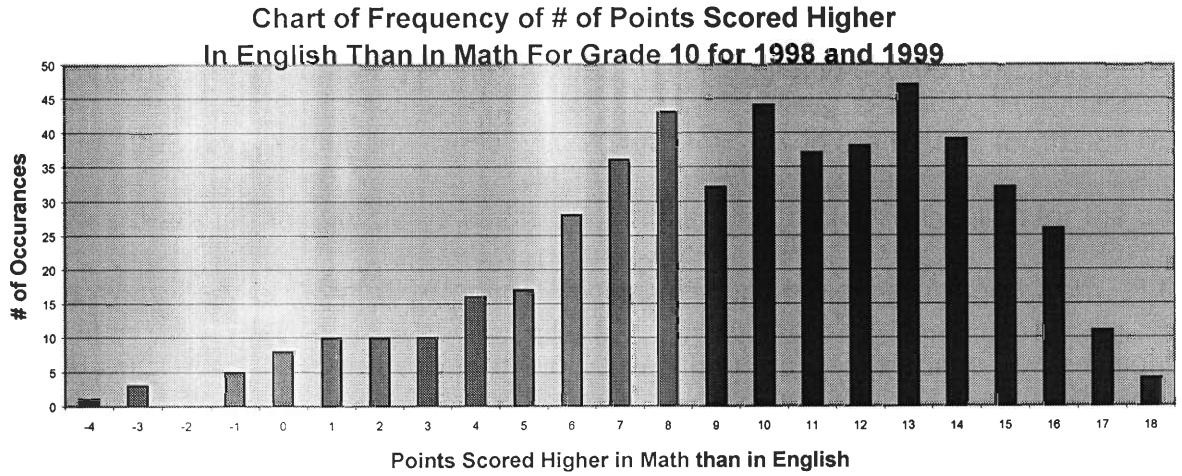
in 1998 to 208 to 250 in 1999. While the range is similar, in 1998 the average points scored higher in English than in Math was 9 and in 1999 the average was 11 points. The following chart shows the number of occurrences of each point difference where the positive numbers are points scored higher in English than Math. The majority of score differences are between 6 and 16 points higher in English than in Math with not many school districts' Math averages being better than their English.




The next two graphs (Appendix 4.3 & 4.4), the changes in MCAS scores from 1998 to 1999 for grade 8, illustrates that in Grade 8 most school districts have improved in English than in Math. The range for the changes in scores is much wider than for grade 4. Most school district seems to have improved by a little margin. Sudbury has increase by the largest amount, 27 points. Fitchburg seems to have decrease in standard by 18 point for English and by 33 points for Math compared to all the other school districts for Grade 8. One could also see that most of the school districts seems to either simultaneously increase or decrease score for Math and English though the improvement in the math scores are generally better than English scores if there is an improvement or worse than English if there is decline in scores.

### 4.1.3 Results for Grade 10

The score results for grade 10 are similar to that of grade 8. Again, on average the scores were higher for English than Math with the average points scored higher in English being 9 in 1998 and 7 points in 1999. The ranges in scores for English are 208 to 250 in 1998 and in 1999 the range was 204 to 248. As in the results for the 8th grade, it appears that the majority of the average points scored higher in English for the school districts were between 6 and 16 points. The difference in scores ranged from –3 to 18 in 1998 and –4 to 18 in 1999 with the positive numbers being points scored higher in English than in Math.




The graphs of changes in 1998 to 1999 MCAS scores per school districts depicts how each grade did compared to the previous year, both in English and Math.

For Grade 10, the graphs in Appendix 4.5 &4.6, change in 1998 to 1999 MCAS scores per school district, implies that the range in the variation is substantially wider than for grade 8. It also shows that the students of grade 10 have improved, in general, more in Math than in English. As we saw for grade 8 the Math and the English scores

seems to move simultaneously, whether there is an improvement or a decline in scores. In the average change in scores for English, there seems to be a decline of 1 point and for the average change in Math there seems to be an improvement of 1point. Cohasset has improved considerably higher than the other school districts for both Math (by 42 points) and English (by 43 points).

## *4.2 Correlations*

The correlation results that we found with the 1998 and 1999 MCAS scores can be found in section 5 of the Appendices. These charts are from a Microsoft Excel file in which we used the Analysis tool to find the correlation numbers. The correlations were found per subject for each grade; therefore, each grade level has 2 correlation charts, one for English and one for Math.

When interpreting the data in the charts provided, it is important to understand that the value '1' in any particular cell signifies that the correlation is the highest – that the column data and the row data are somehow related. If the value in the cell is closer to '0', then the correlations between the two sets of data are not related in the least.

When discussing correlations for each of our three variables, we will compare the results among the three grade levels and also compare changes from 1998 to 1999.

### 4.2.1 Per Pupil Expenditure

According to the Massachusetts Municipal Profiles for 1999-2000, the Per Pupil Expenditures for school districts that are non-regional range from a low of $3,311 in

Lakeville to a high of $11,808 in Rowe with the majority of school districts opting for an amount that is between $4,500 and $6,500.

For grade 4 English scores for 1998 and 1999, the correlations are 0.128 and 0.131 respectively. The grade 4 Math scores for 1999 also resulted in the same range, the correlation was 0.193 and for 1998 it was 0.003. These results are significantly low and we can establish that for grade 4 students, the amount of money that is allotted per student per scholastic year has relatively no relation to the scores that are attained in the MCAS Exams.

For grade 8, in 1998 the correlations between the scores and per pupil expenditure for Math and English were 0.100 and 0.068 respectively and in 1999 these figures were 0.303 and 0.261 respectively. Like the results for grade 4, the correlation values are fairly low and signify that there is no relation present between MCAS scores and the amount that is spent on the student.

Grade 10 also experienced similar results with the correlations between the scores and per pupil expenditure for Math and English being 0.005 and 0.022 respectively in 1998, and 0.271 and 0.100 respectively in 1999.

Overall, these results were much lower than was expected, however, they were consistent among our six different correlation tables.

### 4.4.2 Per Capita Income

The Per Capita Income in Massachusetts is very inconsistent throughout the state with an average of $17,841 and a median of $16,622. The lowest per capita income is $9,686 in Lawrence to a high of $46,855 in Weston. It was possible that if a

parent or parents are financially successful, then the children will perform better in school and thus these exams for various reasons. To determine the relationship between income and scores, we found the correlation values.

For grade 4 scores, 3 out of our 4 correlation charts resulted in a relatively high correlation values. For English scores in 1998 and 1999 the correlation values were 0.6789 and 0.6779 respectively and for Math the correlation values were 0.349 and 0.661 respectively. This led us to believe that the family income could possibly have an affect on a child's score.

Our results for grade 8 were a little contradictory and could either support or destroy the concept that income has a relation to scores. For 1998 scores the correlation results for Math and English were –0.095 and –0.096 respectively. We did not expect Per Pupil Expenditure to influence MCAS Scores more than the other variables and were surprised after reaching the results we did for Grade 4; however, the results for 1999 were very surprising. The correlation values found for English and Math in 1999 were 0.728 and 0.791 respectively. This supported our general conclusion from Grade 4 that income may affect a child's score.

The results for Grade 10 are very similar to the results found for Grade 8. Again, in 1998 the correlations were extremely low at 0.017 for English and 0.026 for Math. The values for 1999, again, were almost the opposite of 1998 with a correlation value of 0.712 for English and 0.778 for Math.

Overall, we determined that Per Capita Income does have a positive correlation with MCAS scores. The reasons for the low and even negative correlations in 1998 for grades 8 and 10 are exceptions and might possibly be due to inaccurate data based on

alterations that had to be made to the data in order to correlate it as was explained in the Methodology.

### 4.4.3 Teacher Salary

For this project, one of our goals was to determine whether a teacher's salary could have a positive relationship with MCAS Scores. We thought it would be possible that if a teacher gets paid more, they might be more motivated in the classroom and therefore have a more motivated class. The median of average teacher salaries in the public schools in the state of Massachusetts is $42,734 as of the 1999-2000 school year. The range of average teacher salaries per school district start at $19,435 in Tynesborough and has a high of $59,730 in Concord.

Math and English scores for grade 4 students in 1998 and teacher salary had a correlation of –0.006 and 0.029 and in 1999 these correlations did not change significantly with correlations of 0.057 and 0.032 respectively. Again to our surprise, it was looking as if teacher salary and the test results had no relation. We compared these results with our results for grades 8 and 10.

For grade 8 students we reached the same conclusion as we did with grade 4. The correlations for 1998 Math and English were –0.004 and 0.011 and in 1999, they were 0.342 and 0.289 respectively. These results were in line with what we had found in grades 4 and 8.

Overall these correlations did not support the theory that teacher salary could have a significantly positive relationship with MCAS Scores. Out of three speculations, the variable we least expected to have a strong correlation with the scores was the only one. Both Per Pupil Expenditure and Teacher Salary did not show any influence on the

test results while Per Capita Income showed the opposite. Some mathematicians feel that a correlation of between 0.8 and 1 is a strong correlation; so while the correlation for Per Capita Income and MCAS Scores are not in that range, they are still significantly higher than both other variants.

## *4.3 Scores by Ethnicity*

This will be a summary of how the students of different ethnicities scored in comparison to one another in the subject of Math and English. Unfortunately for this section, the amount of data that we could find was not significant. Our only source of data for this section was found on the web site for the state Department of Education and this site only had results for the 1999 school year listed. The complete listing of scores for students of different ethnicities can be found in section 1 of the Appendices.

Apparently most school districts chose not to disclose this information, or these school districts do not students of non-white ethnicities enrolled in their public schools. Based on these restrictions, our results are based on a relatively small amount of data.

### 4.3.1 Grade 4

For grade 4 students, the average scores for the state for English ranged from 243.1 to 223.8. A score of 243.1 is considered *Proficient* and a score of 223.8 is considered *Needs Improvement*. The Math score results ranged from 224.0 to 243.9.

Of the 6 major ethnic groups that information was made available for, Asian students averaged statewide a score of 243.1 (*Proficient*) in English and 243.9 (*Proficient*) in Math, which is the highest in both subjects. White students scored an

average of 233.5 (*Needs Improvement*) in English and 238.0 (*Needs Improvement*) in Math, which is second highest. Mixed students followed white students and Hispanic students followed after with Native American students averaging a score lower than the other ethnicities.

| | Asian | Black | Hispanic | Native American | White | Mixed |
|---|---|---|---|---|---|---|
| English | 243.1 | 226.0 | 224.5 | 223.8 | 233.5 | 230.9 |
| Math | 243.9 | 225.3 | 224.8 | 224.0 | 238.0 | 234.5 |

* This chart lists the statewide average score for the different ethnicities

### 4.3.2 Grade 8

The different ethnicities' average scores ranked the same for grade 8 students as for grade 4 students. Asian students averaged the highest scores with 241.1 (*Proficient*) in English and 236.3 (*Needs Improvement*) in Math. Native American students again averaged the lowest score with a 226.0 (*Needs Improvement*) in English and a 211.0 (*Failing*) in Math.

| | Asian | Black | Hispanic | Native American | White | Mixed |
|---|---|---|---|---|---|---|
| English | 241.1 | 230.7 | 227.5 | 226.0 | 241.0 | 237.4 |
| Math | 236.3 | 214.0 | 211.9 | 211.0 | 230.8 | 224.7 |

* This chart lists the statewide average score for the different ethnicities

### 4.3.3 Grade 10

The average scores for the different ethnicities for grade 10 students are almost identical to the past grades with the exception that Native American students score better than Hispanic students in both English and Math.

Asian students again averaged a score higher than the other ethnicities. Asian students score a 233.6 (*Needs Improvement*) in English and a 234.6 (*Needs Improvement*) in Math. Hispanic Students averaged a score of 217.0 (*Failing*) in English and a 208.8 (*Failing*) in Math.

| | Asian | Black | Hispanic | Native American | White | Mixed |
|---|---|---|---|---|---|---|
| English | 233.6 | 221.8 | 217.0 | 221.5 | 232.3 | 227.5 |
| Math | 234.6 | 211.1 | 208.8 | 210.6 | 226.4 | 220.7 |

* This chart lists the statewide average score for the different ethnicities

It is interesting to see that there is consistency with how the average scores of the different ethnicities compare to one another. We feel that this gives the results more credibility. We found it very interesting that Asian students averaged a score higher than the other ethnic groups in both subjects and in all grades.

## *4.4 Scores by Geographic Location*

As described in detail in the Methodology, we decided to color code the different score categories (Failing, Needs Improvement, Proficient and Advanced) for English scores. The color the city is coded represents 1999 scores and the outline color

represents 1998 scores. We decided to designate one of the two maps for Grade 4 results and the other we designated for grade 10 results. Also available on these maps were the combination of 1998 and 1999 Math scores, which were represented by the appropriate outline pattern as is listed on the map.

Since cities with a higher population tend to have more problems with the school system and more importantly inadequate funding, we felt that larger cities would have a lower score than other school districts that are more suburban or rural. We used these maps to visualize the MCAS scores by school district/cities.

### 4.4.1 Grade 4

When looking at the more populated cities in Massachusetts, specifically Boston, Fall River, Holyoke, Lowell, Springfield and Worcester, we found that in 1999 all of these cities scored on average a *Needs Improvement* on both the English and Math exams. Two of these cities, Boston and Holyoke, showed improvement from 1998 to 1999 in Math, having average a *Failing* previously.

Looking at some of the Boston suburbs, such as Watertown, Cambridge, Milton, Brookline and Quincy, we found that they very well in the MCAS scores especially in Math. All of these cities received on average a *Needs Improvement* in English in both 1998 and 1999. Cambridge also received a *Needs Improvement* in Math in 1998 and 1999 while the other cities all received a *Proficient* in Math in 1999. Watertown improved from a *Needs Improvement* the year before while Brookline and Milton received *Proficient* also the year before.

The suburbs for the city of Worcester, the second largest city after Boston, also performed well. Shrewsbury, Auburn and Leicester all averaged a *Needs Improvement* in both English and Math in 1998 and just English in 1999. That year both Shrewsbury and Auburn averaged a *Proficient* in Math.

Lowell's suburbs' performance was very similar to Boston and Worcester's suburbs. Tewksbury, Dracut and Chelmsford all averaged a *Needs Improvement* in English in 1998 and 1999. Dracut and Chelmsford averaged a *Proficient* in Math in 1999 and Tewksbury's average in Math lowered to a *Needs Improvement* in 1999 from a *Proficient* in 1998.

Fall River's suburbs of Freetown, Dartmouth and Westport all scored *Needs Improvement* in Math and English in 1998 and 1999. Westport was the only exception with having dropped from a *Proficient* in Math in 1998 to a *Needs Improvement*.

Springfield and Holyoke are both geographically close sharing some suburbs. Holyoke's suburbs include Chicopee, West Springfield, Southampton and Easthampton. All these cities averaged a *Needs Improvement* in both English and Math in 1998 and 1999 except for Southampton that dropped from having averaged a *Proficient* in Math in 1998. Springfield's suburbs also include Chicopee and West Springfield along with Ludlow and East Longmeadow. Ludlow also averaged *Needs Improvement* in both subject areas in both 1998 and 1999; however, East Longmeadow averaged *Proficient* in Math in 1998 and 1999 and *Needs Improvement* in English.

When comparing these results with the rest of Massachusetts, we see that these scores are not better or worse. For grade 4 English and Math, there was no trend

evident among different types of cities. Whether the cities were larger, smaller, suburbs or rural, they all performed at relatively the same.

### 4.4.2 Grade 10

The average scores for Grade 10 students were much more diverse than grade 4 students. Unfortunately, a number of school districts averaged a *Failing* in English with even more school districts averaging a *Failing* in Math.

Of the six big cities we looked at in Massachusetts, 3 (Boston, Holyoke and Springfield) averaged *Failing* in English in 1999 and 3 (Fall River, Lowell and Worcester) averaged a *Needs Improvement*. All of these cities averaged a *Failing* in Math in 1999. Holyoke and Springfield's average lowered from *Proficient* in 1998 while Boston and Lowell's lowered from *Needs Improvement*. Worcester and Fall River averaged a *Failing* in 1998.

Boston's suburbs of Cambridge, Milton, Quincy and Watertown all averaged a *Needs Improvement* in English in 1999 English MCAS exams with Milton and Watertown dropping from a *Proficient* in 1998. Brookline improved their average in both English and Math from a *Needs Improvement* in 1998 to a *Proficient* in 1999. In Math, Cambridge's Math average dropped from *Needs Improvement* in 1998 to *Failing* in 1999 and Milton's dropped from *Proficient* in 1998 to *Needs Improvement* in 1999. Quincy and Watertown both maintained their *Needs Improvement* average from 1998 into 1999.

Worcester's suburbs averaged close to Boston's suburbs in both subject areas. Leicester and Shrewsbury averaged a *Needs Improvement* in Math and English in both 1998 and 1999. Auburn improved their English average from Auburn, *Needs*

*Improvement* in 1998 to a *Proficient* in 1999 and averaged a *Needs Improvement* in Math both years.

Lowell and Fall River's suburbs also scored in the same range. Lowell's suburbs of Chelmsford, Dracut and Tewksbury and Fall River's suburbs of Dartmouth and Westport all averaged a *Needs Improvement* in English and Math. Chelmsford was able to improve their average from a *Failing* in 1998 and Dracut's average lowered in 1999 from a *Proficient* in 1998.

The suburbs of Chicopee and West Springfield for Holyoke and Springfield both averaged a *Needs Improvement* in English and Math in 1998 and just English in 1999. Unfortunately both these suburbs averaged a *Failing* in Math in 1999. Springfield's other suburbs of Ludlow and East Longmeadow averaged *Needs Improvement* in English and Math in 1999 along with Holyoke's suburb of Easthampton.

These cities averaged scores in both subject areas that were very similar to other cities and counties throughout the state. Again, like we had done in grade 4, we found no evidence suggesting that bigger cities average a score less than other cities that much smaller and much less populated. Unfortunately there are cities of all different sizes averaging a *Failing* score throughout the state, especially in the Math exams. It is important to note that a majority of schools that averaged *Failing* where technical, vocational or industrialized schools.

# 5. Conclusion

After reading the curriculum frameworks and reviewing the sample MCAS exams, we found that they were both in line. We feel that if the frameworks are used correctly and accurately, that students should not score *Failing* in these exams. Some argue that these exams are too difficult; and although we found some exercises that we did consider to be difficult, we agreed that these were necessary to identify 'gifted' or 'talented' students. Although the average student might find some problems difficult, they should still be able to solve enough problems to score *Proficient* or *Needs Improvement*.

We also concluded that this standardized testing is the best tool available to determine if the entire public school system is performing at an acceptable level. Once these tests are molded into the curriculum and the controversies end it will be able to help identify school districts that may be having hardships in a timely manner. As of now, there really is no way to compare how the school districts are doing unless the students are tracked from elementary school, through high school, into college and into the workforce. Statewide standardized testing are already established in many states, and we feel that the time has come for Massachusetts to also incorporate it.

One problem that was evident throughout $10^{th}$ grade students is that Math scores are not nearly as high as English scores. In a society where math, science and technology is so important, the MCAS exams helped identify that this is a problem area where school districts statewide should address.

Although many school officials, administrators and teachers may find this hard to believe, we found no evidence to support that increasing teacher salary or per pupil expenditure will result in higher MCAS scores. This is extremely important in noting especially since ranges for both these factors are quite large. A school district that allocated $3,500 per pupil could perform just as well on these exams as a school district that allocated $11,500. A teachers that make $20,000 annually do not have students that will achieve less than those teachers that make $50,000. It is very possible that funds are not being allocated or spent properly. Funds always seems to be an issue in the media with cuts in funding always making headlines; however, according to our results, it doesn't matter. Also in line with this is that larger cities do not score less than more affluent and smaller communities. It is important to keep in mind that these results are based on average salaries and average scores per school district and the results could possibly change if analysis is done on more specific data, i.e. exact teacher salaries and how their specific students scored, or the number of students in the particular classrooms.

In analyzing this data we found that students of ethnicities that are non-Asian do not perform as high as students that are white. Hispanic students and Native American did not score well and Black students did not score much higher than them. Again, the data we found for this analysis was very limited, and if this information is disclosed, a more accurate analysis can be done. We believe that the ESL program is not necessarily assisting these Hispanic students and it would be beneficial to students of all ethnicities to develop new programs that will help improve these scores.

Many great colleges and universities are located here in Massachusetts and the Boston area is second to Silicon Valley in being a leader in technology. It would be wonderful if more professionals and students got involved in their communities to help these young students since this problem of *Failing* in Math in evident statewide and among all student of all ethnic backrounds.

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