

Running Head: EOC and ACT

Using the Algebra 1 EOC to predict ACT Math Subset Scores

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### Abstract

The purpose of this study was to see whether a prediction model could be found between Algebra 1 EOC scores and ACT Math Subset scores. Students were randomly selected for this study. A simple regression analysis was used in this study with the Algebra 1 EOC score as the independent variable and the ACT Math Subset score as the dependent variable. The results of this study found that the ACT Math Subset score can be predicted from the Algebra 1 EOC score.

## Introduction

### Background, Issues and Concerns

The No Child Left Behind Act (NCLB) requires states to give standardized tests annually in math and communication arts, and in science once in grades 3-5, 7-8, and 9-11. The Common Core State Standards (CCSS) also requires a comprehensive test in math and communication arts in the student's junior year. In high school, Missouri gives End of Course (EOC) Tests to comply with NCLB. Missouri requires all students take EOCs in Algebra 1 or Algebra 2 (if the Algebra 1 EOC is taken before high school), Government, English II, and Biology. Missouri also gives optional EOCs in American History, English 1, Algebra 2 (if the Algebra 1 EOC is taken in high school) and Geometry. In the 2014-2015 school year, Missouri will also give the ACT to juniors as the comprehensive math and communication arts test for the CCSS. (ACT 2014)

Missouri requires students to take the Algebra 1 EOC and also the ACT. When looking at the ACT, there is more information on the ACT than just Algebra 1 concepts. The ACT also covers material related to Geometry, Trigonometry, and Algebra 2 concepts. Most students in high school take Geometry and Algebra 2 to satisfy the states requirement of 3 math credits for graduation. EOCs are available in these subjects as well, but are not required by the state. If a student does not take Geometry, Algebra 2, or Trigonometry the student will not be fully prepared for the required ACT test given to them as a junior.

The Algebra 1 EOC is written so that students can achieve a high score, while the ACT does not compare with a student's grades. Resources are available to teachers to

help prepare students for both the EOC and ACT. On the Missouri Department of Elementary and Secondary Education's (DESE) website, there are the Course Level Objectives for the class, a blueprint of the EOC (which is a list of how heavily a certain objective will be tested), and a released form of the EOC (a practice test). This information helps the teacher focus on what needs to be taught/ reviewed when preparing students for the EOC. The ACT website contains test taking tips, test descriptions (which is similar to the blueprint for the EOC), and practice tests.

### Practice under Investigation

Every student who earns a High School diploma from the state of Missouri must take the Algebra 1 EOC or the Algebra 2 EOC if the Algebra 1 EOC is taken before high school to comply with NCLB, and every junior will also be required to take the ACT to comply with the CCSS. The ACT was also commonly taken by high school students as a college entrance exam before it was required.

### School Policy to be Informed by Study

If a predictive model is found between the Algebra 1 EOC and the math subset of the ACT, the school and students could use the information to improve ACT math subset scores after the Algebra 1 EOC scores have been received.

### Conceptual Underpinning

The study was conducted to see if there is a predictive model that links Algebra 1 EOC scores to ACT Math Subset scores. The research would be helpful when trying to improve standardized test scores that determine Adequate Yearly Progress (AYP). The

state requires the Algebra 1 EOC be given to comply with NCLB. The new CCSS would be satisfied with giving the ACT to juniors.

The study was conducted to see if a predictive model can be found which would be helpful between the time a student takes the Algebra 1 EOC and the ACT. The student and teacher could focus on improving math skills before the ACT is taken. The ACT Math Subset score has been used to determine if a high school student can take a dual credit College Algebra class. In past years, an ACT Math Subset score of 20 is needed to be able to take College Algebra for dual credit. If a predictive model is found a student would be able to see if taking College Algebra is possible, or what work needs to be completed to be able to reach their goals.

#### Statement of the Problem

To insure the ACT score is adequate for student success. Teachers and school districts want students to do well on the ACT because it is now being required for all juniors to satisfy the CCSS. Students want to do well on the ACT for dual credit class enrollment and college admission. The study would see if the EOC can predict the ACT Math Subset score and whether the EOC can be used as a benchmark for both teachers and students.

### Purpose of the Study

The purpose of this study was to see whether a prediction model could be found between Algebra 1 EOC scores and ACT Math Subset scores. The independent variable was the Algebra 1 EOC scores and the dependent variable was the ACT Math Subset scores. The Algebra 1 EOC test was chosen because all students graduating high school must take the Algebra 1 EOC test. There Common Core is implementing the ACT be taken as a comprehensive high school test in the junior year. The regression method was used in determining whether a prediction model could be found.

### Research Question

Can a prediction model be found for ACT Math Subset scores from Algebra 1 EOC scores?

### Null Hypothesis

There is no prediction model that can be found from the Algebra 1 EOC scores that will help determine ACT Math Subset Scores.

### Anticipated Benefits of the Study

The anticipated results of this study are that there is a prediction model that can be found from Algebra 1 EOC scores that will help determine the ACT Math Subset scores, and the higher the Algebra 1 EOC results the higher the ACT Math Subset scores.

## Definition of Terms

Adequate Yearly Progress (AYP) is whether a school district has met academic achievement based on standardized testing.

American College Test (ACT) is a standardized test that colleges use as part of the admission process. The state of Missouri also gives the ACT to all juniors as part of the Common Core State Standards.

Common Core State Standards (CCSS) is a national initiative to align all state standards.

End Of Course (EOC) is a standardized state test that is given at the end of the course. The EOCs are given in high school as part of the Missouri Assessment Program. The results are used to determine the school's AYP.

Missouri Assessment Program (MAP) is the state assessment program that is required through the No Child Left Behind Act.

No Child Left Behind Act (NCLB) was put into action in 2001 and was a national act to that required all states to give a statewide standardized test annually and the results would be used to help determine AYP.

## Summary

The study was conducted to determine if the Algebra 1 EOC scores can be used to predict the math ACT subset scores. The NCLB Act requires students to take a standardized state test and the state of Missouri chooses to satisfy this by giving EOCs. The new CCSS requires that a comprehensive math test be given at the end of the student's junior year and Missouri is satisfying this requirement by giving the ACT. The results of the study would help determine how the student will perform on the ACT Math

Subset, and decide if extra work is needed to help improve the score after the Algebra 1

EOC is taken.



### Review of Literature

“Calls for reform are a familiar and recurring theme in public school history.” (Levine, M., & Levine, A., 2012, p. 1) There are couple problems with NCLB, one is that there is a narrow curriculum- if it isn’t tested it may be taught less or even at all and the second is cheating- NCLB set goals so high they were impossible to reach. One such goal is that by 2014 100% of students had to be proficient on state tests in order to receive federal money. NCLB came from the Texas miracle, which had students practice taking the test 8-10 hours a week before the actual test was given. Schools also had testing pep rallies to help students get pumped up for the test. The increase on state tests did not transfer over to increase on national tests like SAT. Cheating was also an issue because if a school doesn’t obtain Adequate Yearly Progress (AYP) they are labeled as a failing school. Some teachers and principals just cheat outright, by changing incorrect answers before turning in the test. Teachers who were caught cheating were afraid of being fired for having low test scores or were promised a bonus for having high test scores. (Levine, M., & Levine, A., 2012).

Missouri requires EOCs to be taken in Algebra I, Biology, English II, and Government while the graduating class of 2016 will also be required to take English I and American History. The Algebra I tests consists of both multiple choice and performance event questions. The EOCs are not timed tests; a student can take as much time that is needed to take the test as long as the student is making progress on the test (DESE 2014). Missouri requires all 11<sup>th</sup> grade students to take the ACT in 2014-2015 school year (MAP Fast Facts 2014 ).

The ACT Math Subset test has 60 multiple choice questions and has a time limit of 60 minutes (ACT 2014). According the ACT (2014), the math test is broken down into six different sections: Pre-Algebra, Elementary Algebra, Intermediate Algebra, Coordinate Geometry, Plane Geometry, and Trigonometry. According to Qiu and Wu (2011), the best predictor of ACT scores is academic success.

“End-of-Course (EOC) assessments have gained popularity nationwide in recent years” (Blazer, 2012, p. 1). About half of the states administer EOCs and a state could give anywhere from 1 to 16 EOCs. There are 20 states that administer an Algebra EOC (Blazer, 2012).

The Common Core State Standards were created because there was a need for “creating common educational standards, preparing students for college, stressing quality education for all students, and increasing rigor in schools.” (Wallender, 2014, p. 10). The CCSS are standards for each grade K-12 in English and Math. (Understanding the Common Core Standards,2014).

According to Wong and Paris, the older the student is the more negative their views are about standardized tests. The study gave a survey to students about standardized tests and classroom tests. Students in the 10<sup>th</sup> grade thought that standardized tests were less important and less useful than their classroom tests and therefore put forth less effort on the standardized tests. Students in the 4<sup>th</sup> grade responded positively to both standardized tests and classroom tests. One theory provided by Wong and Paris as to why 10<sup>th</sup> graders put forth more effort on classroom tests was because they saw how the grades on classroom tests impacted their grades and the scores on standardized tests did not. (Wong & Paris, 2000). The state of Missouri has taken this

theory into account and tied the score of the EOC to the student's final grades. The suggested amount is between 10%-20% and a curved percentage is also given on the DESE website.

The EOCs hold not only teachers and school districts accountable, but also students accountable because the scores obtained on the EOCs can be used when figuring students grades. This provides motivation for students to do their best. Some states even require that students pass the EOC test in order to earn credit for the class (Domaleski, C., & Council of Chief State School, O., 2011).

## Research Methods

### Research Design

A regression analysis was completed with an alpha level of 0.25. The Algebra 1 EOC scale score was used, while the math subset ACT raw score was used. The reason the Algebra 1 EOC scale score was used is because the number of questions has changed in the years that the Algebra 1 EOC has been given. The scale score has been consistent even though the number of questions has changed. There was no scale score reported for the ACT which is why the raw score was used. The independent variable was the Algebra 1 EOC score and the dependent variable was the ACT math subset score.

### Study Group Description

The study group was 57 randomly selected high school students from a rural school district. The district has 653 students and is 96.3% white with 23.8% receiving free/reduced lunch (MODESE 2013)

### Data Collection and Instrumentation

The data was collected by first collecting the ACT scores from the counselor and then looking in cumulative folders for corresponding Algebra 1 EOC scores. For students who took the ACT more than once, the most recent score was used.

### Statistical Analysis Methods

The data was analyzed through descriptive analysis and a statistical program was used when conducting the regression analysis.

### Findings

The research question: Can a predictive model be found for the ACT Math Subset score from the Algebra 1 EOC score? The independent variable was the Algebra 1 EOC score, and the dependent variable was the ACT Math Subset score. A simple regression analysis was completed and the results are shown below.

Figure 1: EOC and ACT measures of central tendency

	EOC	ACT
Mean	219.98	20.04
Median	218	19
Maximum	250	33
Minimum	177	13
Standard Deviation	19.96	4.48

The mean EOC score was 219.98 and the mean ACT score was 20.04. The scale score for the EOC is between 100 and 250 and the ACT raw scores are between 1 and 36. The median score of the EOC was 218 and for the ACT was 19. The maximum score for the EOC was 250, which is also the maximum score given. The maximum score for the ACT was 33. The minimum score for the EOC was 177 and for the ACT was 13. The standard deviation for the EOC was 19.96 and for the ACT was 4.48.

Figure 2: Scatter Plot of student's EOCs and ACT scores

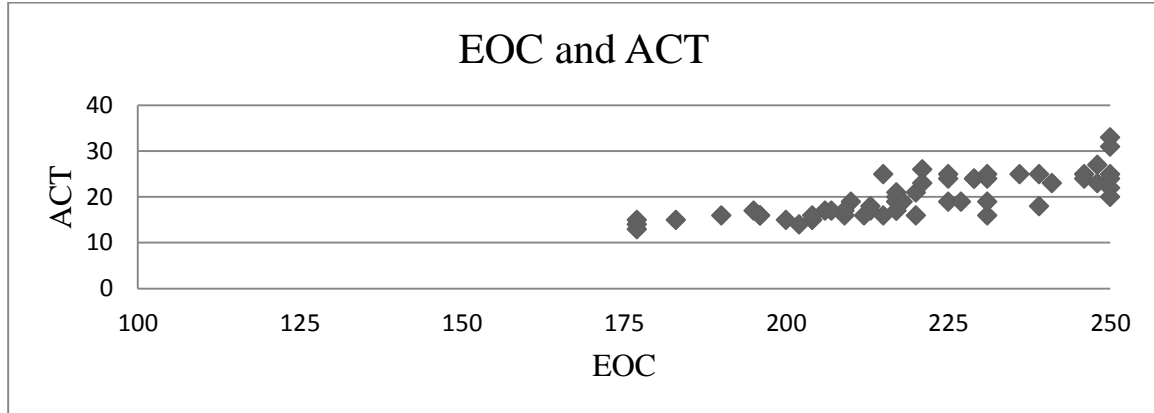


Figure 3: Regression Analysis for Algebra 1 EOC v. Math ACT

$$\text{Model: ACT} = 0.174 \text{ EOC} + -18.142 \text{ CNST}$$

Source	Beta Coef.	R <sup>2</sup>	SEE	F	p-value
Constant	-18.142				
EOC	0.174	0.599	2.860	82.192	1.658E-12

Alpha = 0.25

Conditions: Confidence Level = 95

Value for Algebra 1 EOC = 200

Forecast = 16.567

Lower = 10.736

Upper = 22.399

The independent variable was Algebra 1 EOC score and the dependent variable was the ACT Math Subset score. There were 57 students analyzed in this study. The constant for the model was -18.142. The slope was 0.174, which means for every 1 point of increase in the Algebra 1 EOC score the Math ACT score raised 0.174 points. The model power was 59.9% and was accurate within 2.860 points at 1 standard deviation. There was a strong significant predictive power with the F-ratio at 82.192. The null hypothesis was: The ACT Math Subset score cannot be predicted from the Algebra 1 EOC score. The null hypothesis was rejected because the p-value was 1.658E-12, which is considerably less than the alpha level of 0.25. This means that the ACT Math Subset can be predicted from the Algebra 1 EOC score. The higher the Algebra 1 EOC score the higher the ACT Math Subset score. The forecast for an Algebra 1 EOC score of

200 is a Math ACT score of 16.567, and the lower forecast of 10.736 and an upper forecast of 22.399.



### Conclusions and Recommendations

The results of this study found that the ACT Math Subset score can be predicted from the Algebra 1 EOC score. This will be useful because students and teachers can use Algebra 1 EOC score to predict how students will score on the ACT Math Subset test. This will allow students to follow their current study habits if a predicted ACT Math Subset score is acceptable or would allow students to prepare more for the ACT Math Subset if a higher score is desired.

This study used the most recent ACT score, which for some students was not their first time taking the ACT. The students could have taken the ACT and not obtained the ACT Math Subset score they wanted and then studied to obtain a higher score. A study could be designed so that the first ACT Math Subset score be used to see if a predictive power still exists between the Algebra 1 EOC score and the ACT Math Subset score.

The results of this study can be helpful when planning what classes a student would like to take in their future years of high school. Some schools offer a Dual Credit College Algebra class, but in order to earn dual credit in the class a student must earn a 20 on the ACT Math Subset test. The results of this will help a student plan on whether or not to take the class. Some students in the past have planned on taking the class but then could not earn the required Math score on the ACT. The results of this study could help a student in knowing whether the class could be taken, or if more time spent studying for the ACT would be helpful in obtaining the required score.

Another concern with this study was that the Algebra 1 EOC only covers Algebra 1 concepts while the ACT covers not only Algebra 1 concepts, but also Algebra 2 Geometry, and Trigonometry concepts. The ACT is about half Pre-Algebra and Algebra

1 concepts, but not all concepts on the ACT Math Subset are covered in the Algebra 1 EOC. The Algebra 1 EOC is mostly taken by 8<sup>th</sup> and 9<sup>th</sup> graders and a few 10<sup>th</sup> graders, while the ACT is taken by a few 10<sup>th</sup> graders and mostly 11<sup>th</sup> and 12<sup>th</sup> graders so there is an age difference and time to learn the extra concepts covered on the ACT. This allows the Algebra 1 EOC to serve as a benchmark for the ACT Math Subset test even though not all concepts are covered.

Another study should be completed with a larger group of students. This study reviewed two classes with a total of 57 students who had scores for both the Algebra 1 EOC and also the ACT. As with any study, the larger the population the better predictive model can be found.

With the state of Missouri administering the ACT to all 11<sup>th</sup> graders in the 2014-2015 school year, this study also needs to be completed again to look at how all students' Algebra 1 EOC and ACT Math Subset scores compare. At the time of this study only the Algebra 1 EOC was required for all students, but now the ACT will be given to all students before graduation to comply with the new Common Core State Standards.

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