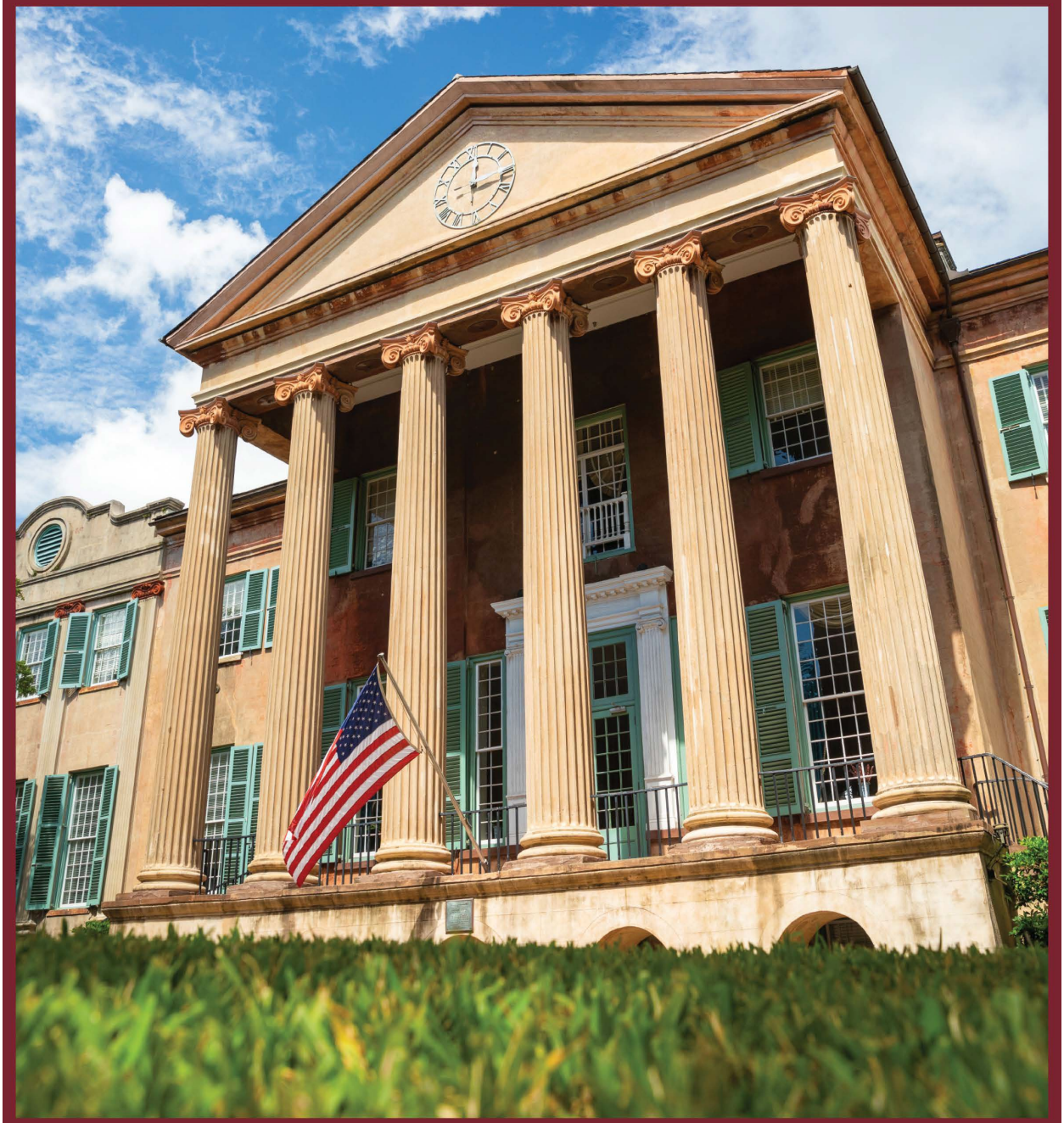
COLLEGE of CHARLESTON

OFFICE FOR INSTITUTIONAL EFFECTIVENESS

# ETS PROFICIENCY PROFILE LONGITUDINAL ANALYTICAL REPORT



# ETS Proficiency Profile Longitudinal Analytical Report from 2009 to 2018-The College of Charleston

## Prepared By:

## The Office of Institutional Effectiveness

## July 2020

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## Introduction

The ETS Proficiency Profile (EPP) test is designed by the Educational Testing Service (ETS) as a measure of college-level reading, mathematics, writing, and critical thinking in the context of the humanities, social sciences, and natural sciences. Postsecondary institutions across the United States have utilized the ETS Proficiency Profile because the ETS test provides invaluable data for accreditation, strategic planning, curriculum improvement, benchmarking, and for assessing general education outcomes. For the same purpose, The College of Charleston has conducted ETS Proficiency Profile test in 2009 (N=199), 2012 (N=403), 2015(N=778) and 2018 (N=399), respectively. The total number of students who took the EPP test over these four data points is 1880. Although annual ETS Proficiency Profile analytical reports have been present to the College, there have been no reports available to get the College informed from the perspective of longitudinal analysis, a study that can showcase the trends of how students performed over the years in the EPP test as well as how different demographic and educational background factors impacted students' performance in the EPP test. Given the small sample size every year (less than 450 except in 2015) and the limitation of providing a snapshot of how students at the College performed in the annual analytical report, the past EPP reports lack the in-depth understanding of how students performed over the years as well as what factors significantly and consistently affected students' EPP performance. To bridge this gap, the Office of Institutional Effectiveness acquired the original four year's datasets from ETS and conducted this longitudinal data analysis.

Knowing the structure of EPP test plays a crucial role in better understanding this longitudinal analysis. The EPP test (abbreviated version) is a standardized test composed of 36 multiple choice questions designed to assess students' competencies in critical thinking, reading, writing,

and mathematics. Questions in the EPP test are multiple choices and are arranged in blocks of three to eight. Each section tests the same types of skills. The total score on the test is reported on a scale of 400-500. There are seven sub-scores that are reported on a scale of 100-130 for each skill area (Critical Thinking, Reading, Writing, Mathematics, Humanities, Social Sciences, and Natural Sciences). In addition to a total score, institutions receive proficiency classifications (i.e. proficient, marginal or not proficient) for each skill level identified simply as Level 1, Level 2 and Level 3 based on students' performance taken as a group in each skill dimension. **Appendix A** provides a comprehensive overview of each proficiency level, which is defined in terms of competencies expected of students. Proficiency classifications capture how well students have mastered each skill area.

## Research Questions

This longitudinal analytical report was guided by the following research questions:

1.What are the demographic and educational characteristics of students at the College who took the EPP test over time?

2.How have students at the College performed in the EPP scale scores and the EPP proficiency classifications over the years?

3. How have students at the College performed on the EPP test over time by demographic and educational background variables, such as gender, race, transfer students, Honors students, undergraduate student status, hours worked per week and school?

4. Among these demographic and educational background factors, what are the key factors that have statistically significant effects on the performance of EPP test, all else being equal?

## Methodology

Basic descriptive analysis was conducted to illustrate the percentage of students who took the EPP test over the years to answer research question 1. To answer question 2 and 3, cross-tabulation trend analysis was used to yield the trend of students' EPP performance over the years by gender, race, transfer students, honors student status, undergraduate student status, hours worked per week and school.

With the descriptive analysis and cross-tabulation analysis as the foundation for further analysis, multiple regress strategy was utilized to reveal the factors that significantly impacted students' EPP performance over the years, all else being equal. The independent variables were grouped into three models (see Table 1 for details). The three models were run successively and checked for R-squared value in every model to decide if a specific variable should or should be not included in the next model. The R-squared in the final model is 27.17%, meaning that 27.17% of variance in the EPP total scores are explained by the variables included in the present analysis. Detailed regression results of the three models are presented in **Appendix B**. Given the exploratory nature of this analysis, the purpose of revealing the relationships among demographic and educational background factors and the EPP total scale scores has been achieved, although the R-squared might be relatively low. Future analysis could carry on by adding more variables related to students' EPP performance into this proposed equation to increase the explaining power of this model.

The multiple regression equation is listed below:

$$ETS\ Total\ Score=\beta_0+\beta * DEM + \alpha * EDU + \gamma * YEA+\delta * MAJ +\mu$$

DEM represents a vector of demographic variables, including age, race/ethnicity and gender. EDU denotes a vector of educational background variables, including transfer student status, honors student status, enrolled part-time/full-time, hours worked per week, GPA, if English as

the primary language and freshmen vs. seniors. YEA represents the controlled year variable (2009, 2012, 2015 and 2018 with 2009 being the reference group), and MAJ represents 32 majors (32 majors are provided in **Appendix C**) in this analysis. $\beta_0$ is the constant of the regression equation and $\mu$ is the error term.

# Findings

## Basic Descriptive Analysis

- No interpretations are provided in this session, given that donut charts below are straightforward to understand.
- The total number of students in the data file from ETS is 1780, but due to the missing data issue, this number could vary across questions. For instance, it could be the case that only 1779 responses in the year question, with 1 missing value.

Figure 1. Percentage of Students Who Took EPP by Year

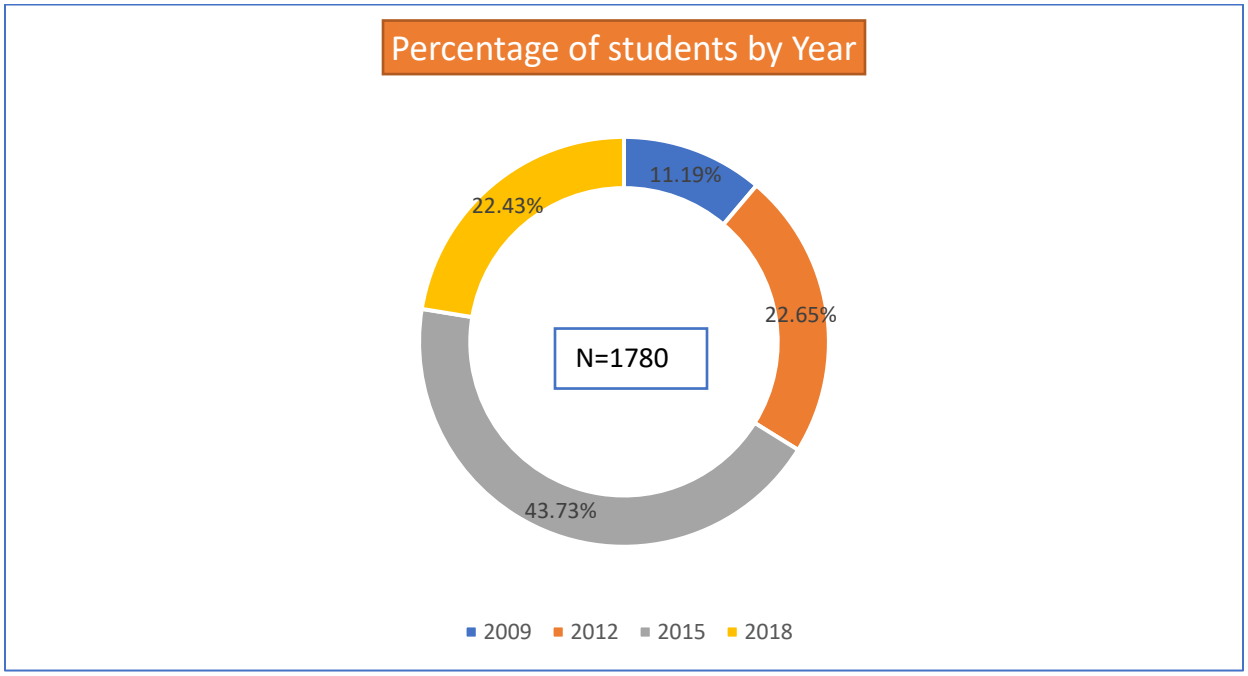


Figure 2. Percentage of Students Who Took EPP by Undergraduate Student Status

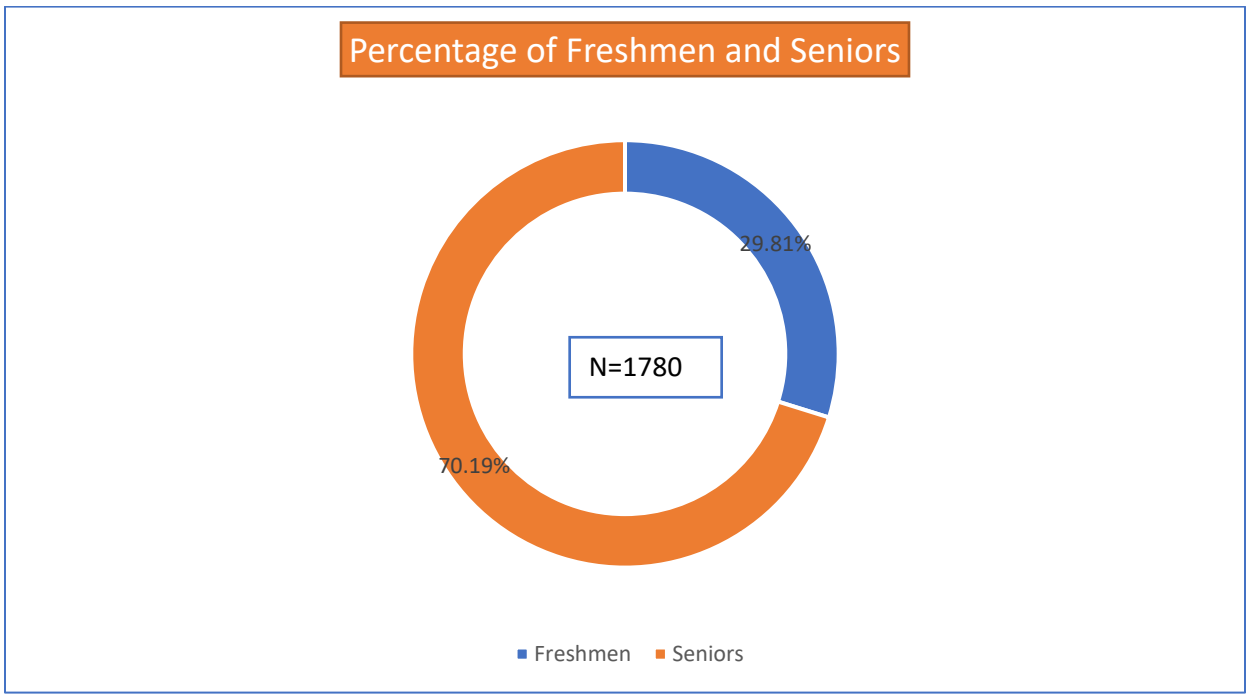



Figure 3. Percentage of Students Who Took EPP by Gender

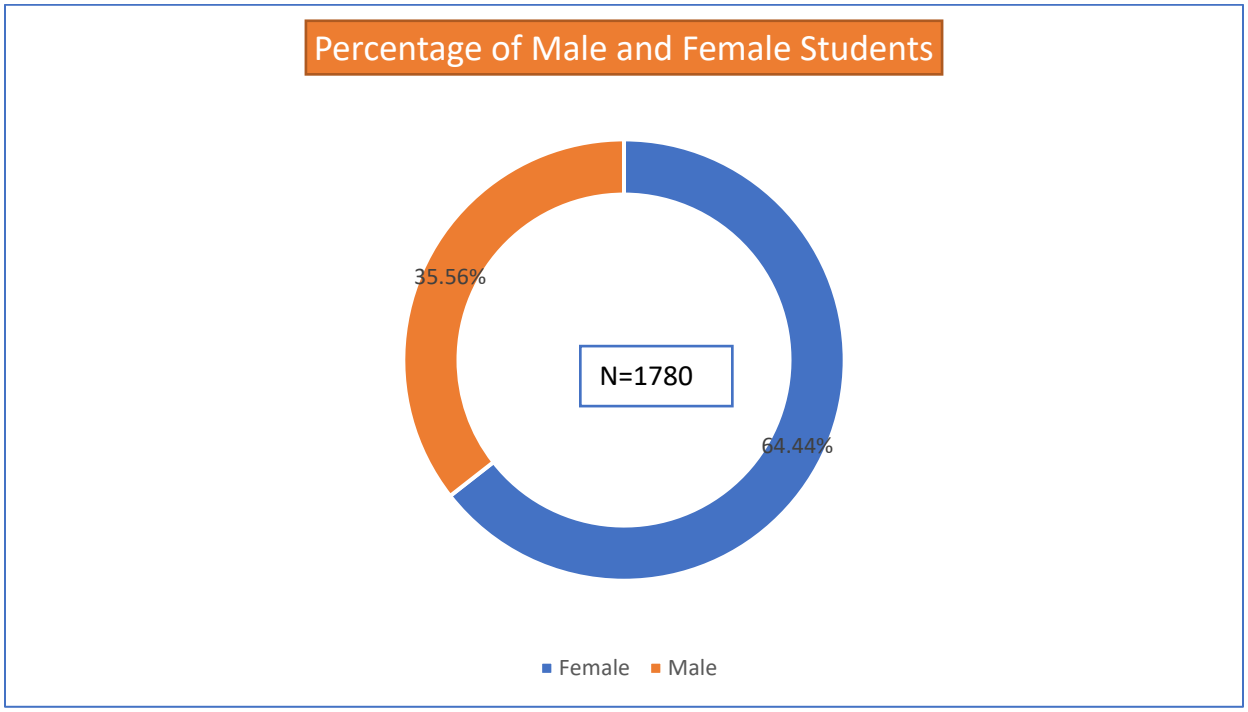


Figure 4. Percentage of Students Who Took EPP by Race

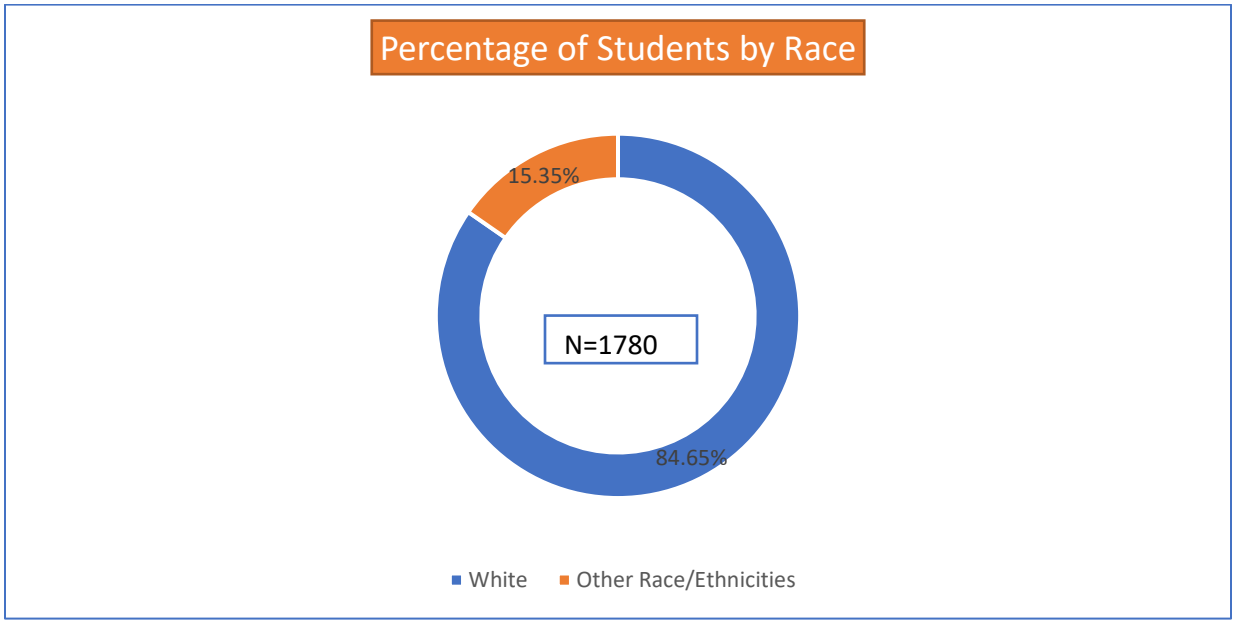



Figure 5. Percentage of Students Who Took EPP by Honors Student Status

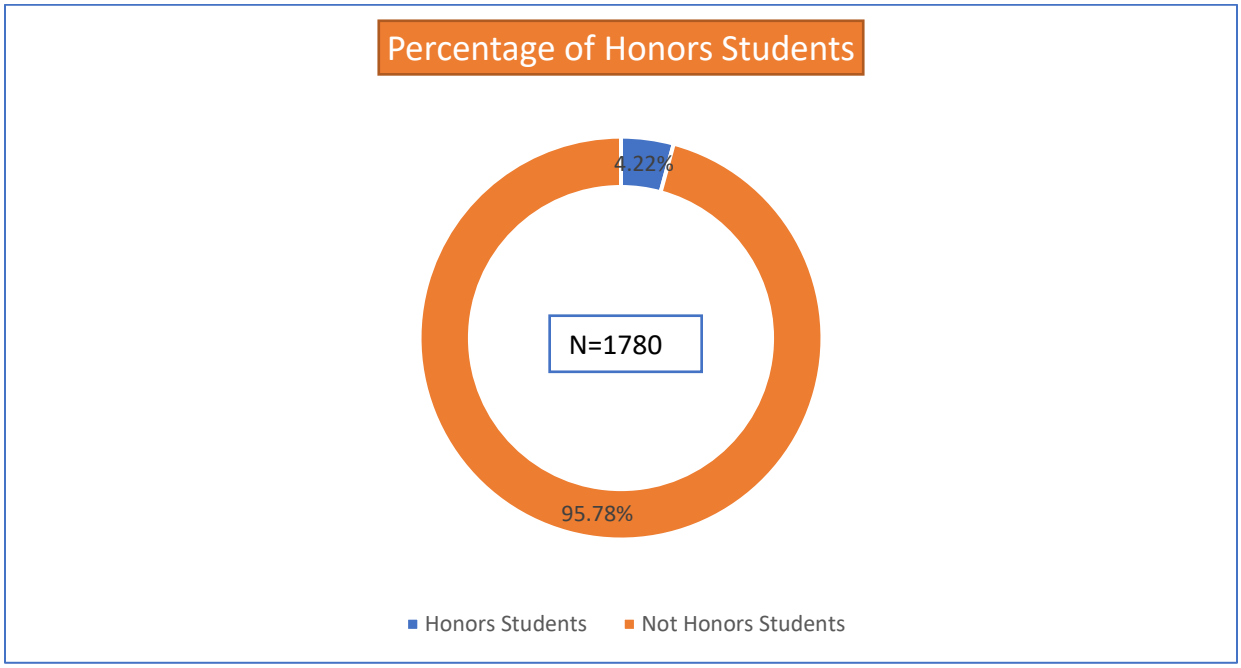


Figure 6. Percentage of Students Who Took EPP by Transfer Student Status

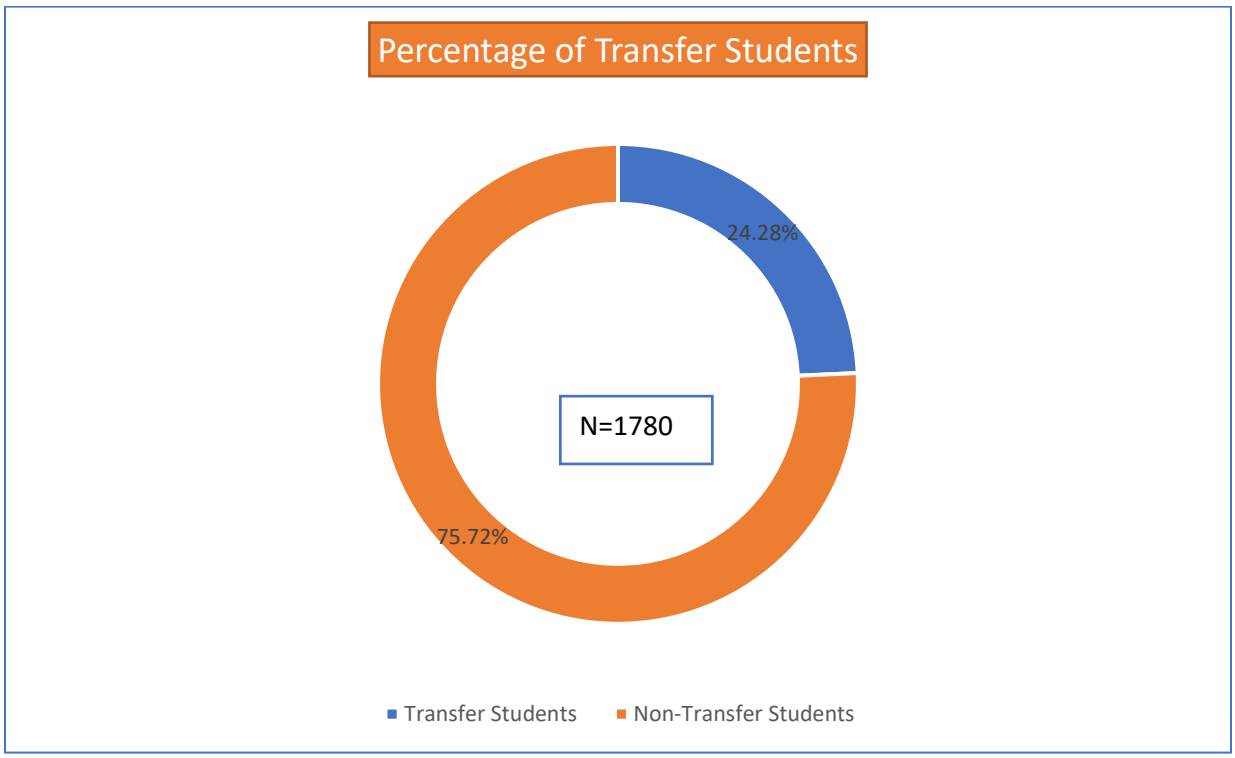



Figure 7. Percentage of Students Who Took EPP by School

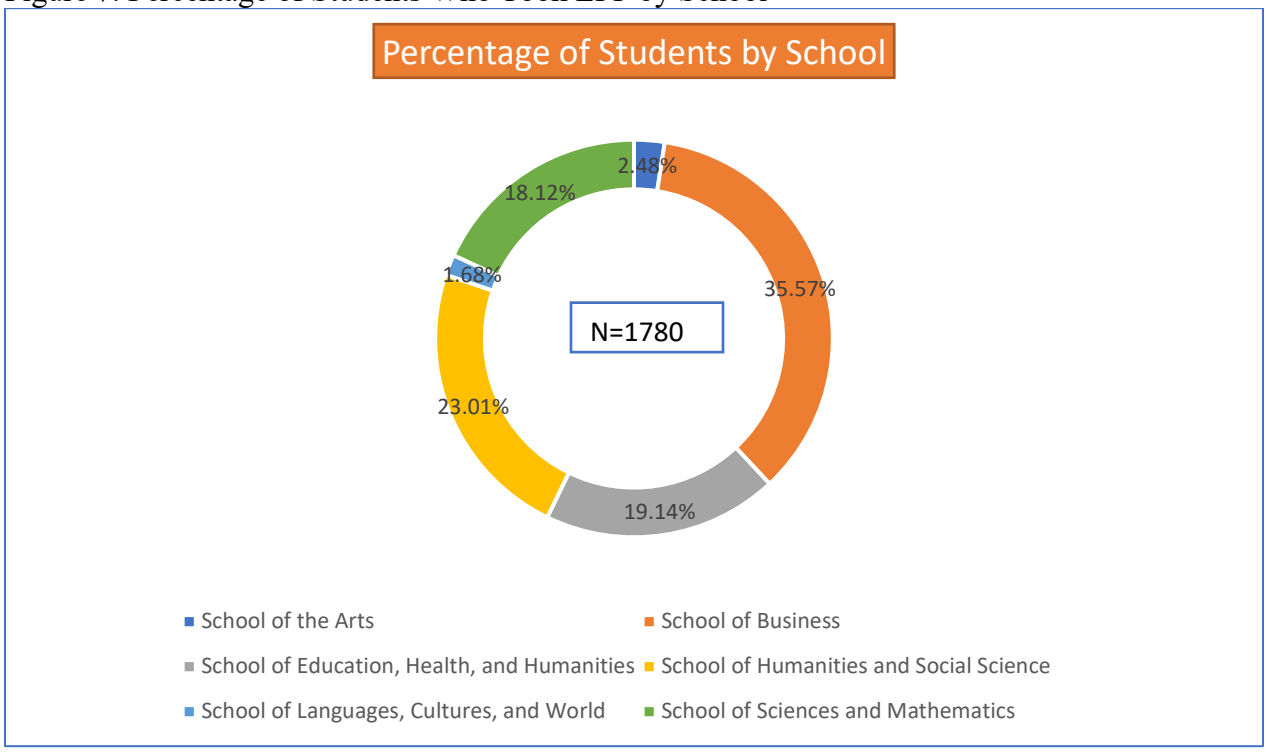
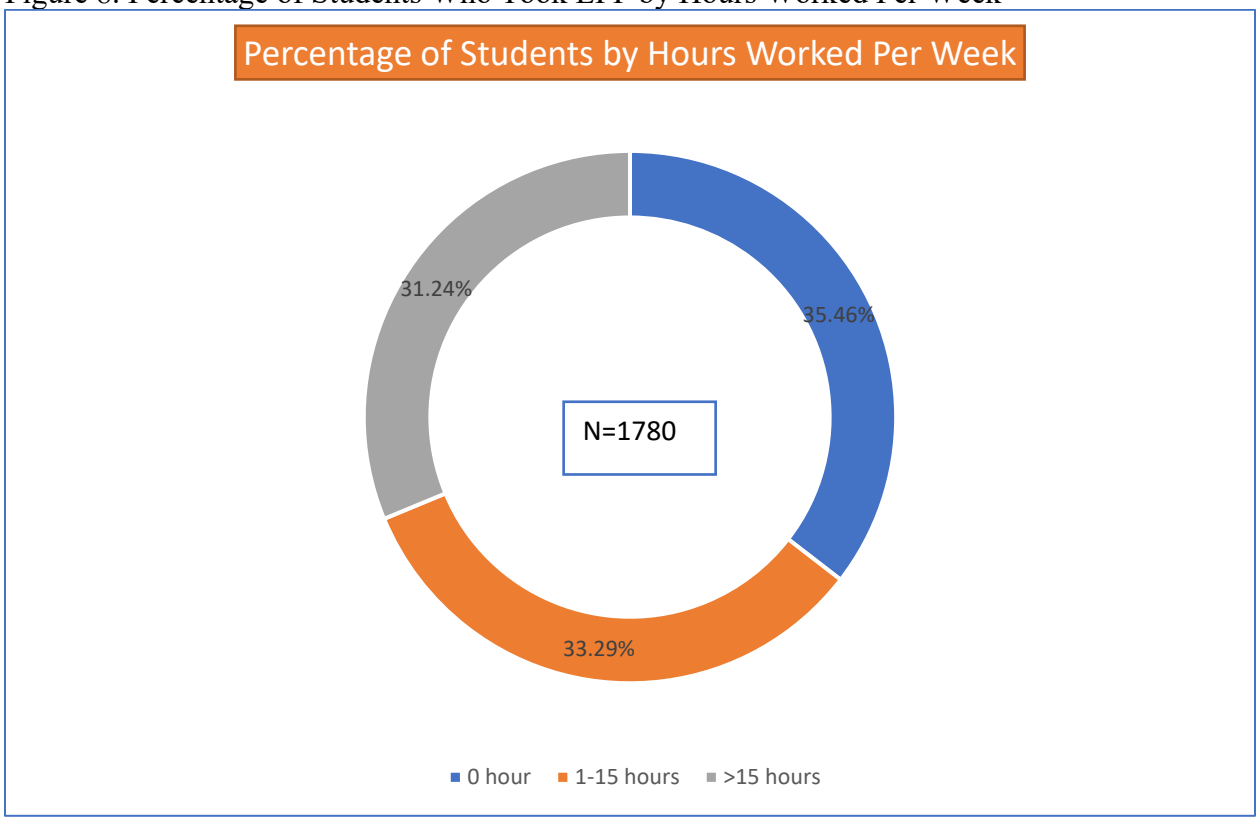
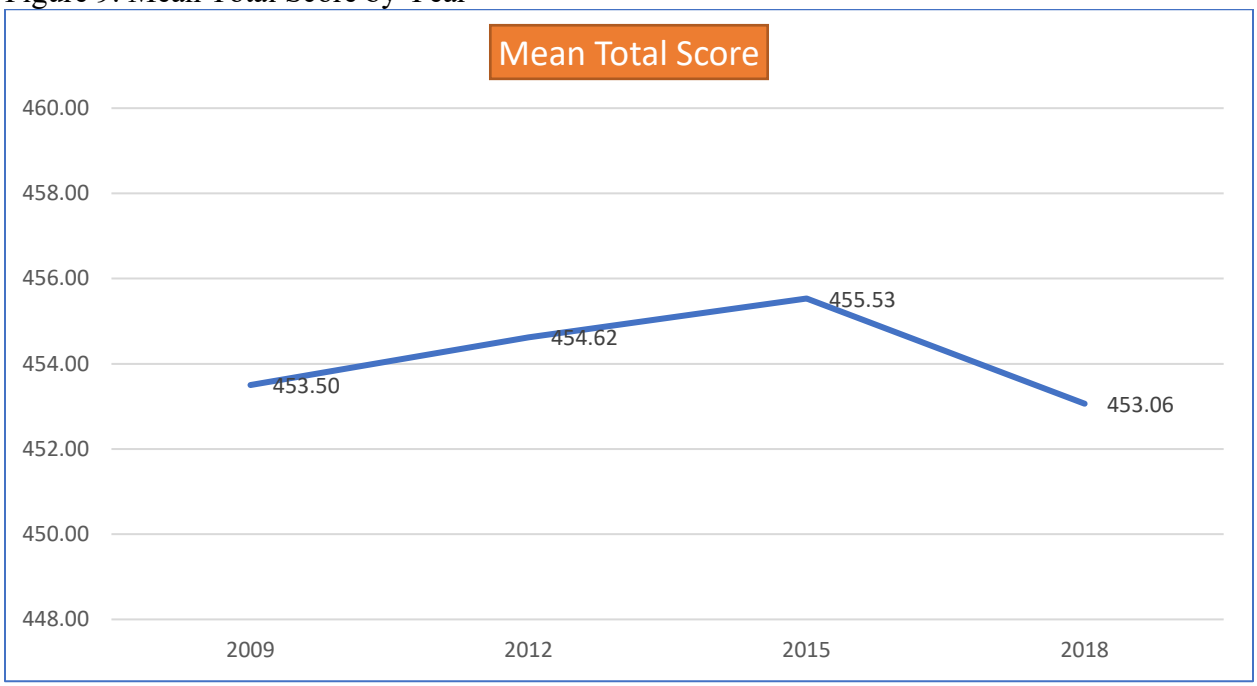


Figure 8. Percentage of Students Who Took EPP by Hours Worked Per Week



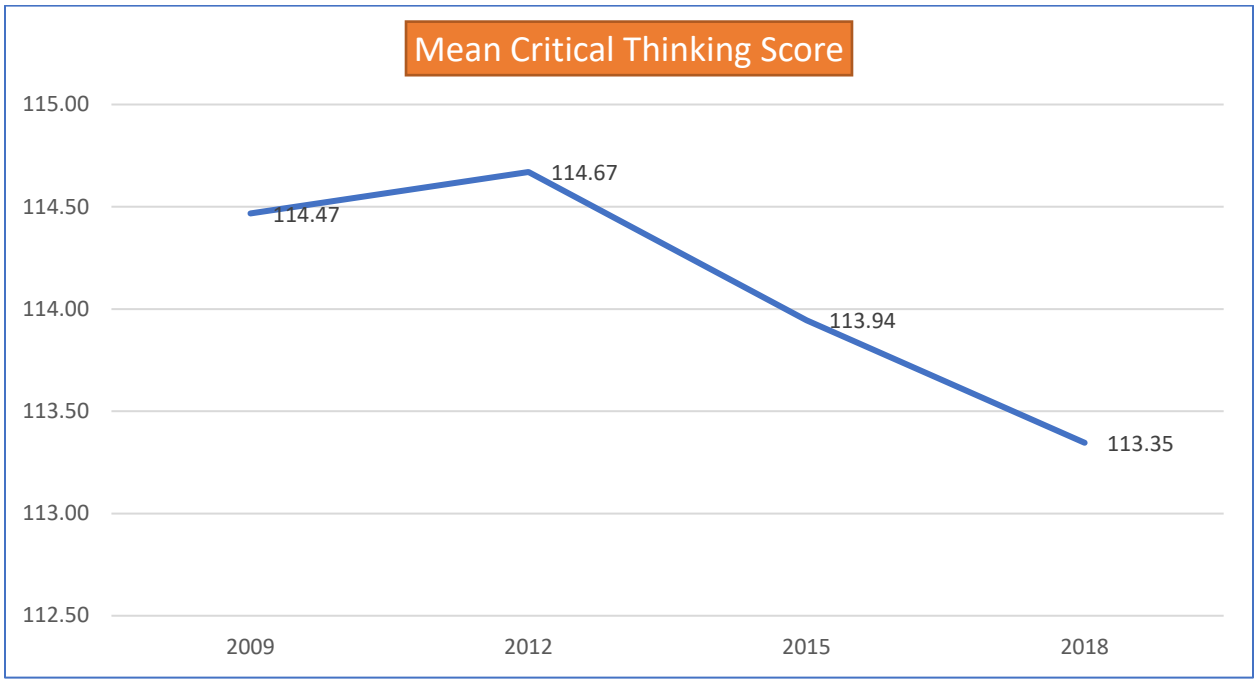
## Descriptive Analysis in EPP Scale Score by Year

Figure 9. Mean Total Score by Year



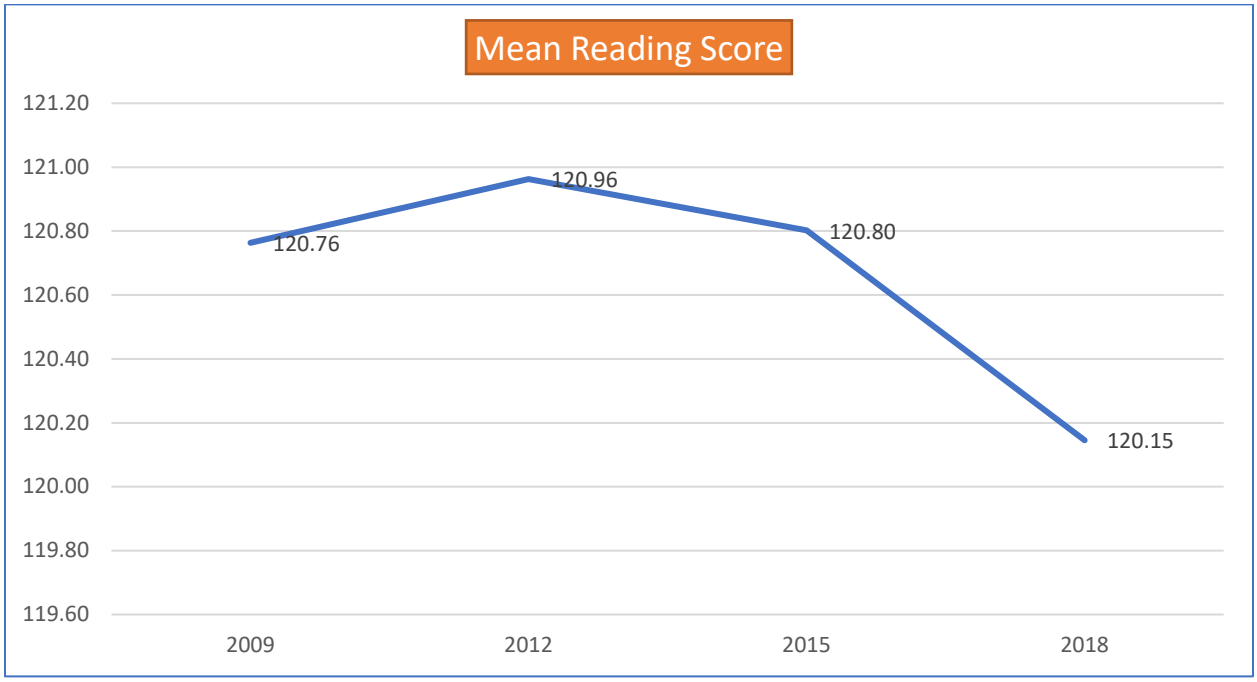

- The mean EPP total score did not change much over these four administration years.
- 2015 witnessed the highest average EPP total score, which was 455, while in 2018, the average EPP total score decreased from 455 to 453.

Figure 10. Mean Critical Thinking Score by Year



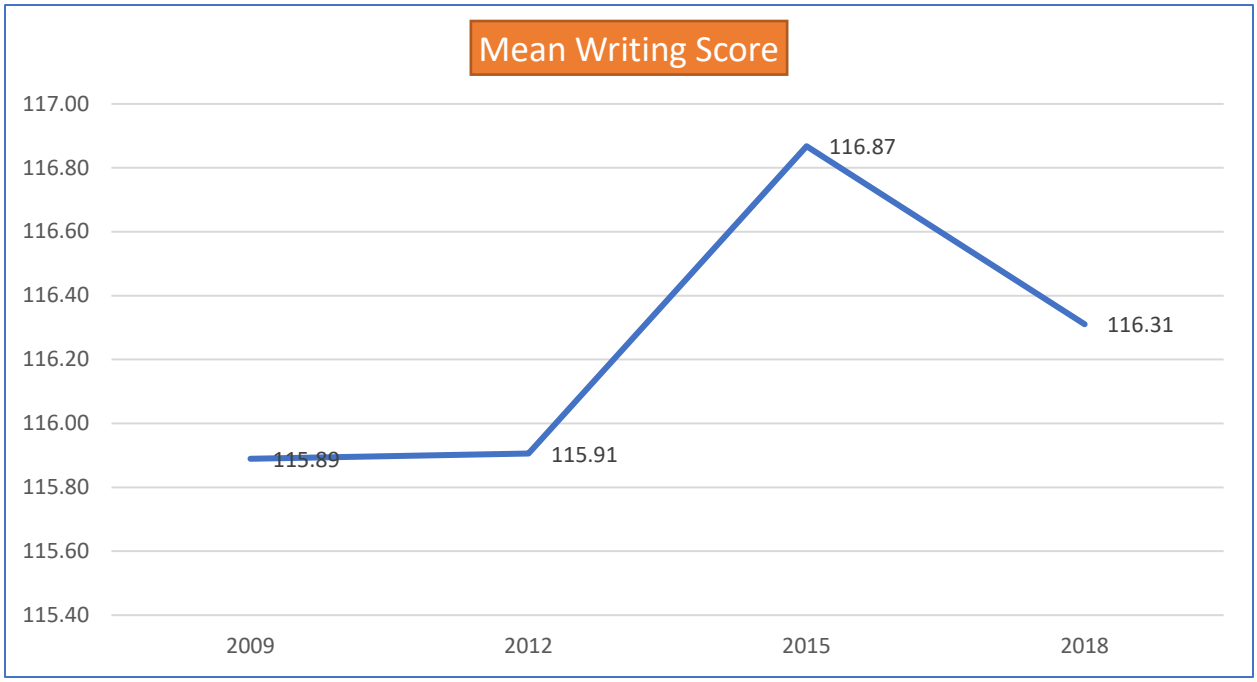
- The data showed a downward trend from 114 in 2009 to 113 in 2018.
- The downward trend was minimal from 2012 to 2018.

Figure 11. Mean Reading Score by Year



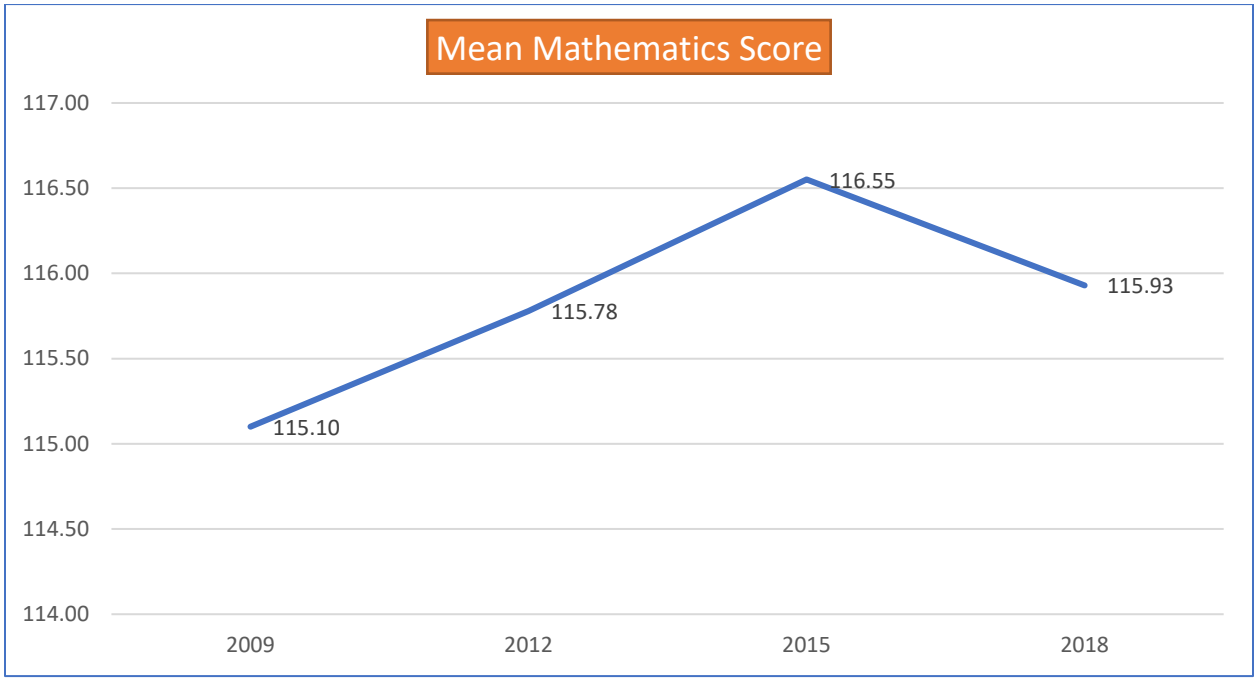

- The Mean reading score was stable over the years.

Figure 12. Mean Writing Score by Year



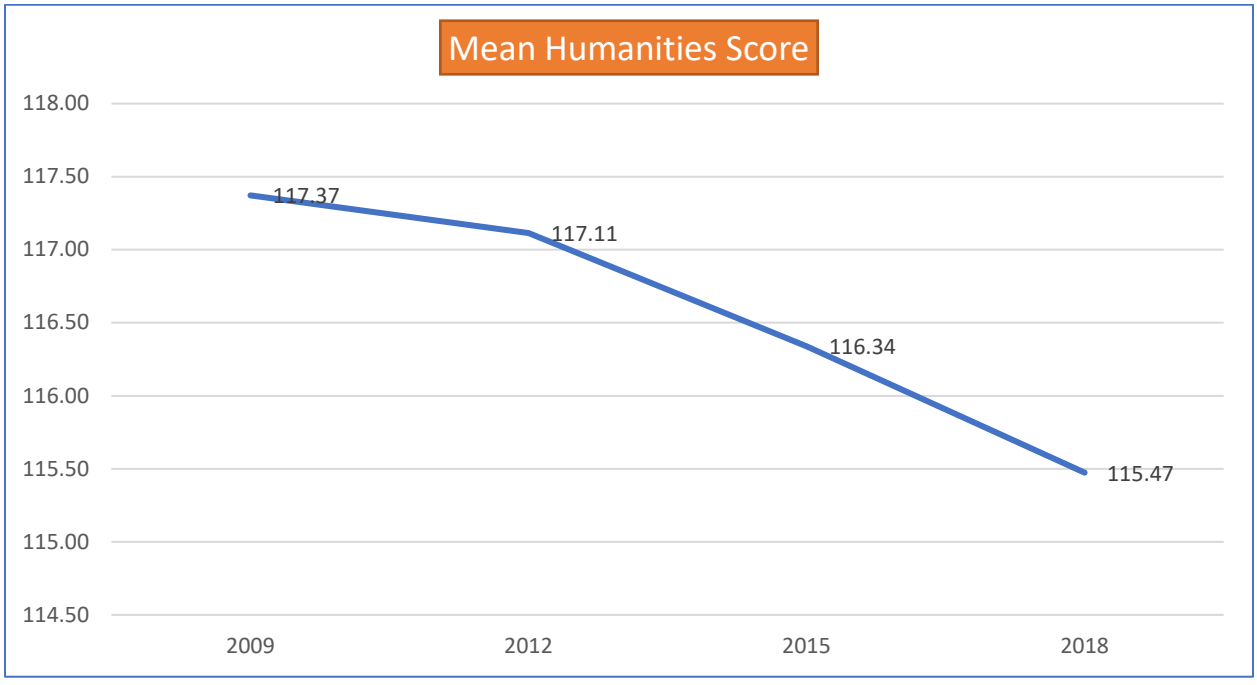
- The Mean writing score slightly increased from 2012 to 2015, but was stable overall over the years.

Figure 13. Mean Mathematics Score by Year



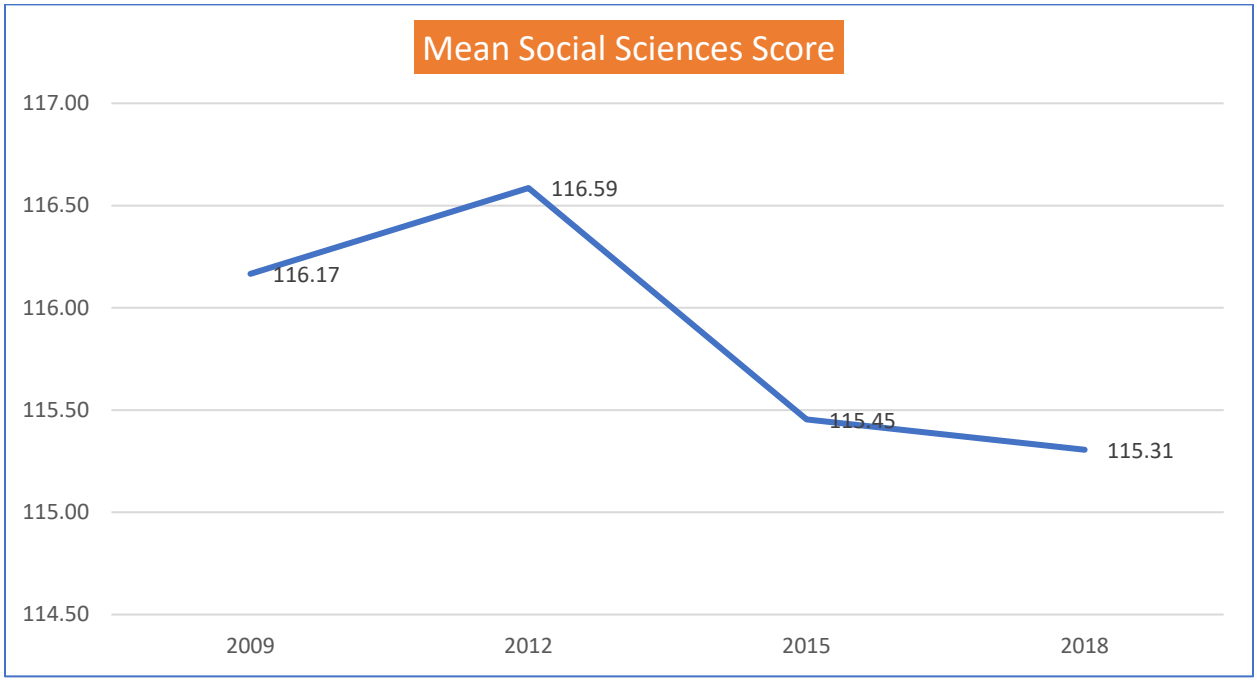

- The average math score was stable over the years.
- It trended up in 2015 by about 1 point and then dropped back by a point in 2018.

Figure 14. Mean Humanities Score by Year



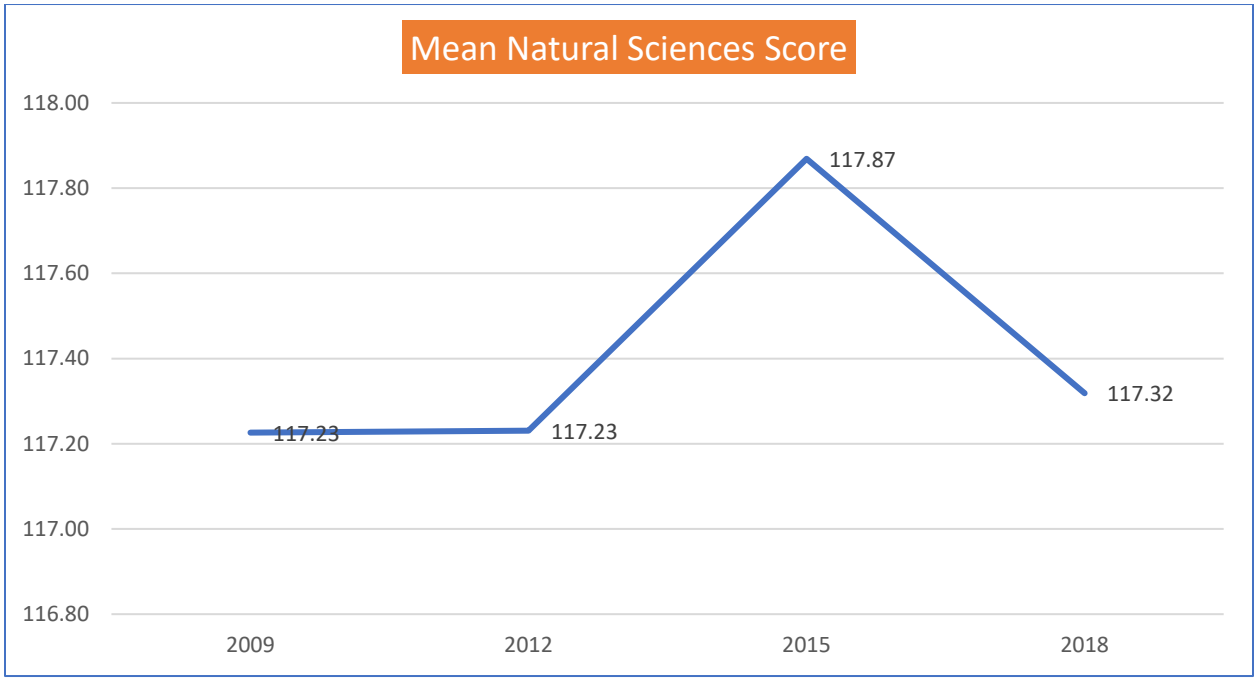
- The average humanities score decreased by about 2 points from 2009 to 2018.
- The College should implement strategies to increase the score.

Figure 15. Mean Social Science Score by Year




- The average social science score was generally stable over the years.
- 2015 saw the slight decrease by about 1 point.

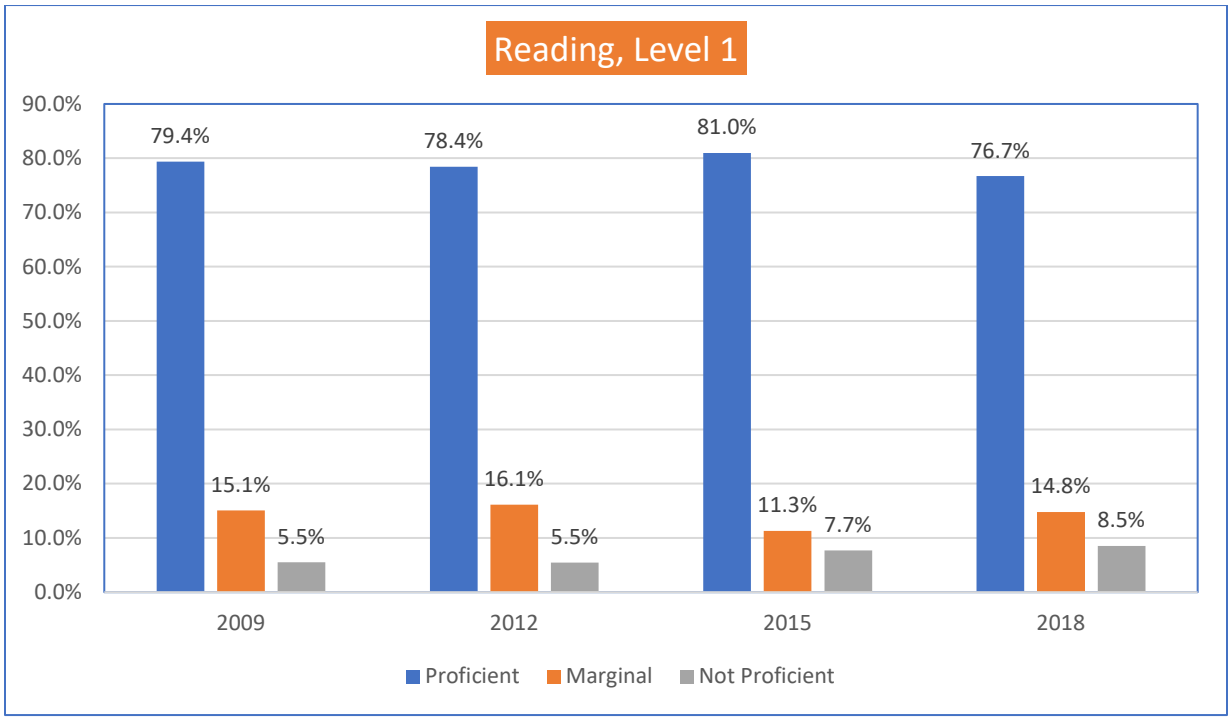
Figure 16. Mean Natural Science Score by Year



- The average natural science score was generally stable over the years.
- In 2015, it slightly increased by about 0.5 point.

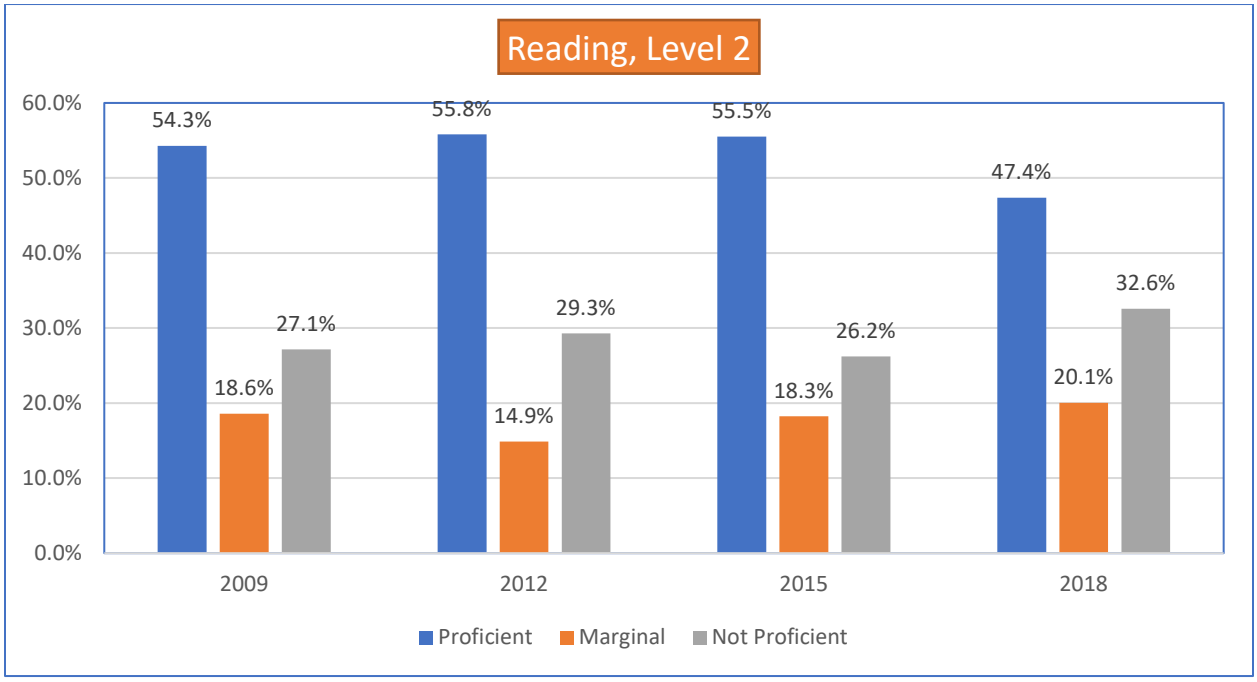
## Descriptive Analysis in EPP Proficiency Classifications by Year

Figure 17. Reading Level 1 Proficiency Classifications by Year



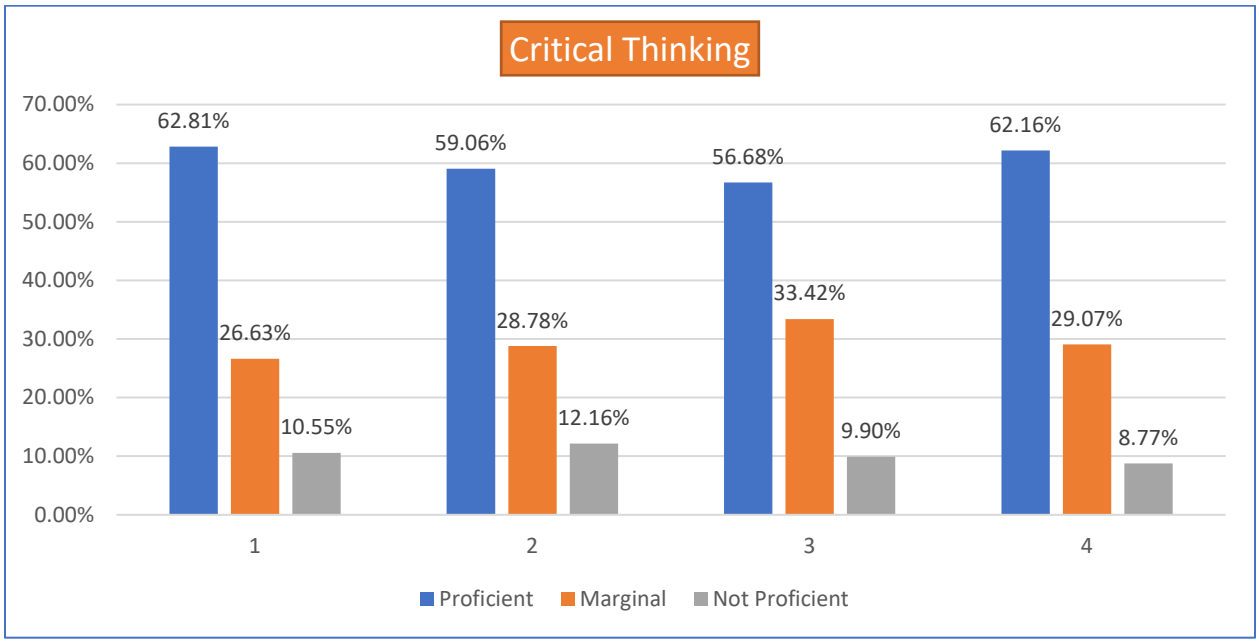

- Students performed the best in 2015 in reading level 1.
- It showed a slightly downward trend from 2015 to 2018.

Figure 18. Reading Level 2 Proficiency Classifications by Year



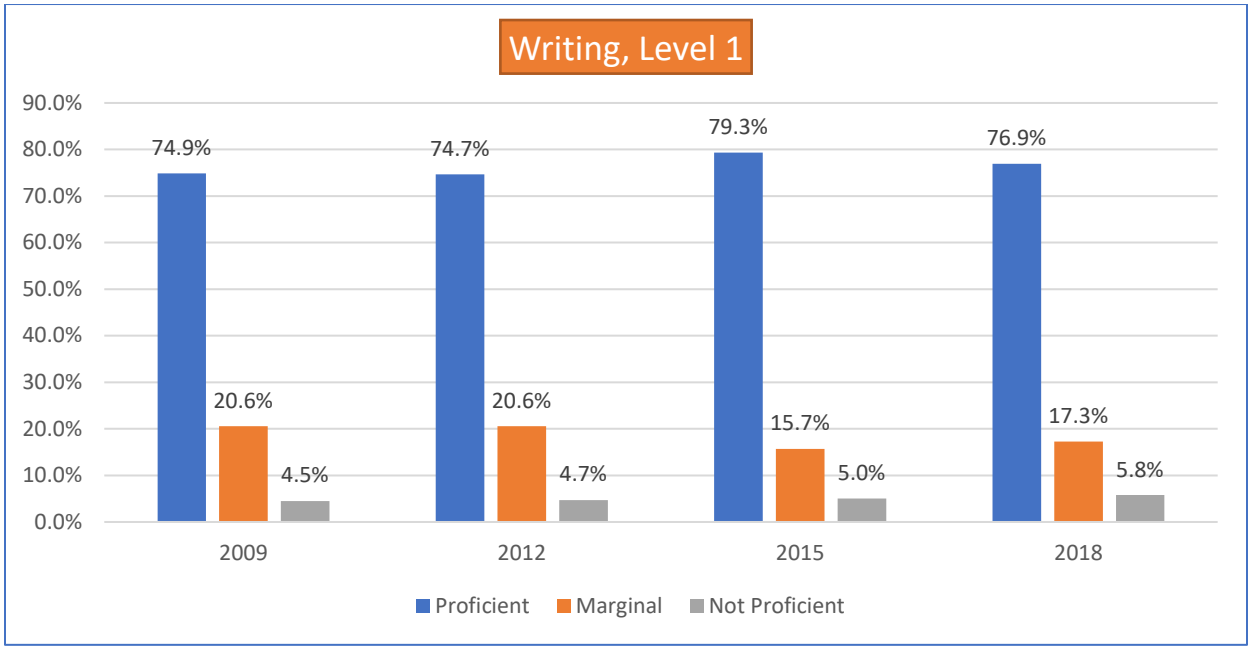

- Students performed the best in 2012 in reading level 2.
- It showed a decrease in the proficient category from 55% to 47% from 2015 to 2018.

Figure 19. Critical Thinking Proficiency Classifications by Year



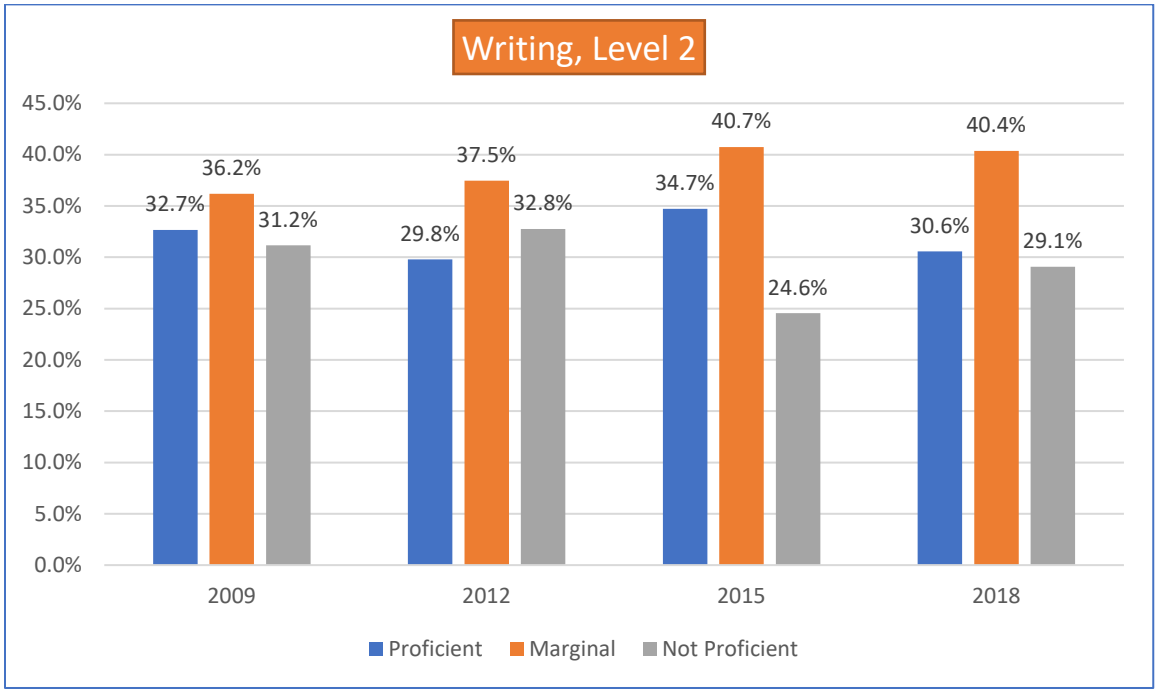

- Students performed the best in 2009 in critical thinking measures.
- Students showed an increase in the proficient category from 56% to 62% from 2015 to 2018.

Figure 20. Writing Level 1 Proficiency Classifications by Year



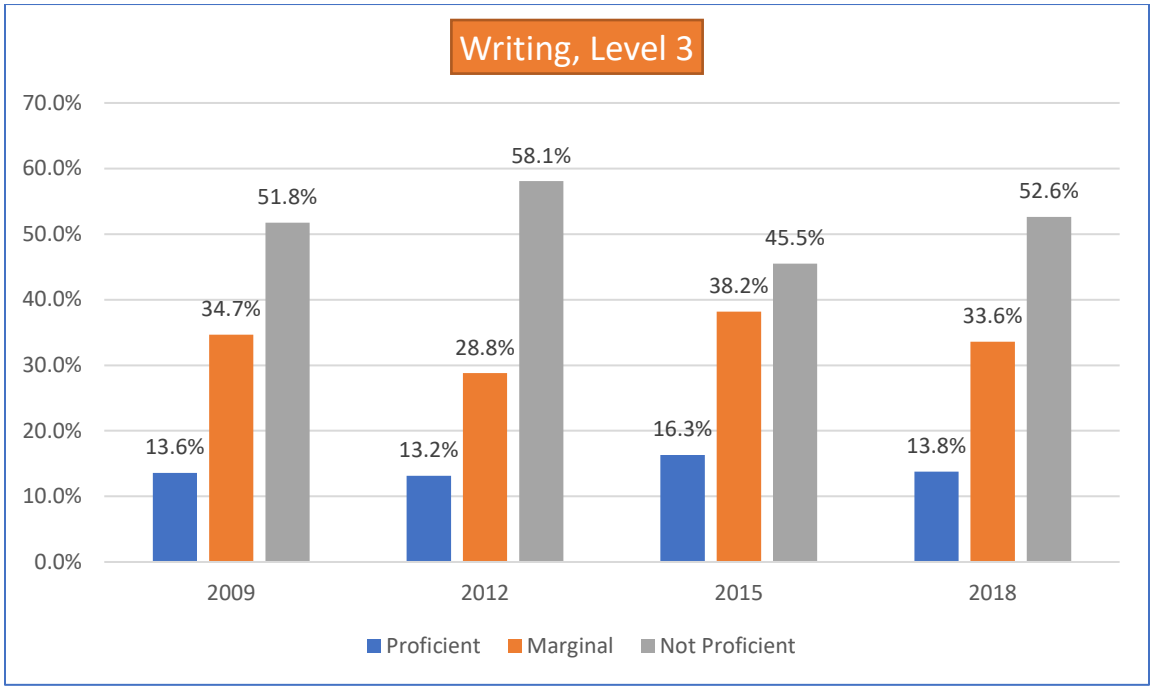

- Students performed the best in 2015 in writing level 1 measures.
- Students showed a noticeable increase in the proficient category from 74% to 79% from 2009 to 2015.

Figure 21. Writing Level 2 Proficiency Classifications by Year



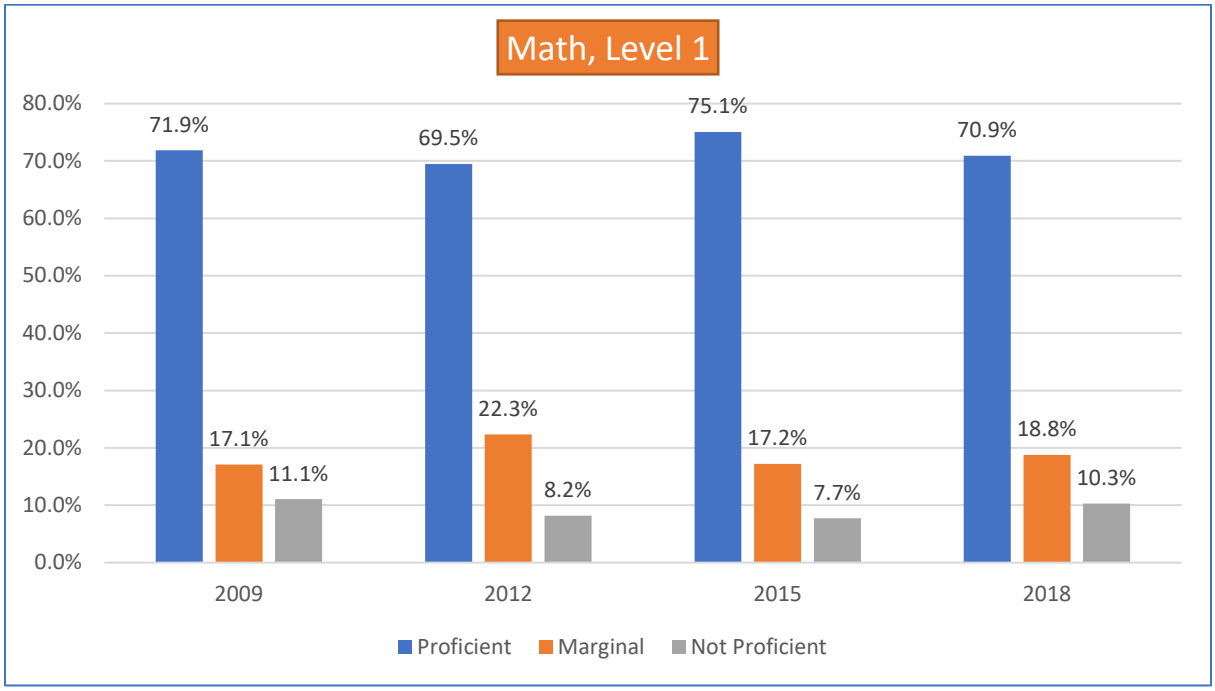

- Less than 40% of students received the proficient mark in writing level 2 over the years.
- Students performed the best in 2015, with 34% of students being proficient.

Figure 22. Writing Level 3 Proficiency Classifications by Year



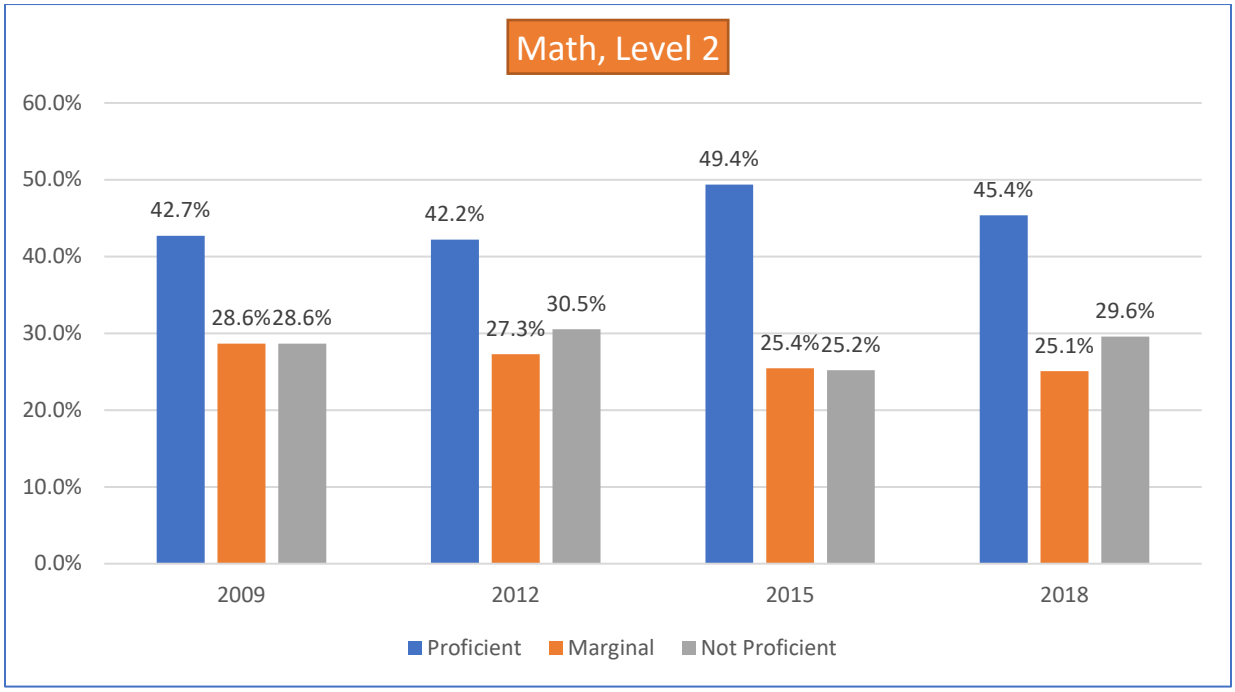

- Less than 20% of students received the proficient mark in writing level 3 over the years.
- Students performed the best in 2015, with 16% of students being proficient.

Figure 23. Math Level 1 Proficiency Classifications by Year



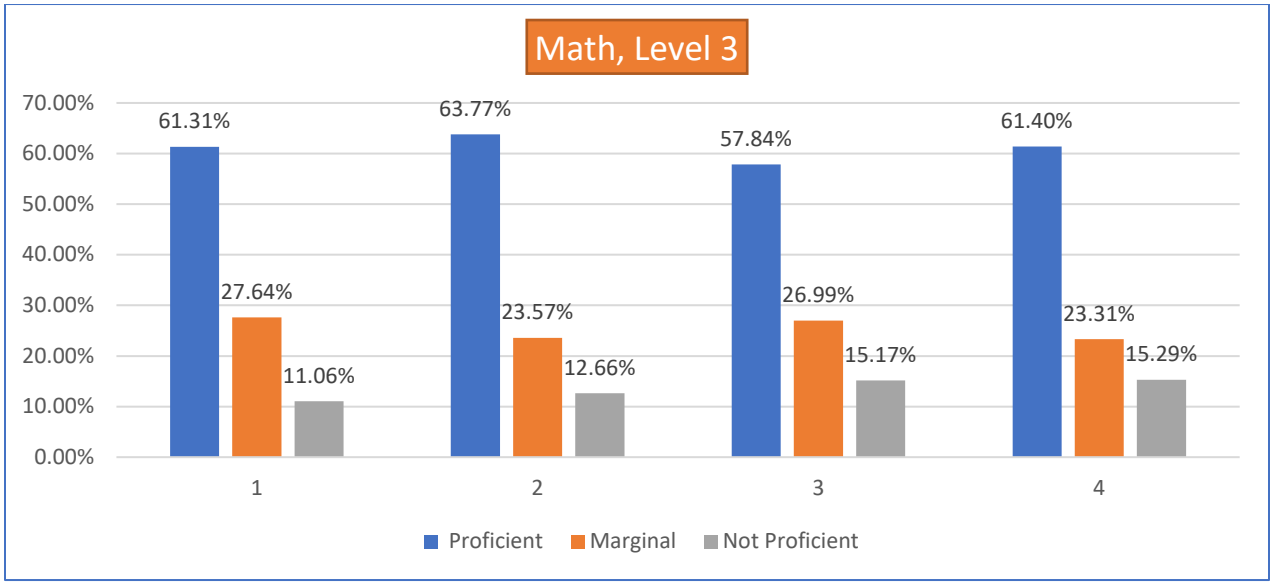

- 69% to 75% of students received the proficient mark in math level 1 over the years.
- Students performed the best in 2015, with 75% of students being proficient.

Figure 24. Math Level 2 Proficiency Classifications by Year




- Less than 50% of students received the proficient mark in math level 2 over the years.
- Students performed the best in 2015, with 49% of students being proficient.

Figure 25. Math Level 3 Proficiency Classifications by Year

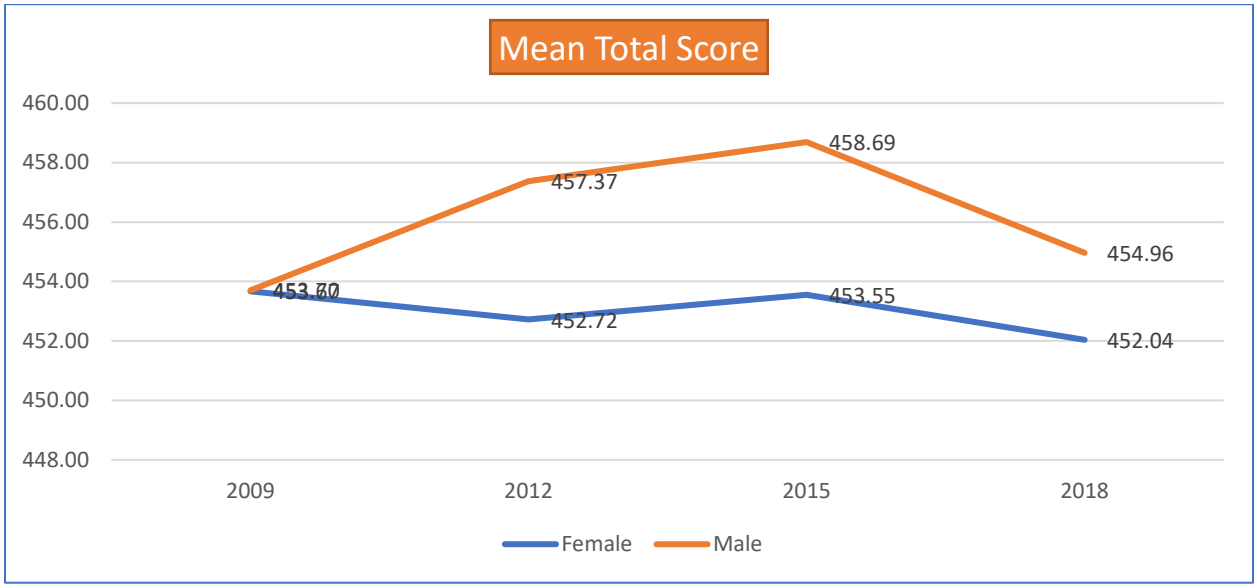



- Less than 20% of students received the proficient mark in math level 3 over the years.
- Students performed the best in 2018, with 15.3% of students being proficient.

## Cross-Tabulation Trend Analysis

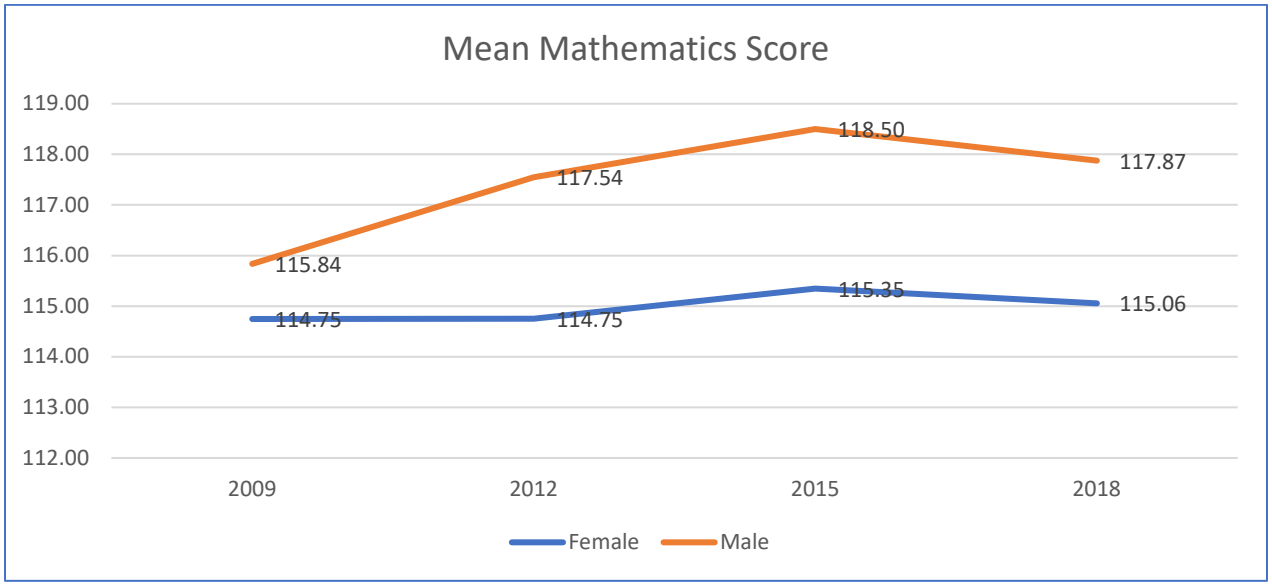
### EPP Scale Scores by Gender and by Year

Figure 26. Mean Total Scores by Gender and by Year



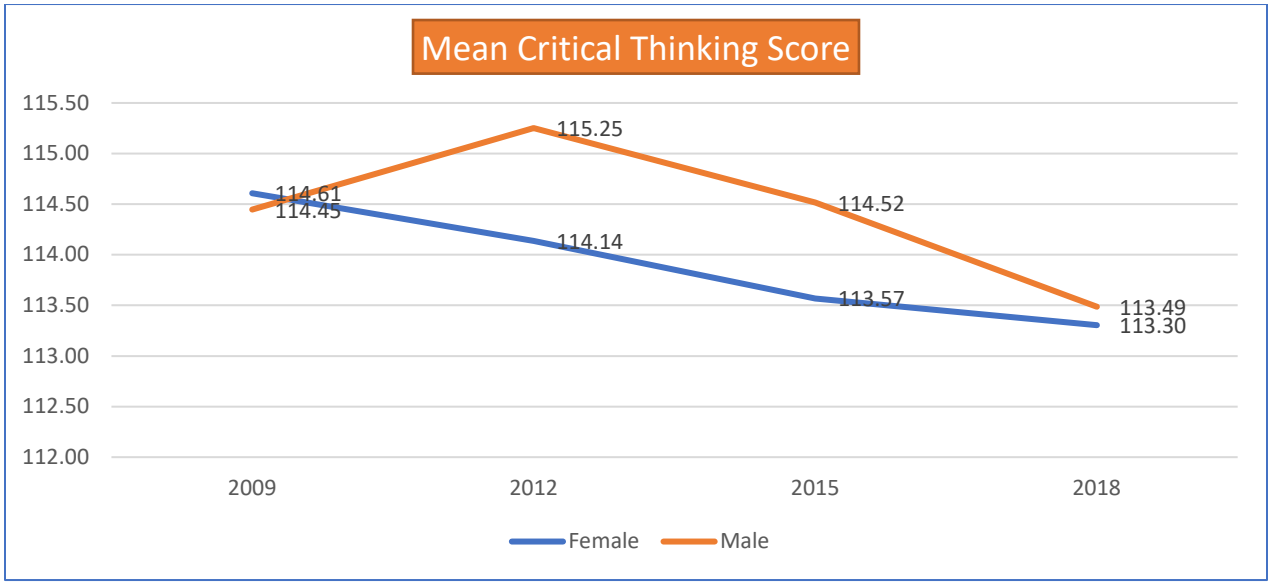

- Male students performed better over the years than female students in the total score.
- The gender difference was minimal in 2009, but it was expanded since 2012.

Figure 27. Mean Mathematics Scores by Gender and by Year



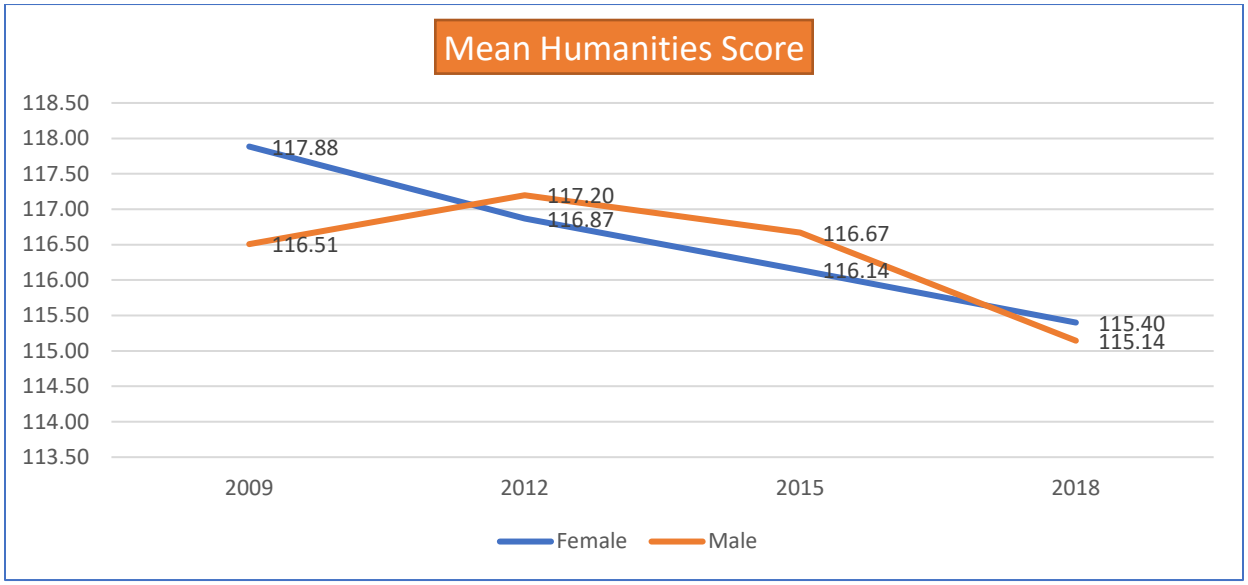

- Male students performed better over the years than their female peers in the math score.
- The gender difference was minimal in 2009, but it became more in 2012 and 2015.

Figure 28. Mean Critical Thinking Scores by Gender and by Year



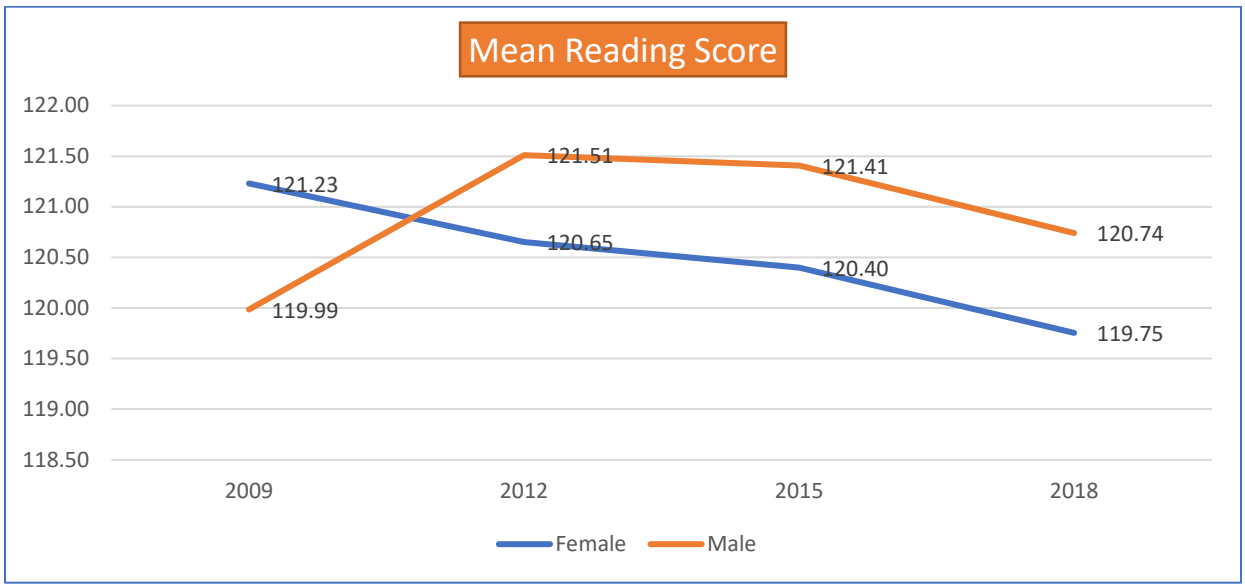

- Except in 2009, Males performed better over the years than females in the critical thinking score.
- The gender difference was small in 2012 and 2015, but this gap was bridged in 2018.

Figure 29. Mean Humanities Scores by Gender and by Year



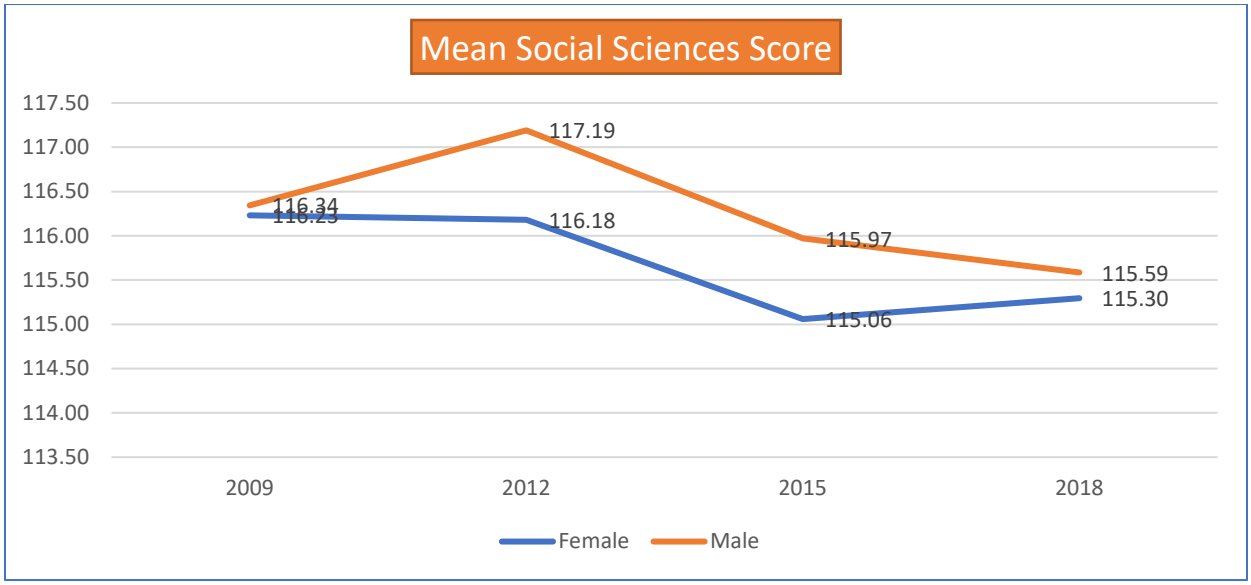

- Gender difference is not large over the years in humanities score.
- Female students performed slightly better in both 2009 and 2018.

Figure 30. Mean Reading Scores by Gender and by Year



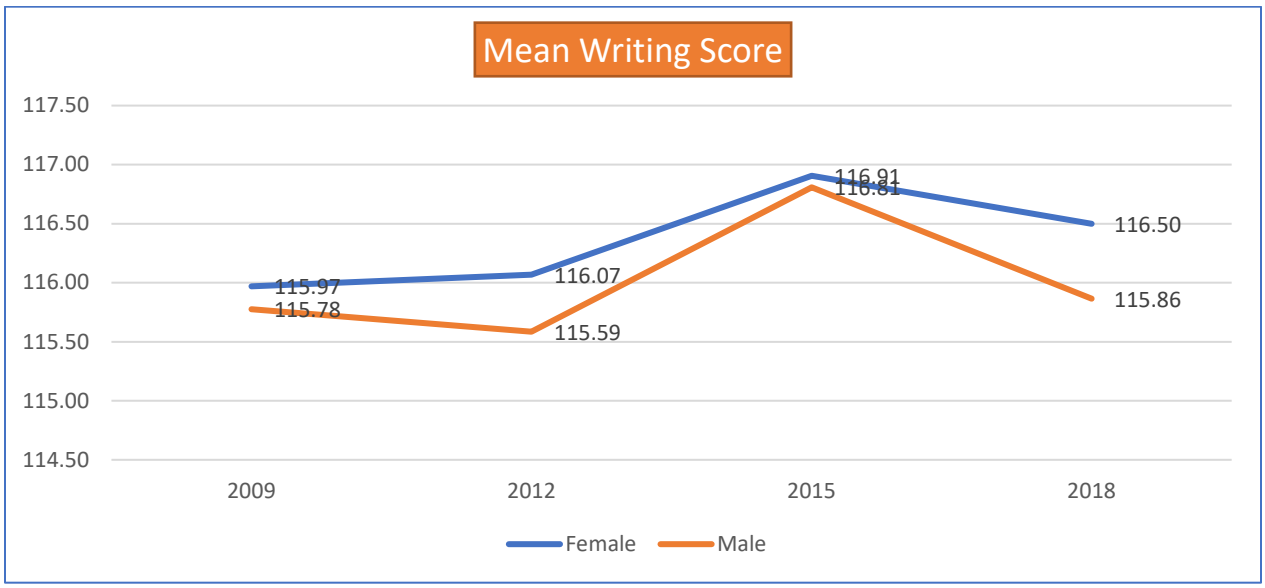

- Male students performed better in reading score over the years expect in 2009.
- Gender difference in reading score is not large.

Figure 31. Mean Social Science Scores by Gender and by Year



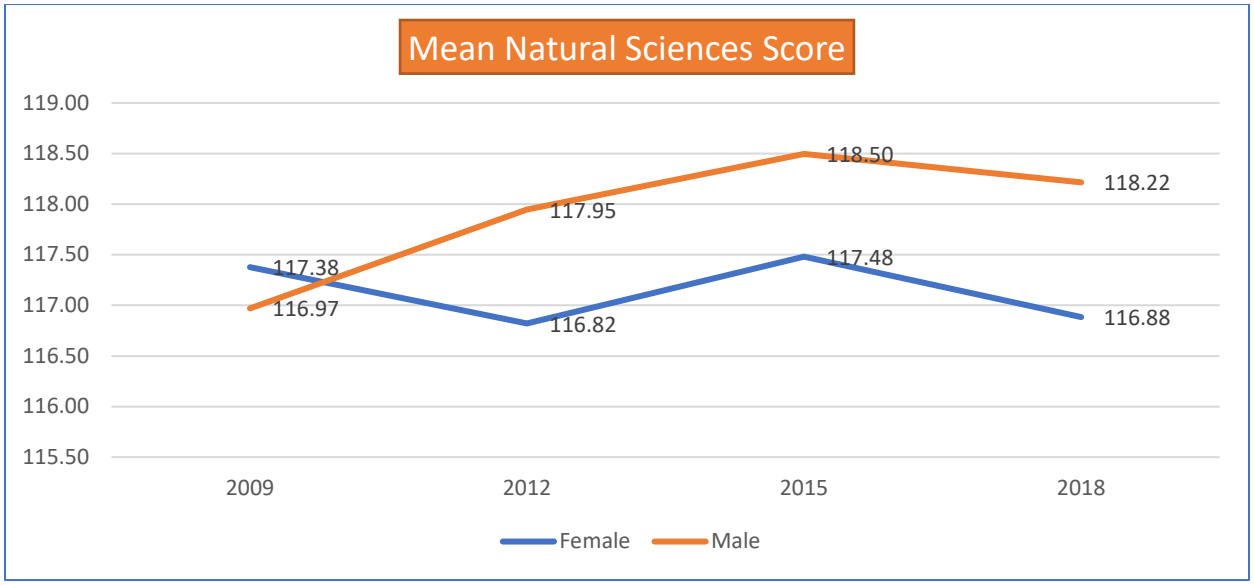

- Male students performed better in social science over the years.
- Gender difference in social science score is not considerable.

Figure 32. Mean Writing Scores by Gender and by Year




- Female students performed better in writing score over the years.
- Gender gap in writing score is not large enough to be significant.

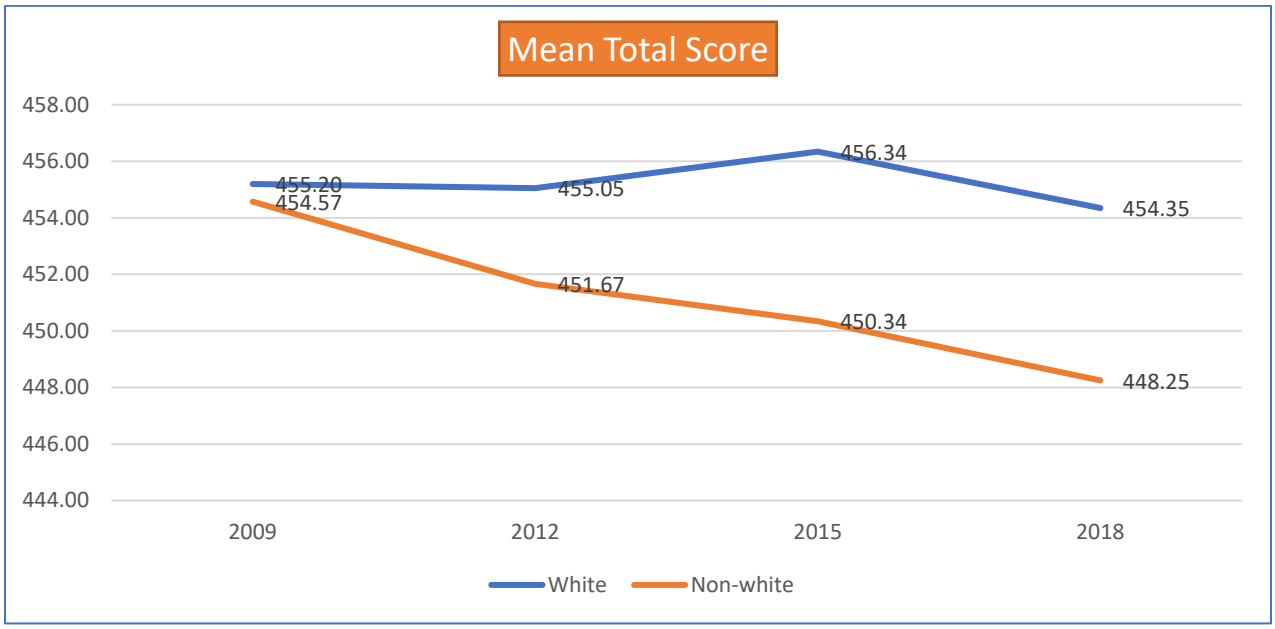
Figure 33. Mean Natural Science by Gender and by Year




- Male students performed better in natural science score over the years except in 2009.
- Gender gap in natural science score is not large enough to be significant.

## EPP Scale Scores by White and Non-White and by Year

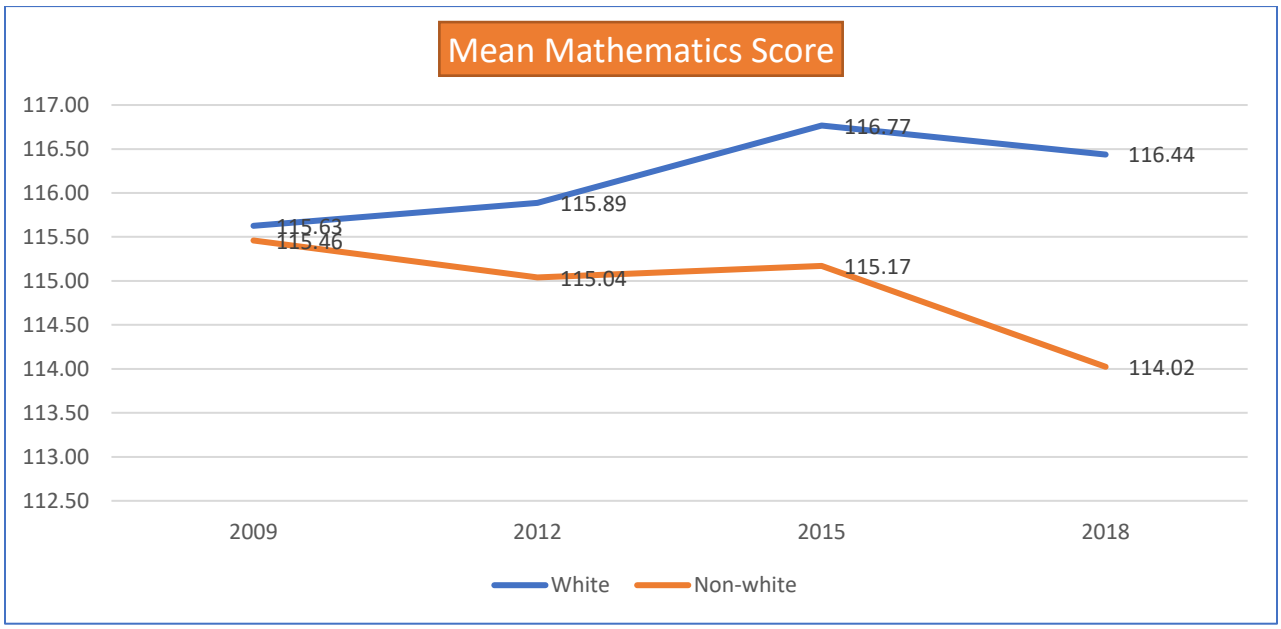
Figure 34. Mean Total Score by White and Non-White and by Year




Note: Non-White students include African American, American Indian or Alaskan Native, Asian American or Pacific Islander, Black Hispanic, Hispanic and other races.

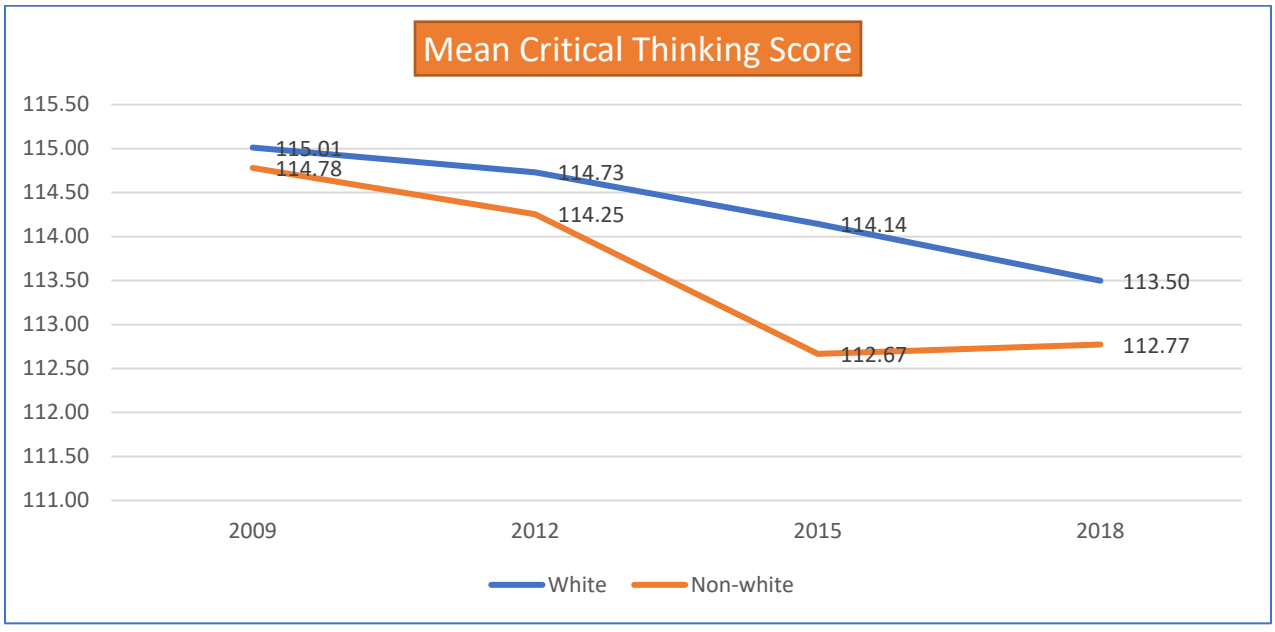
- White students performed better than non-white students in total score over the years.
- The gap associated with race is the largest in 2015, with white students gaining 6 points more than the non-white group.

Figure 35. Mean Mathematics Score by White and Non-White and by Year



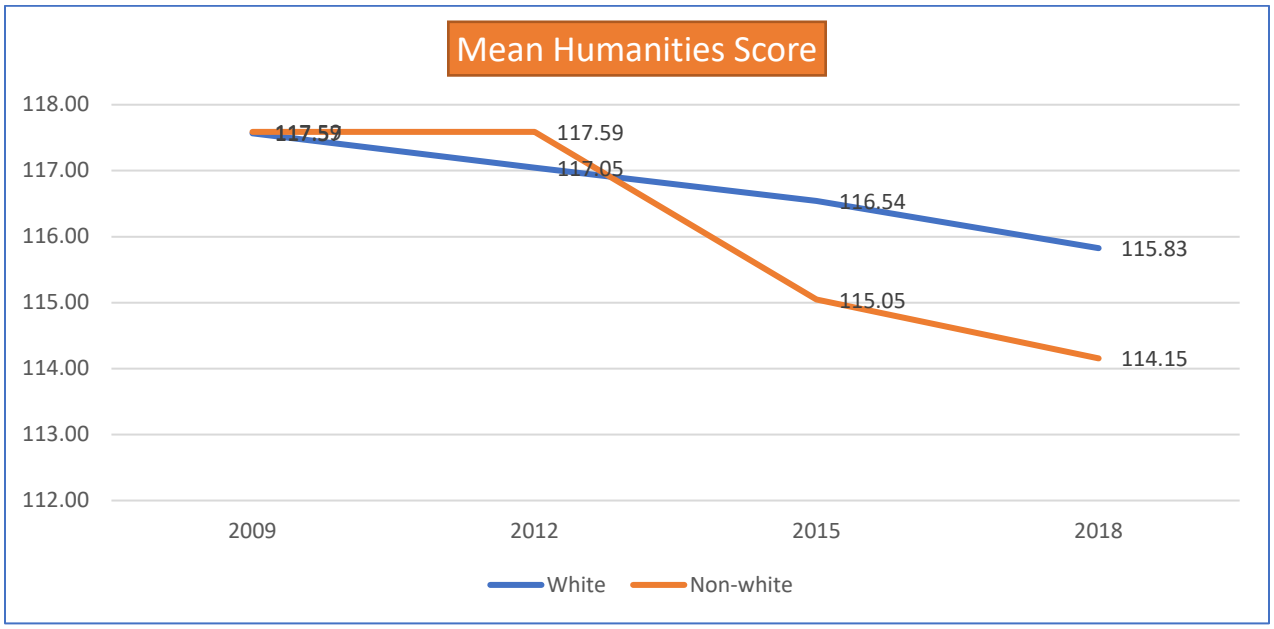

- White students performed better than non-white students in math score over the years.
- The gap associated with race in math score is not considerable.

Figure 36. Mean Critical Thinking Score by White and Non-White and by Year



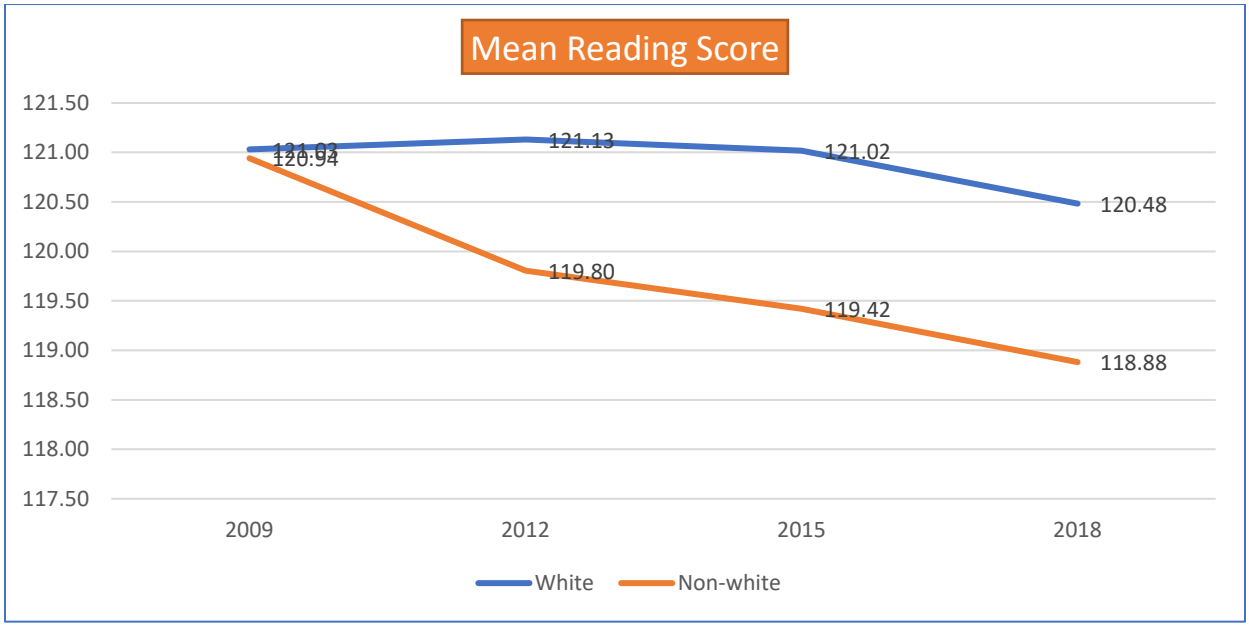
- White students performed better than non-white students in critical thinking score over the years.
- The gap associated with race in critical thinking score is about 2 points.

Figure 37. Mean Humanities Score by White and Non-White and by Year



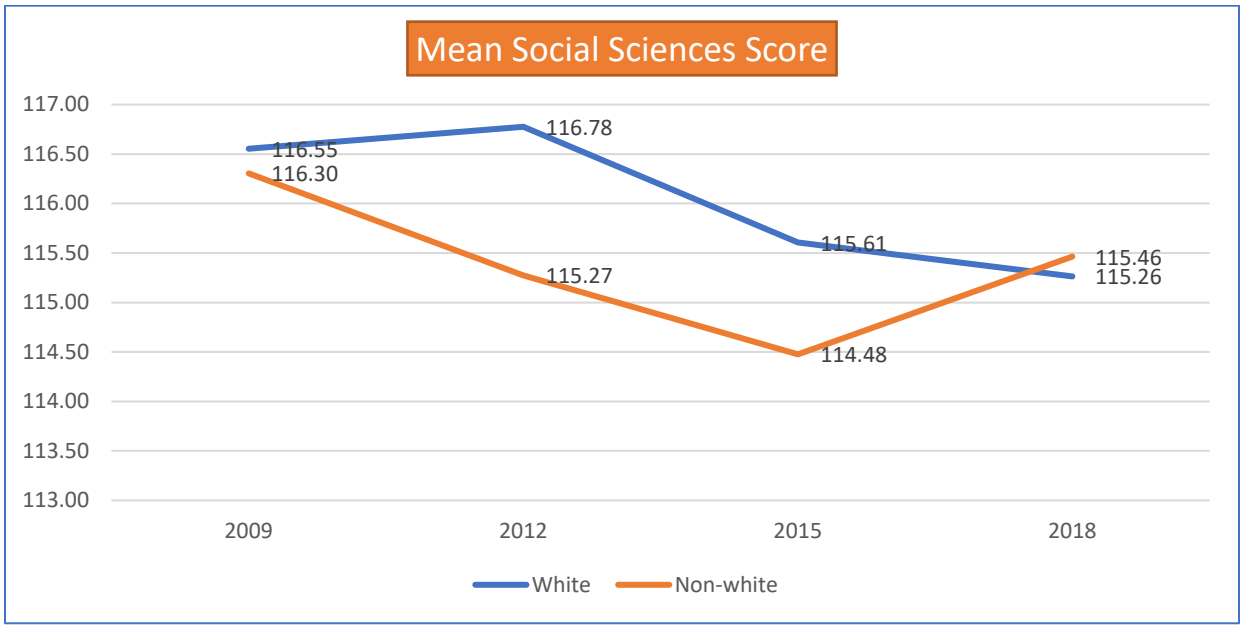

- Non-White students performed slightly better than white students in humanities score in 2009 and 2012.

Figure 38. Mean Reading Score by White and Non-White and by Year



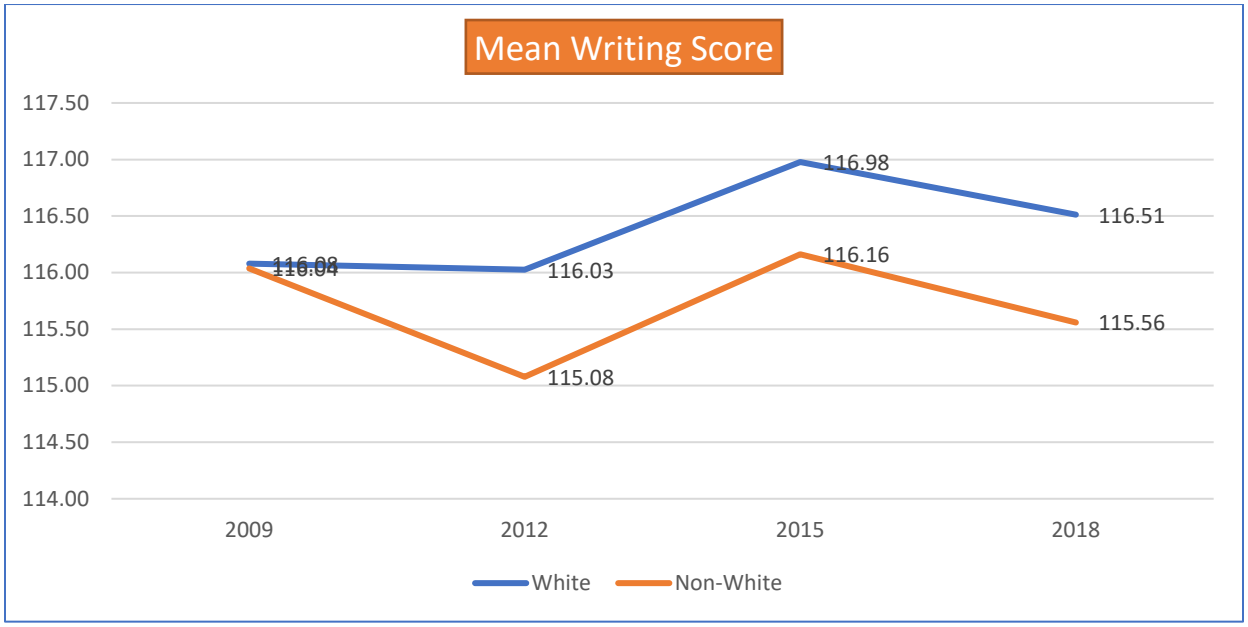

- White students performed better than non-white students in reading score over the years.
- The gap associated with race in reading score is about 2 points.

Figure 39. Mean Social Science Score by White and Non-White and by Year



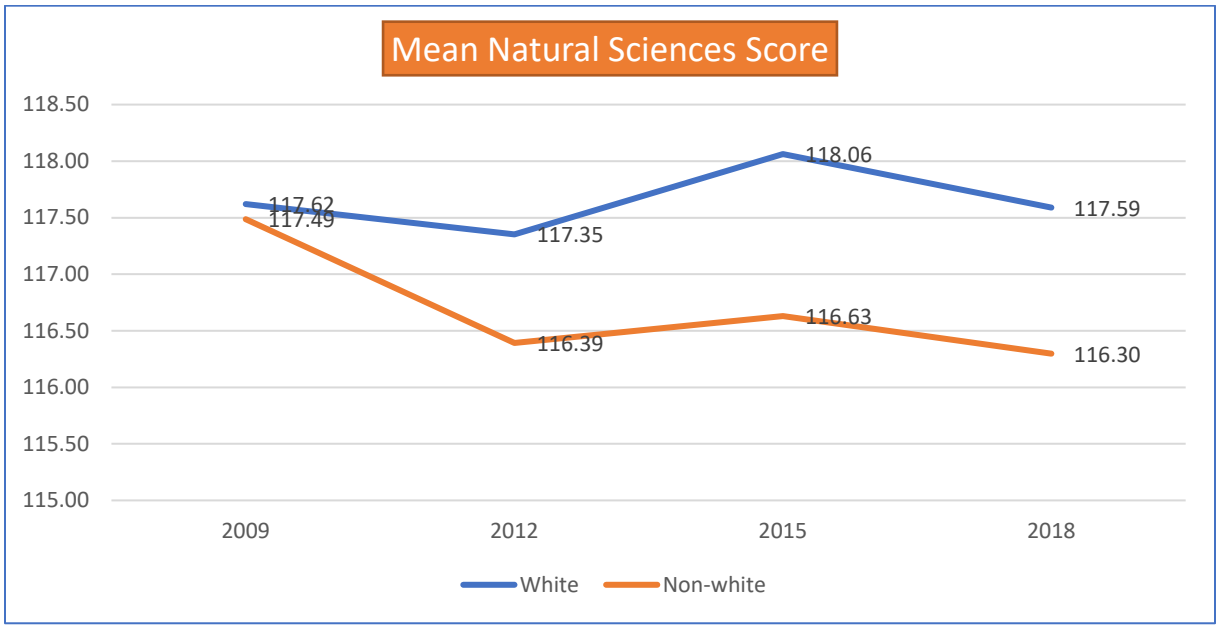

- White students performed slightly better than non-white students in social science score over the years except in 2018.

Figure 40. Mean Wrting Score by White and Non-White and by Year




- White students performed better than non-white students in writing score over the years.
- The gap associated with race in writing score is not considerable.

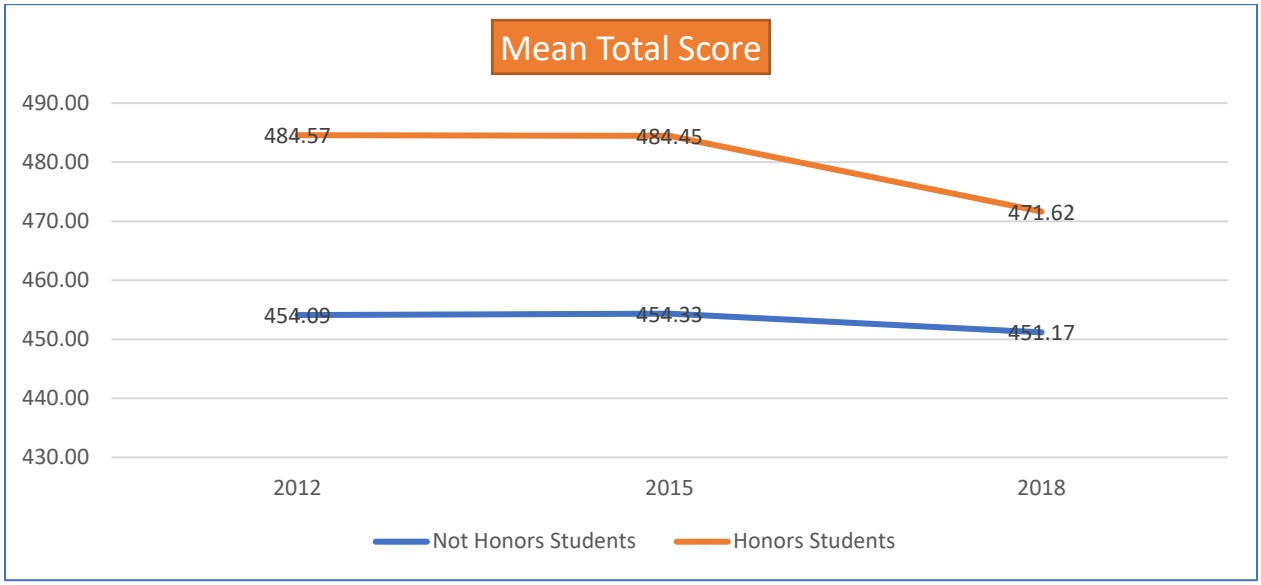
Figure 41. Mean Natural Science Score by White and Non-White and by Year




- White students performed better than non-white students in natural science score over the years.
- The gap associated with race in writing score is about 2 points in 2015.

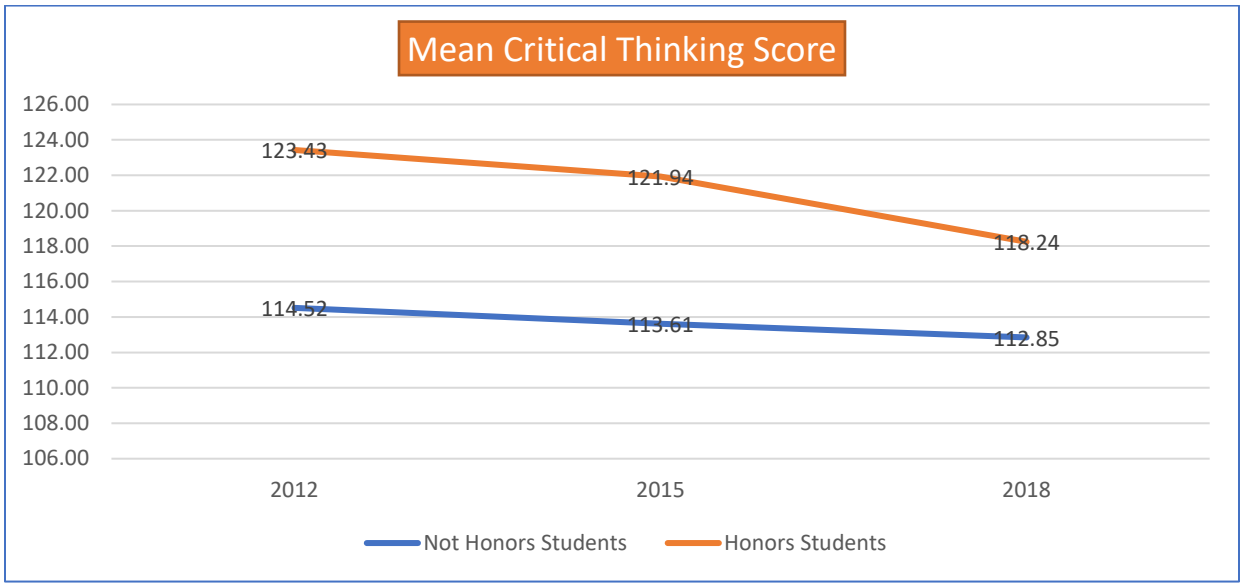
## EPP Scale Score by Honor Student Status and by Year

Figure 42. Mean Total Score by Honors Students and Non-Honors and by Year




- Honors students held a considerable advantage in the mean total score over the years.
- The gap between Honors students and Non-Honors students was between 20 to 30 points.
- The difference in the total score between Honors and Non-Honors students decreased from 2015 to 2018.

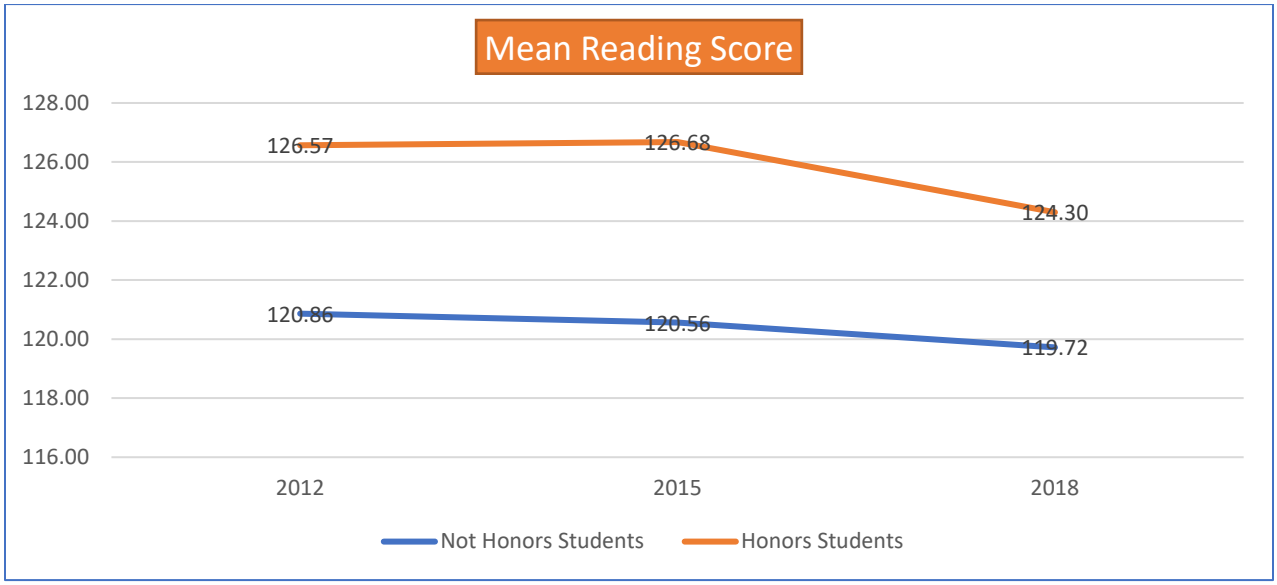
Figure 43. Mean Critical Thinking Score by Honors Students and Non-Honors and by Year




- Honors students held a considerable advantage in the critical thinking score over the years.
- The gap between Honors students and Non-Honors students was about 8 points in 2015.

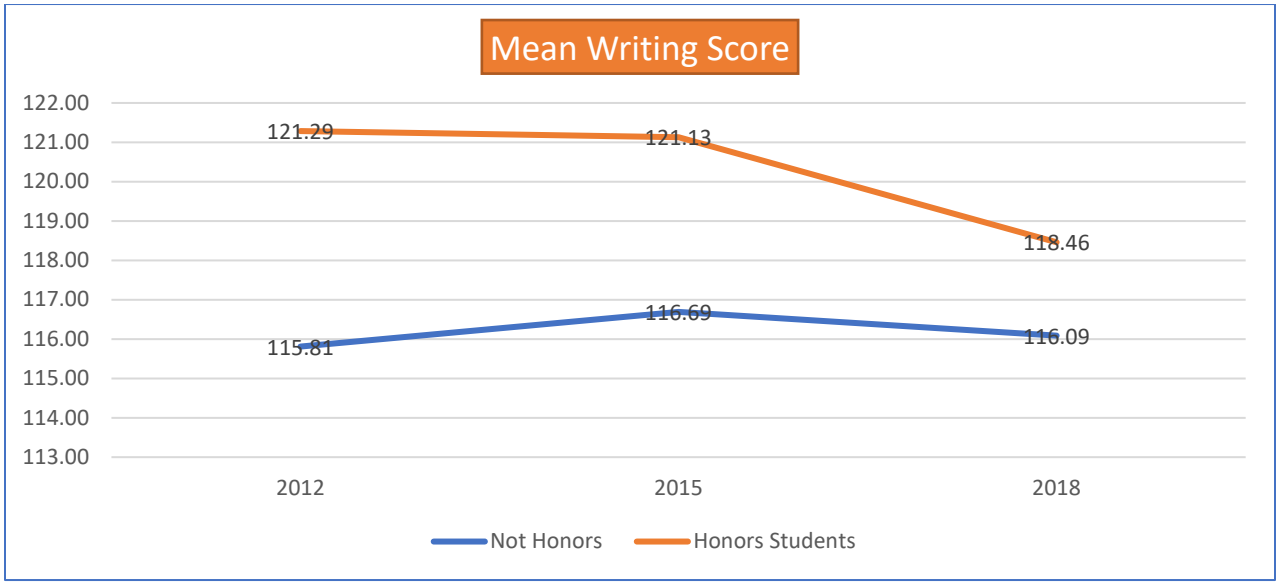
- The difference in the critical thinking score between Honors and Non-Honors students decreased from 2015 to 2018.

Figure 44. Mean Reading Score by Honors Students and Non-Honors and by Year



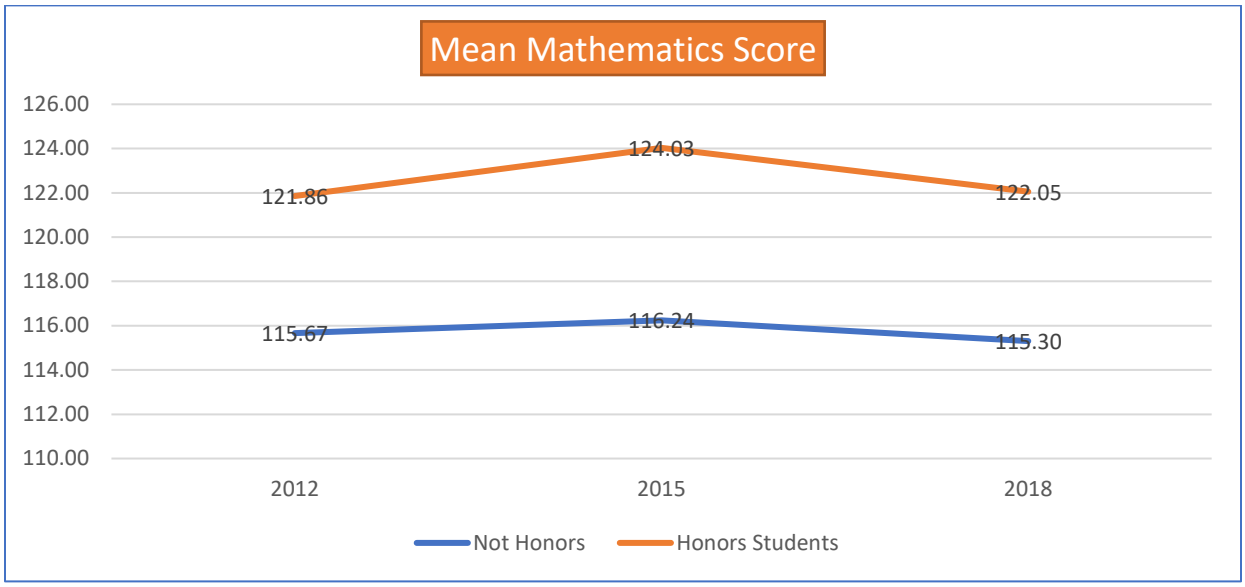

- Honors students performed better in the reading score over the years.
- The gap between Honors students and Non-Honors students was about 6 points in 2015.
- The difference in the reading score between Honors and Non-Honors students decreased from 2015 to 2018.

Figure 45. Mean Writing Score by Honors Students and Non-Honors and by Year



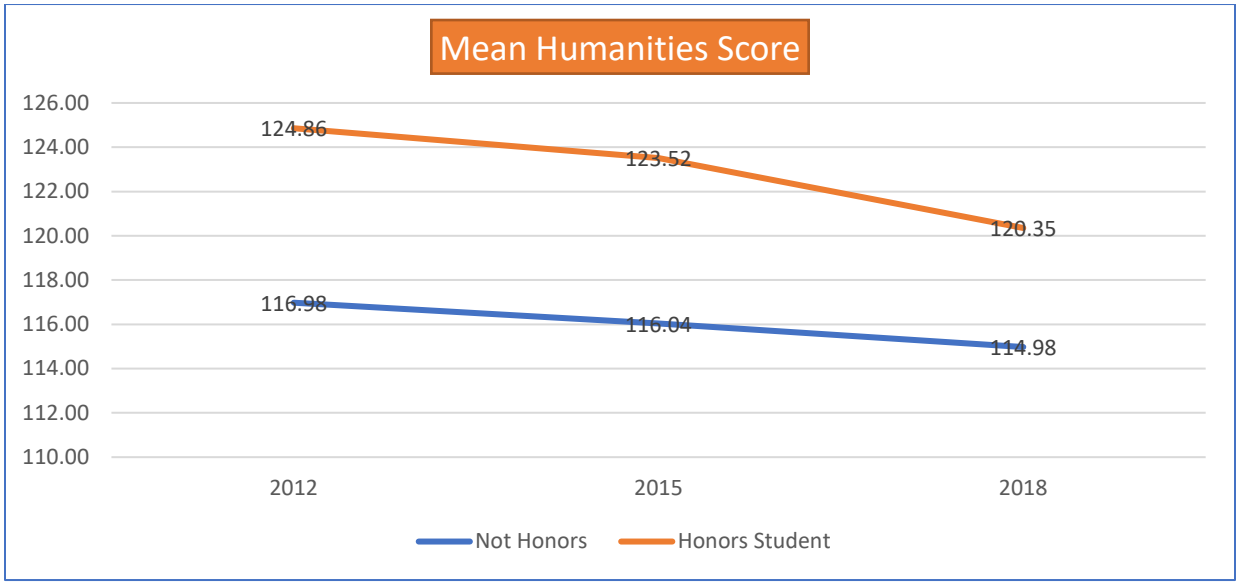

- Honors students performed better in the writing score over the years.
- The gap between Honors students and Non-Honors students was about 5 points in 2015.
- The difference in the writing score between Honors and Non-Honors students decreased from 2015 to 2018.

Figure 46. Mean Mathematics Score by Honors Students and Non-Honors and by Year



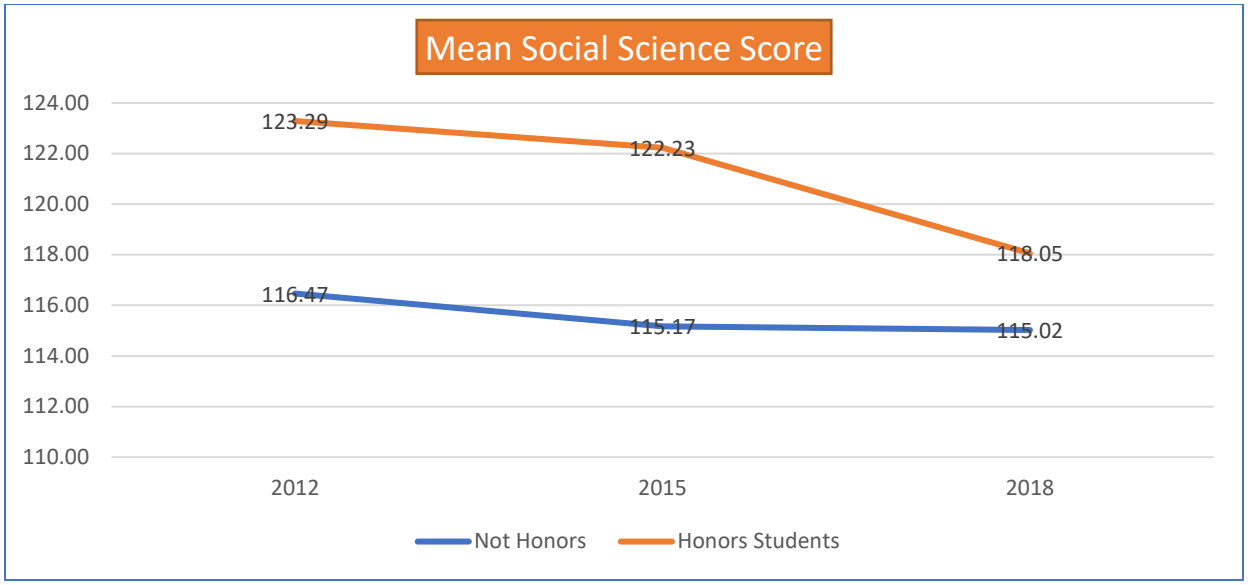

- Honors students performed better in the math score over the years.
- The gap between Honors students and Non-Honors students was about 8 points in 2015.

Figure 47. Mean Humanities Score by Honors Students and Non-Honors and by Year



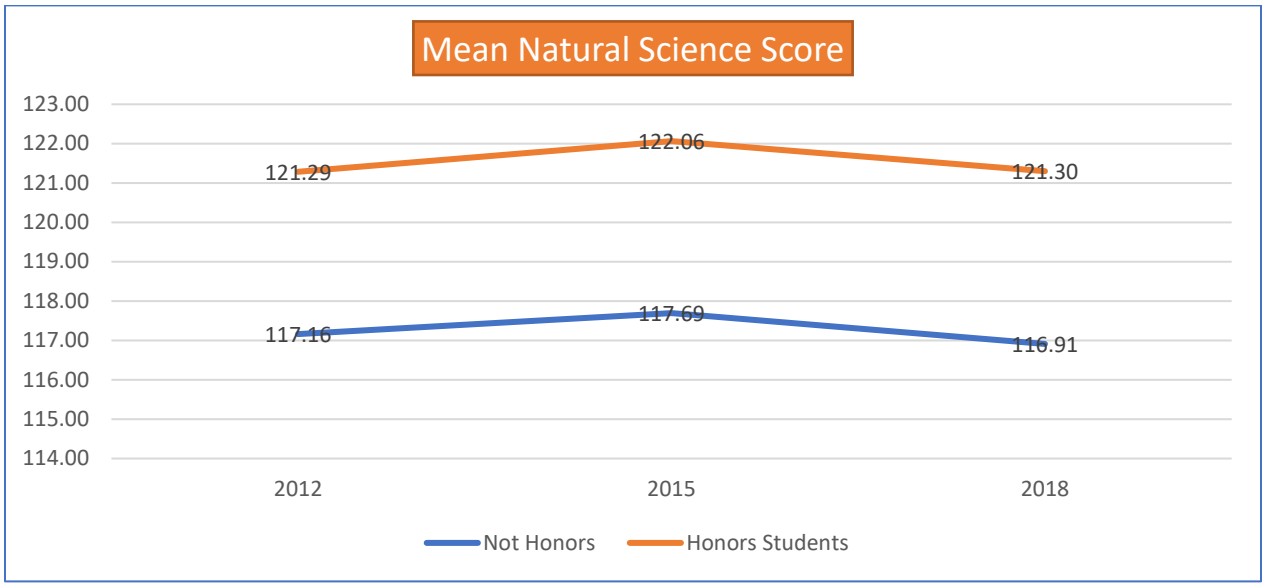

- Honors students performed better in the humanities score over the years.
- The gap between Honors students and Non-Honors students was about 7 points.
- The difference in the humanities score between Honors and Non-Honors students decreased from 2015 to 2018.

Figure 48. Mean Social Score by Honors Students and Non-Honors and by Year




- Honors students performed better in the social science score over the years.
- The gap between Honors students and Non-Honors students was about 7 points.
- The difference in the social science score between Honors and Non-Honors students significantly decreased from 2015 to 2018.

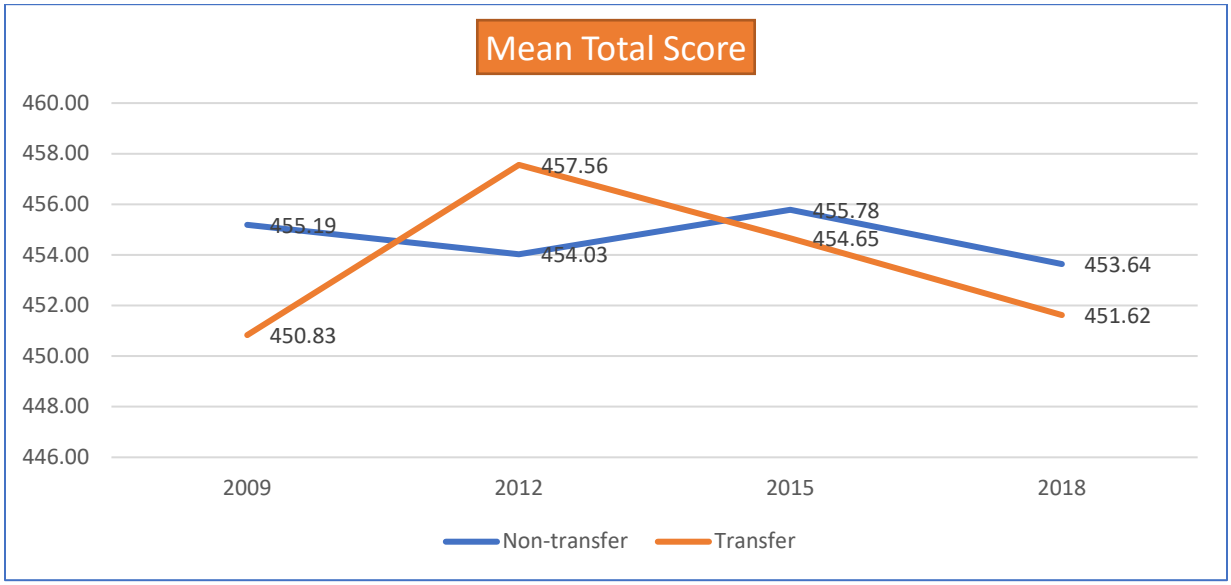
Figure 49. Mean Natural Science Score by Honors students and Non-Honors and by Year




- Honors students performed better in the natural science score over the years.
- The gap between Honors students and Non-Honors students was about 5 points.

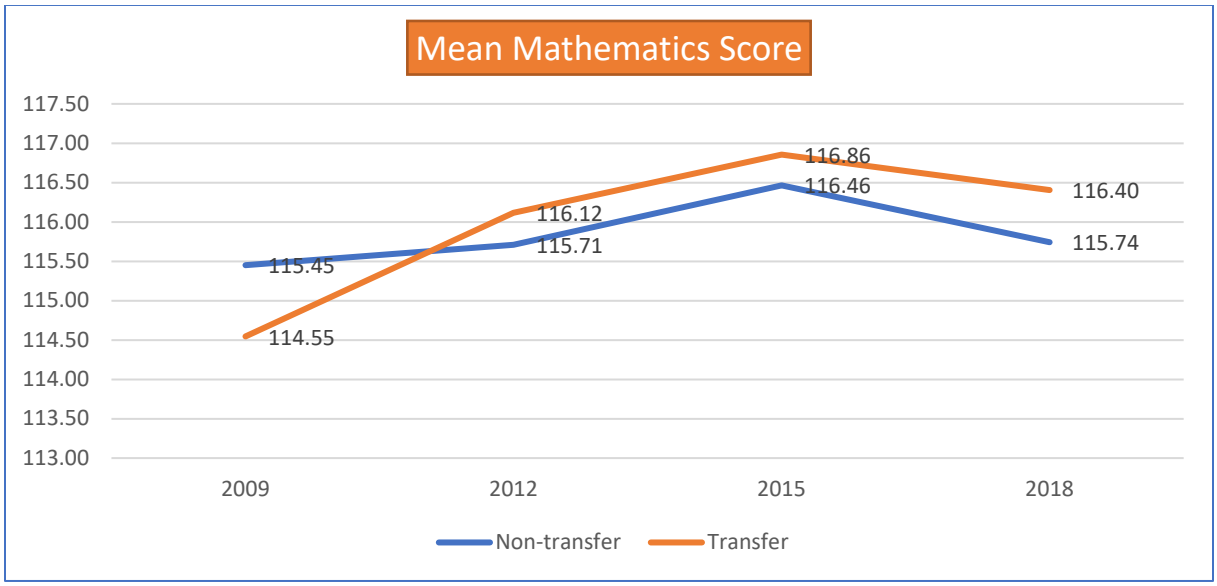
## EPP Scale Scores by Transfer students and Non-Transfer Students and by Year

Figure 50. Mean Total Score by Transfer Students and Non-Transfer Students and by Year



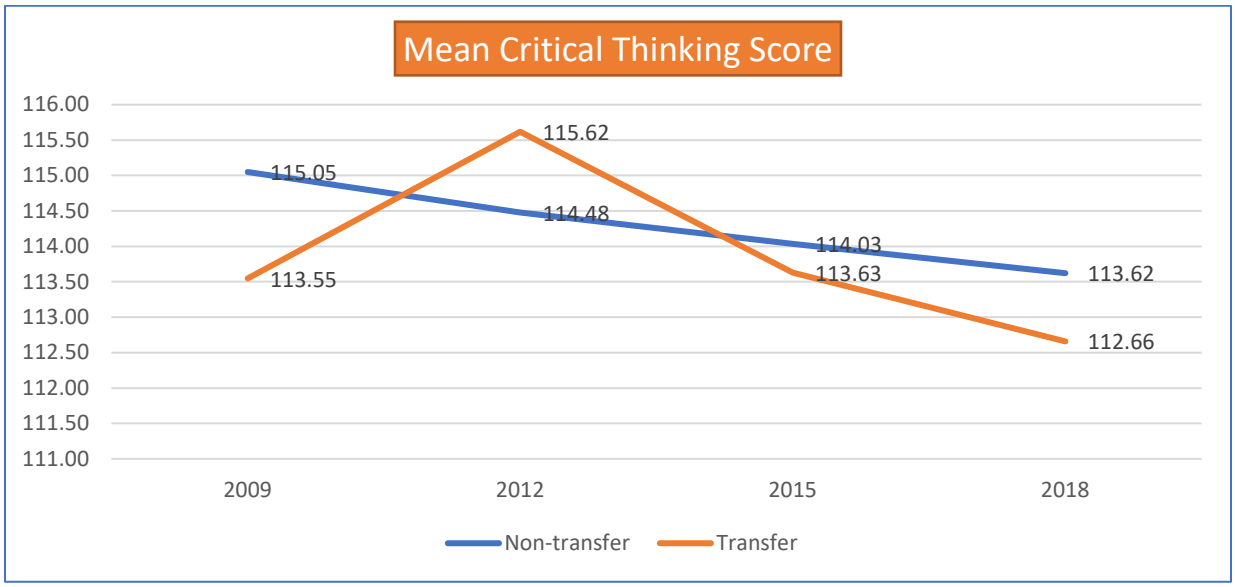

- Non-transfer students performed better than transfer students in total score in 2009 and 2015.
- The largest gap in total score between these two groups was about 5 points in 2009, favoring non-transfer students.

Figure 51. Mean Mathematics Score by Transfer Students and Non-Transfer Students and by Year



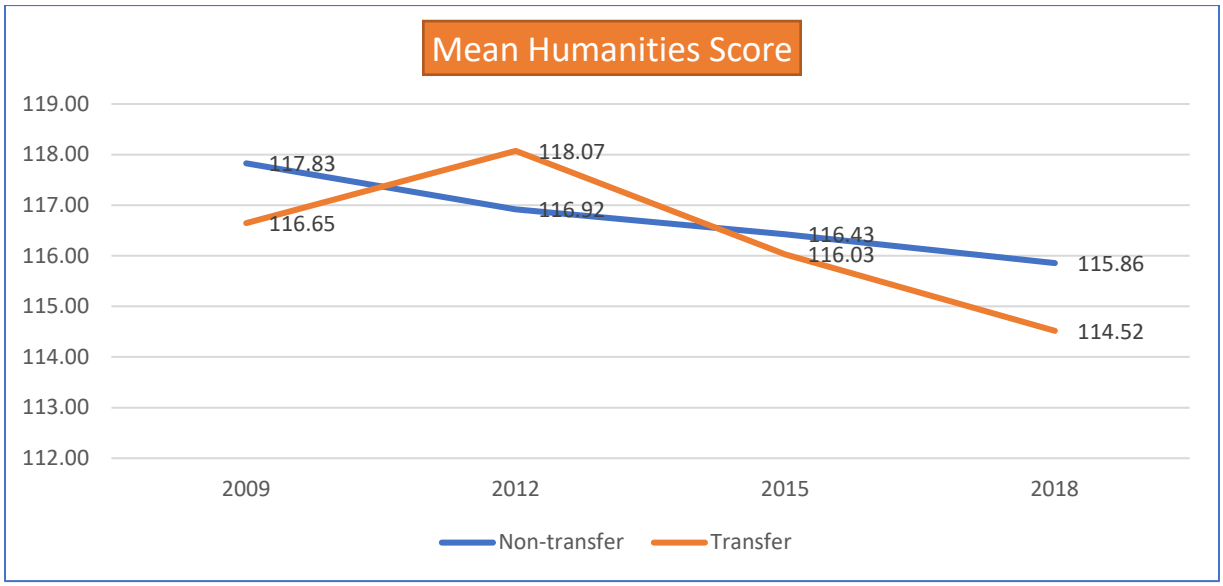

- Non-transfer students performed better than transfer students in math score in 2009 only.
- Transfer students performed slightly better since 2012, but this difference was not considerable.

Figure 52. Mean Critical Thinking Score by Transfer Students and Non-Transfer Students and by Year



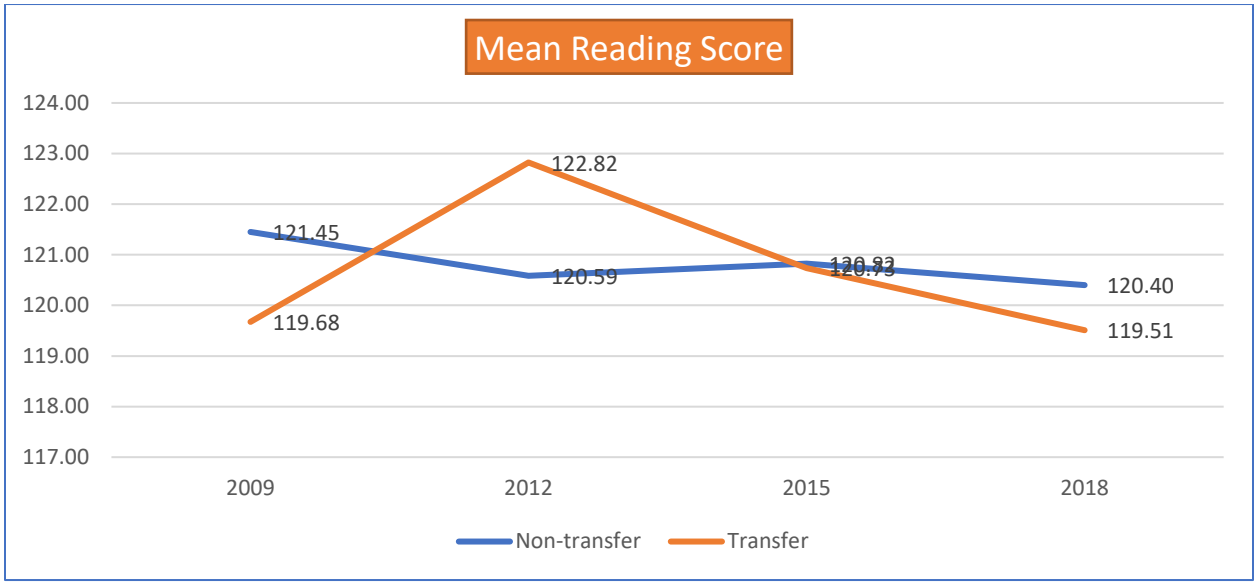

- Non-transfer students performed better than transfer students in critical thinking score in 2009 and 2018.
- Transfer students performed slightly better in 2012, but this difference was small.

Figure 53. Mean Humanities Score by Transfer Students and Non-Transfer Students and by Year



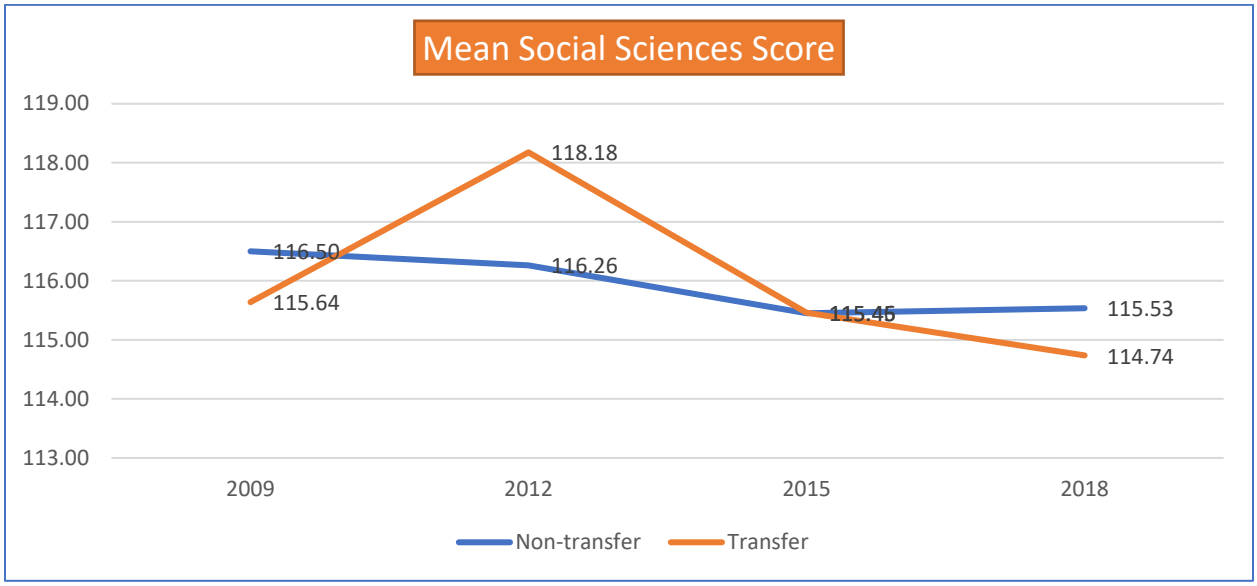

- Non-transfer students performed better than transfer students in humanities score in 2009 and 2015.
- Transfer students performed slightly better in 2012, but this difference was not considerable.

Figure 54. Mean Reading Score by Transfer Students and Non-Transfer Students and by Year



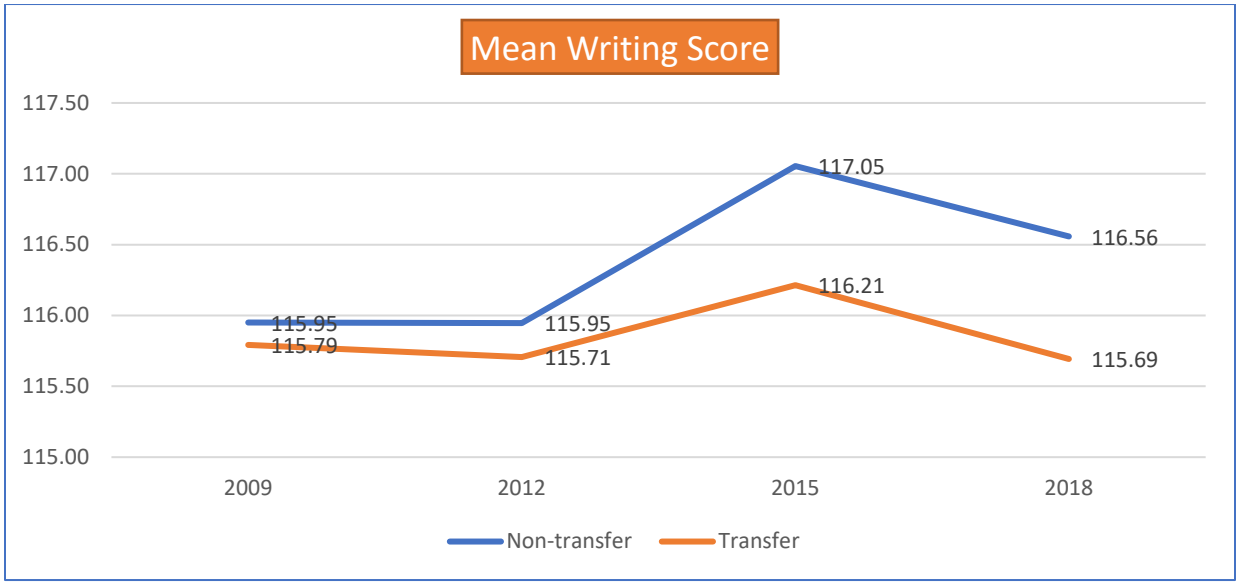

- Non-transfer students performed better than transfer students in reading score in 2009, 2015 and 2018.
- Transfer students performed slightly better in 2012, but this difference was a gap of 2 points.

Figure 55. Mean Social Science Score by Transfer Students and Non-Transfer Students and by Year



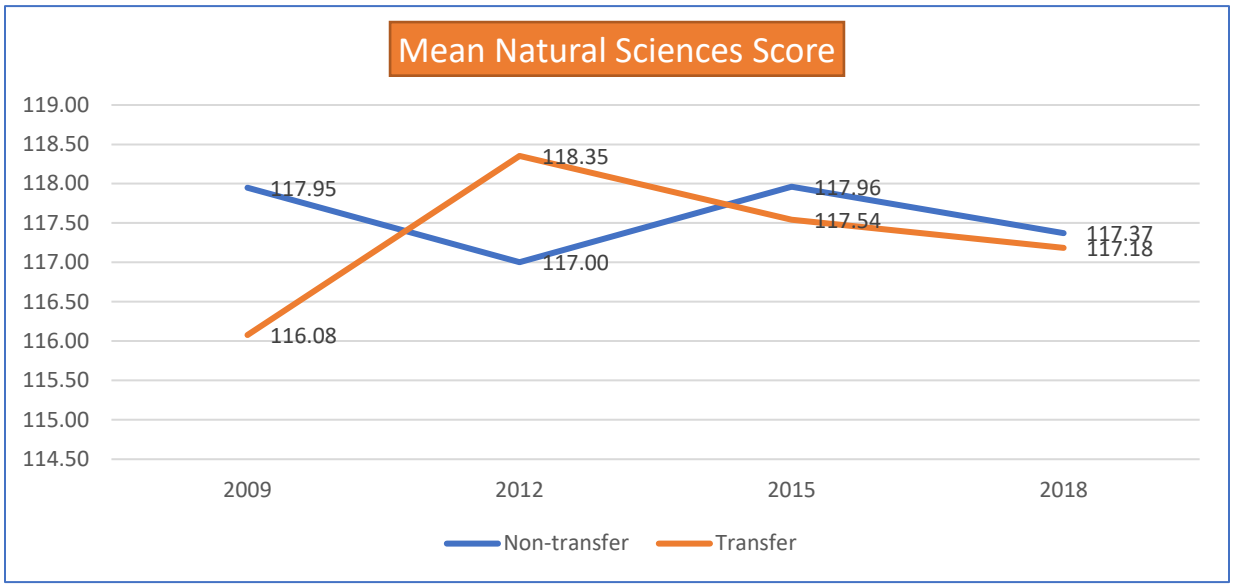

- Non-transfer students performed better than transfer students in social science score in 2009 and 2018.
- Transfer students performed slightly better in 2012, but this difference was a gap of 2 points.

Figure 56. Mean Writing Score by Transfer Students and Non-Transfer Students and by Year




- Non-transfer students consistently performed better than transfer students in writing science score over the years tested.

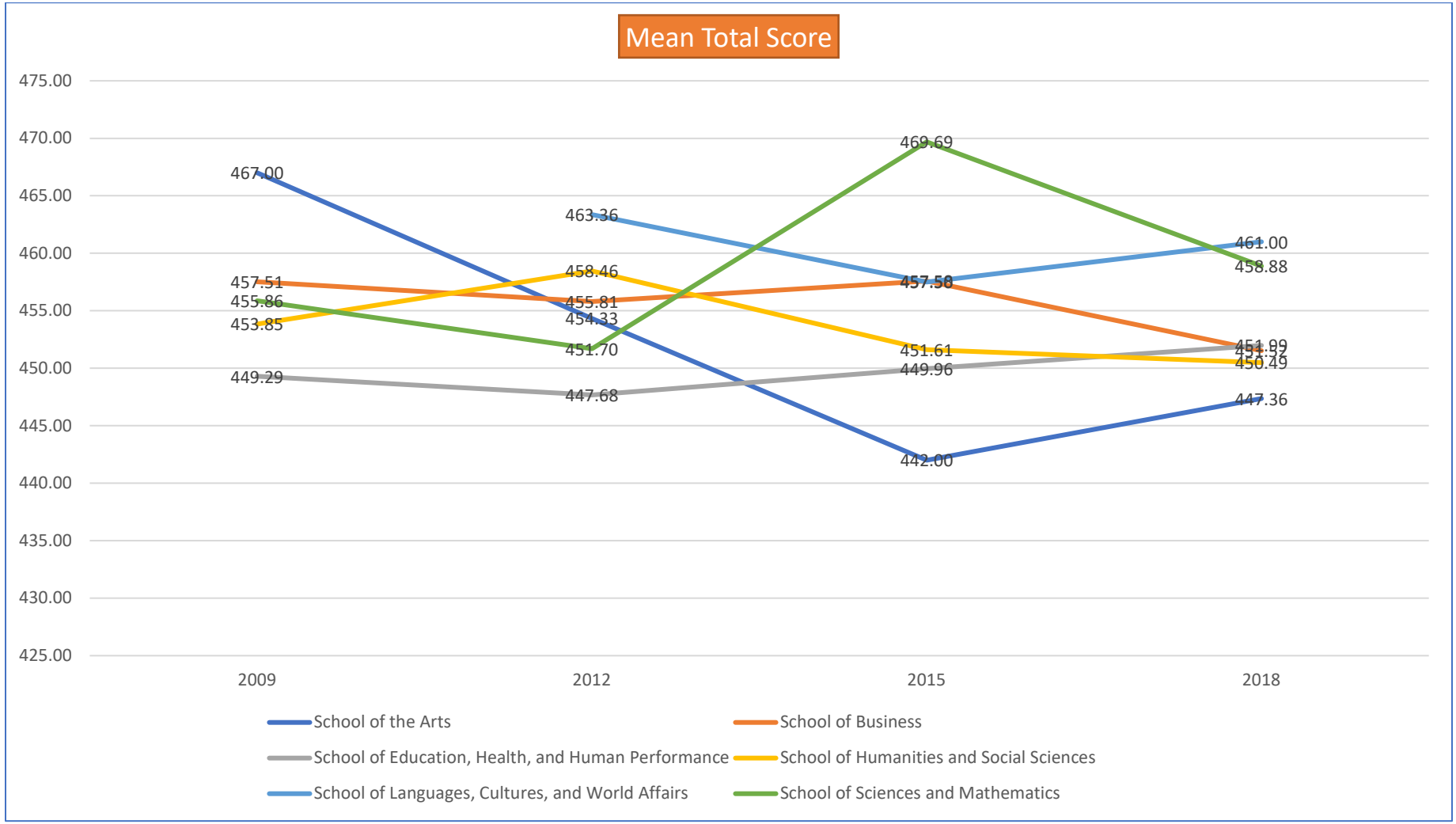
Figure 57. Mean Natural Science Score by Transfer Students and Non-Transfer Students and by Year




- Non-transfer students performed better than transfer students in natural science score in 2009, 2015 and 2018.
- Transfer students performed slightly better in 2012, but this difference was a gap of 1 point.

## EPP Scale Scores by School and by Year

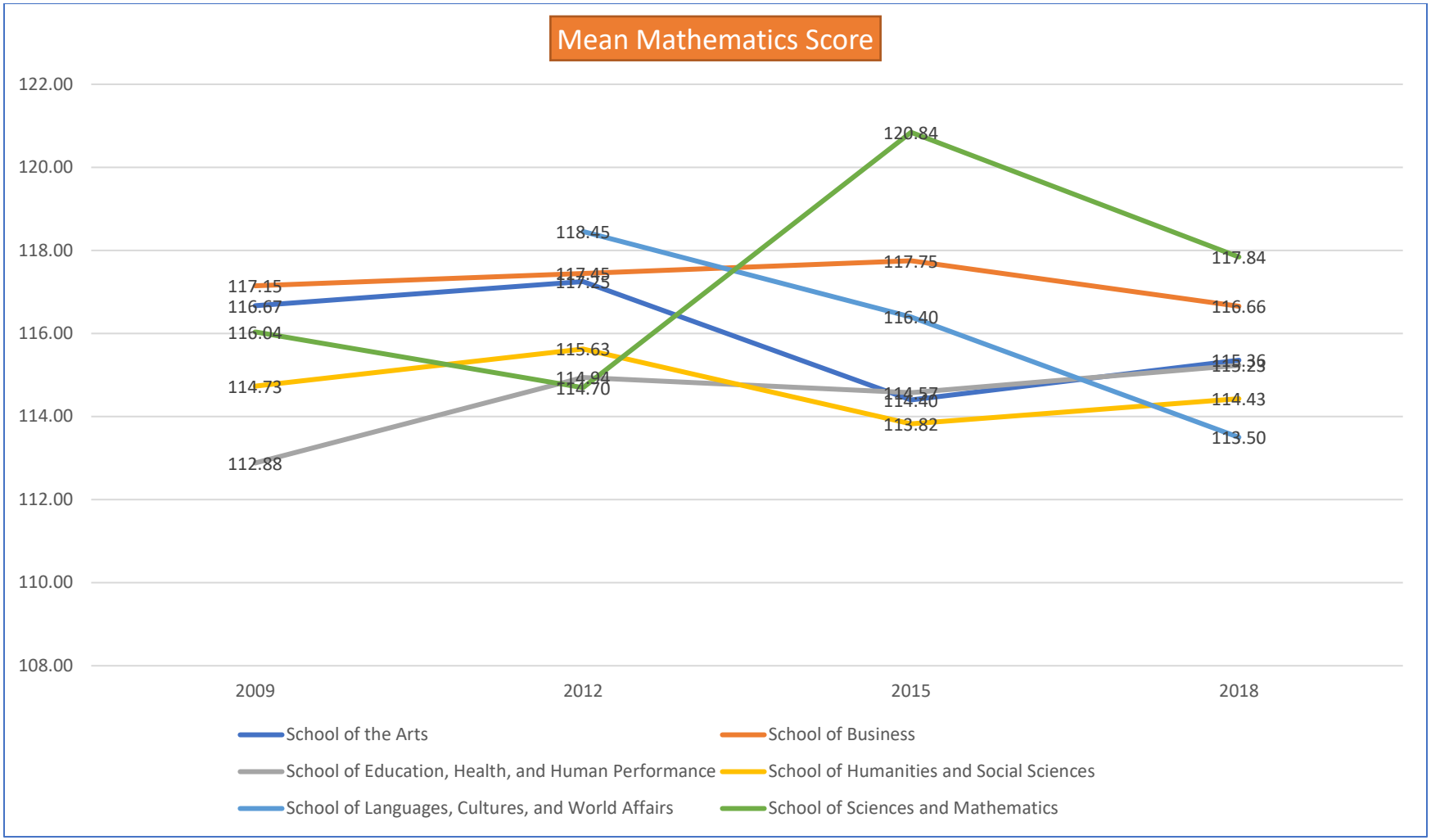
Figure 58. Mean Total Score by school and by Year




- School of Science and Mathematics showed a clear increase in the total score from 2012 to 2015.
- School of Arts saw a significant decrease in the total score from 2009 to 2015.

- School of Education, Health and Human Performance was relatively stable in the total score over the years.
- School of Languages, Cultures and World Affairs slightly trended downward over the years.
- School of Humanities and Social Sciences showed a downward trend from 2012 to 2018.
- School of Business had a slightly increase in the total score from 2009 to 2018.

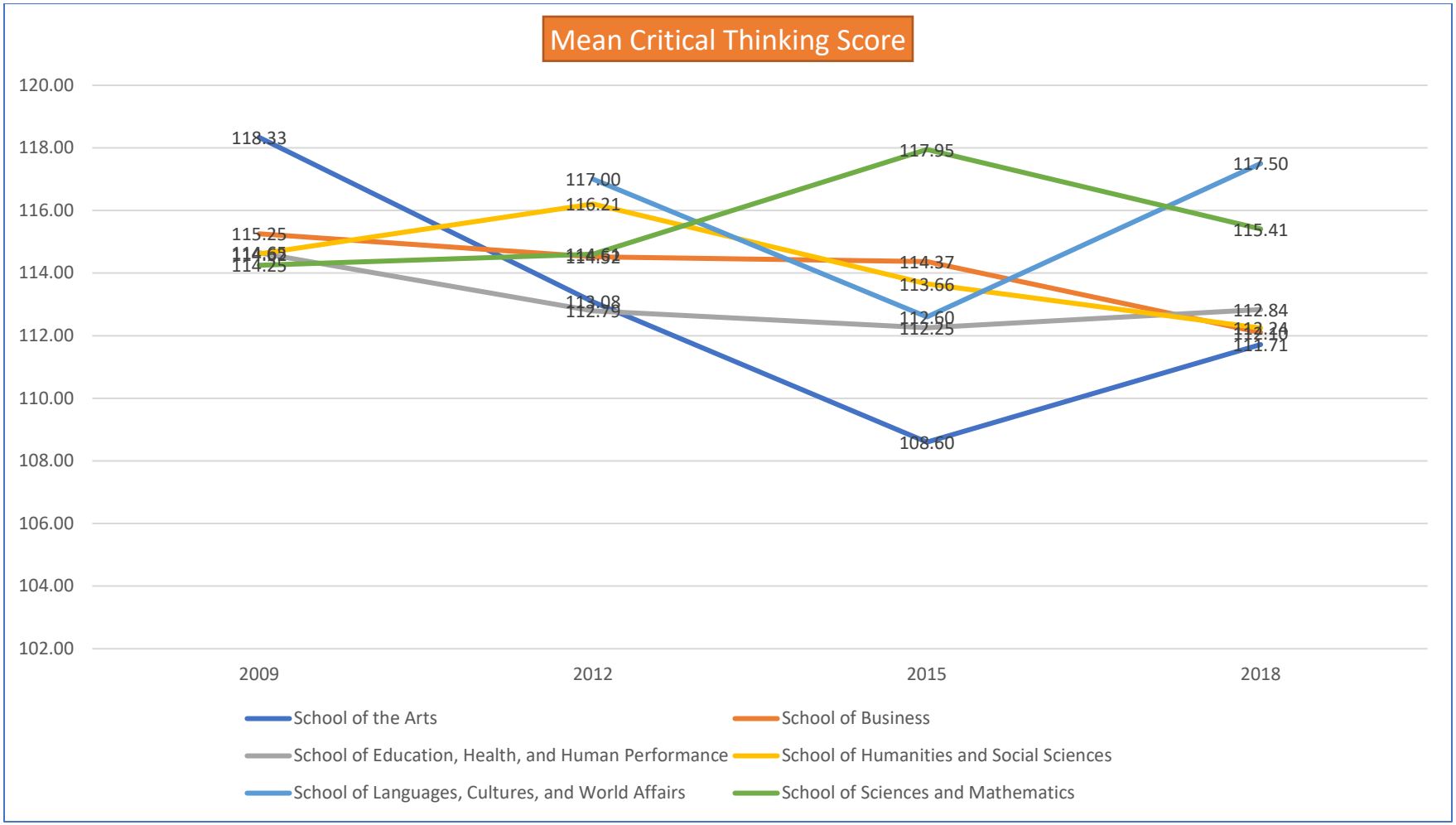
Figure 59. Mean Mathematics Score by school and by Year




- School of Science and Mathematics showed a clear increase in the math score from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts saw fluctuations in the math score from 2009 to 2018.

- School of Education, Health and Human Performance was relatively stable in the math score over the years.
- School of Languages, Cultures and World Affairs trended downward from 2012 to 2018.
- School of Humanities and Social Sciences was relatively stable over the years.
- School of Business was relatively stable over the years.

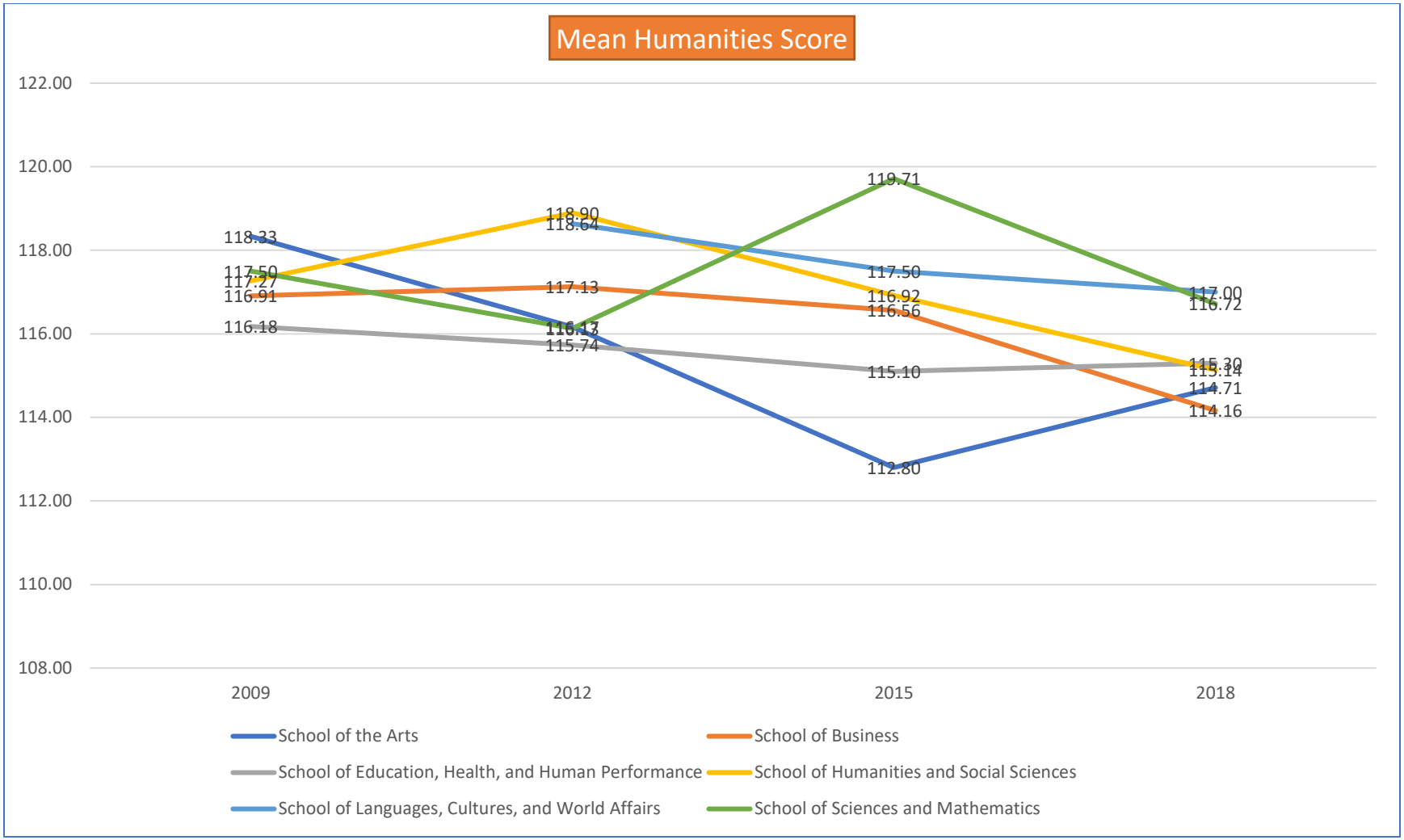
Figure 60. Mean Critical Thinking Score by school and by Year




- School of Science and Mathematics showed a clear increase from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts witnessed a significant 10-points decrease from 2009 to 2015.
- School of Education, Health and Human Performance was relatively stable over the years.
- School of Languages, Cultures and World Affairs had a 5-points decrease from 2012 to 2015.

- School of Humanities and Social Sciences was relatively stable over the years.
- School of Business was relatively stable over the years.

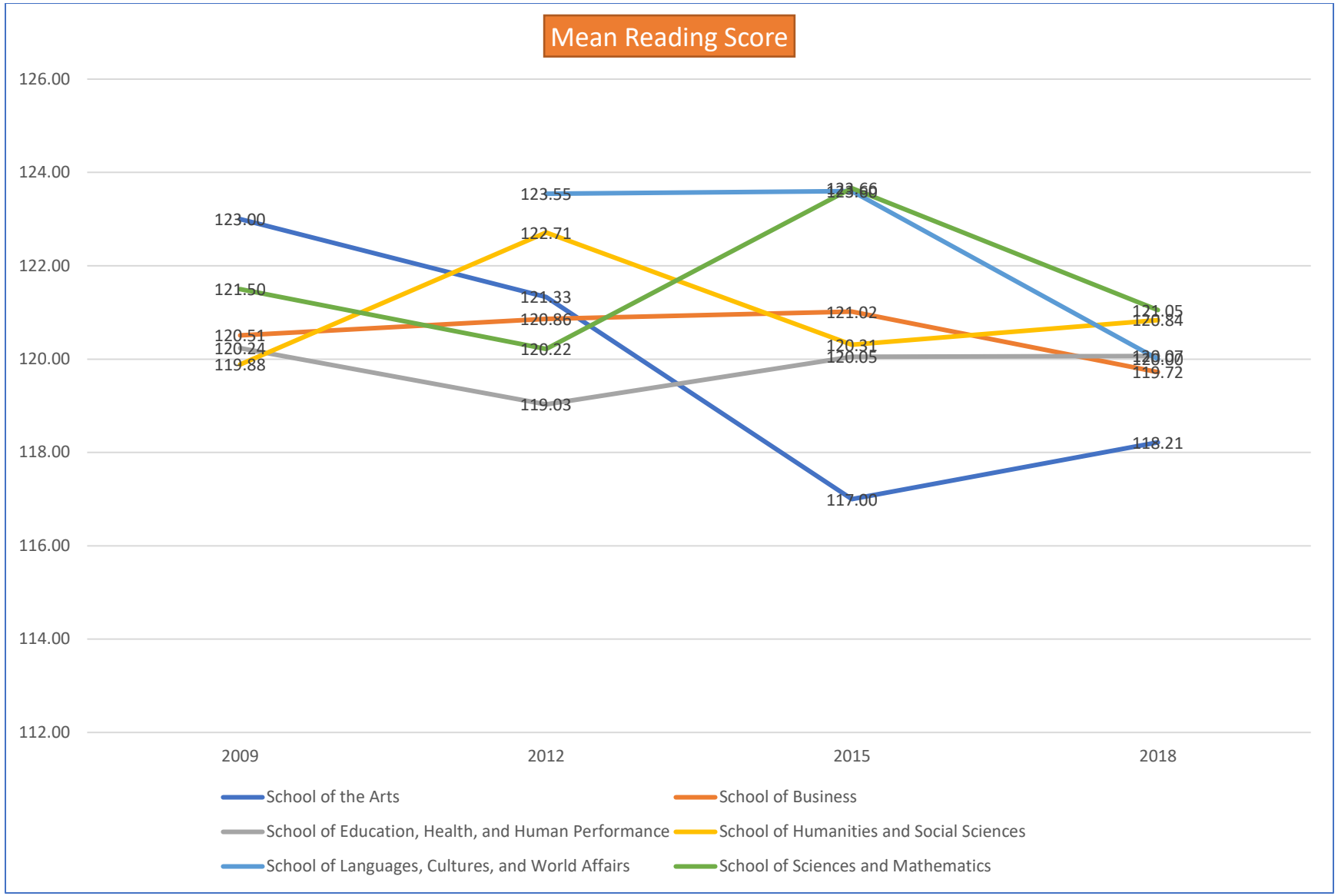
Figure 61. Mean Humanities Score by school and by Year




- School of Science and Mathematics showed a clear increase from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts witnessed a 6-points decrease from 2009 to 2015.
- School of Education, Health and Human Performance was relatively stable over the years.

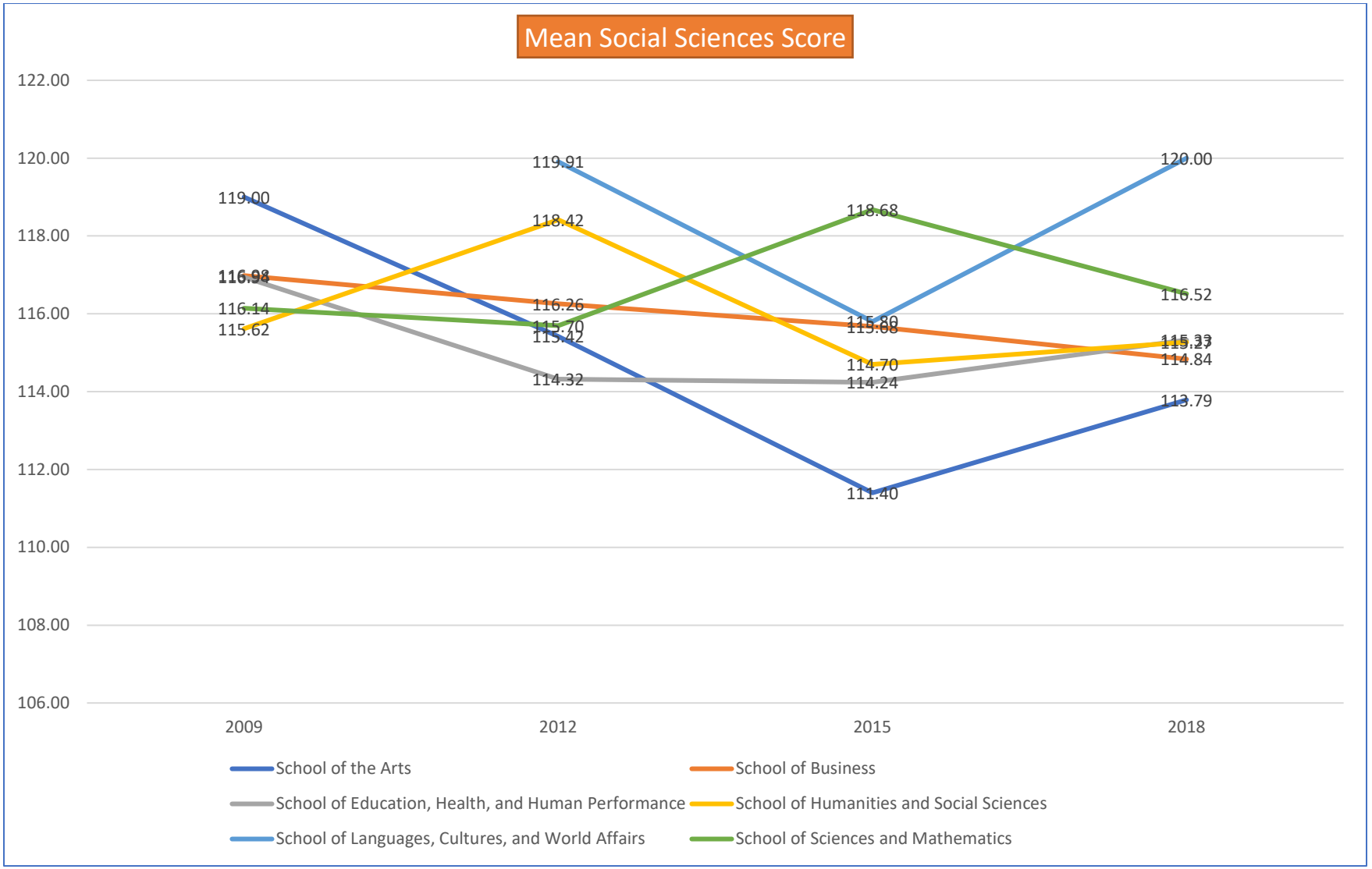
- School of Languages, Cultures and World Affairs was relatively stable over the years.
- School of Humanities and Social Sciences had a decrease from 2012 to 2018.
- School of Business had a decrease from 2012 to 2018.

Figure 62. Mean Reading Score by school and by Year



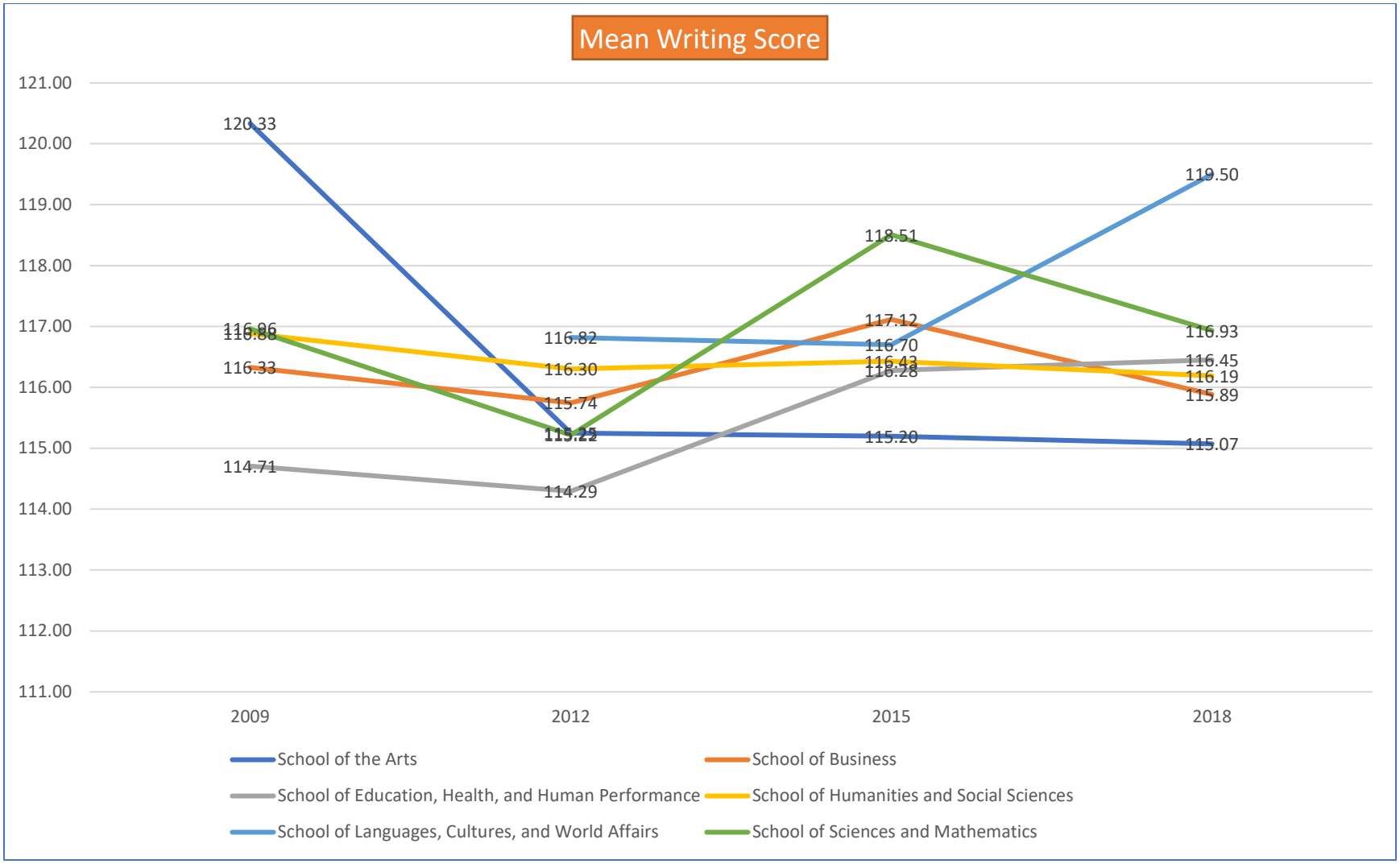
- School of Science and Mathematics showed a clear increase from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts witnessed a 6-points decrease from 2009 to 2015.
- School of Education, Health and Human Performance was relatively stable over the years.
- School of Languages, Cultures and World saw a decrease from 2015 to 2018.
- School of Humanities and Social Sciences was relatively stable over the years.
- School of Business was relatively stable over the years.

Figure 63. Mean Social Science Score by school and by Year



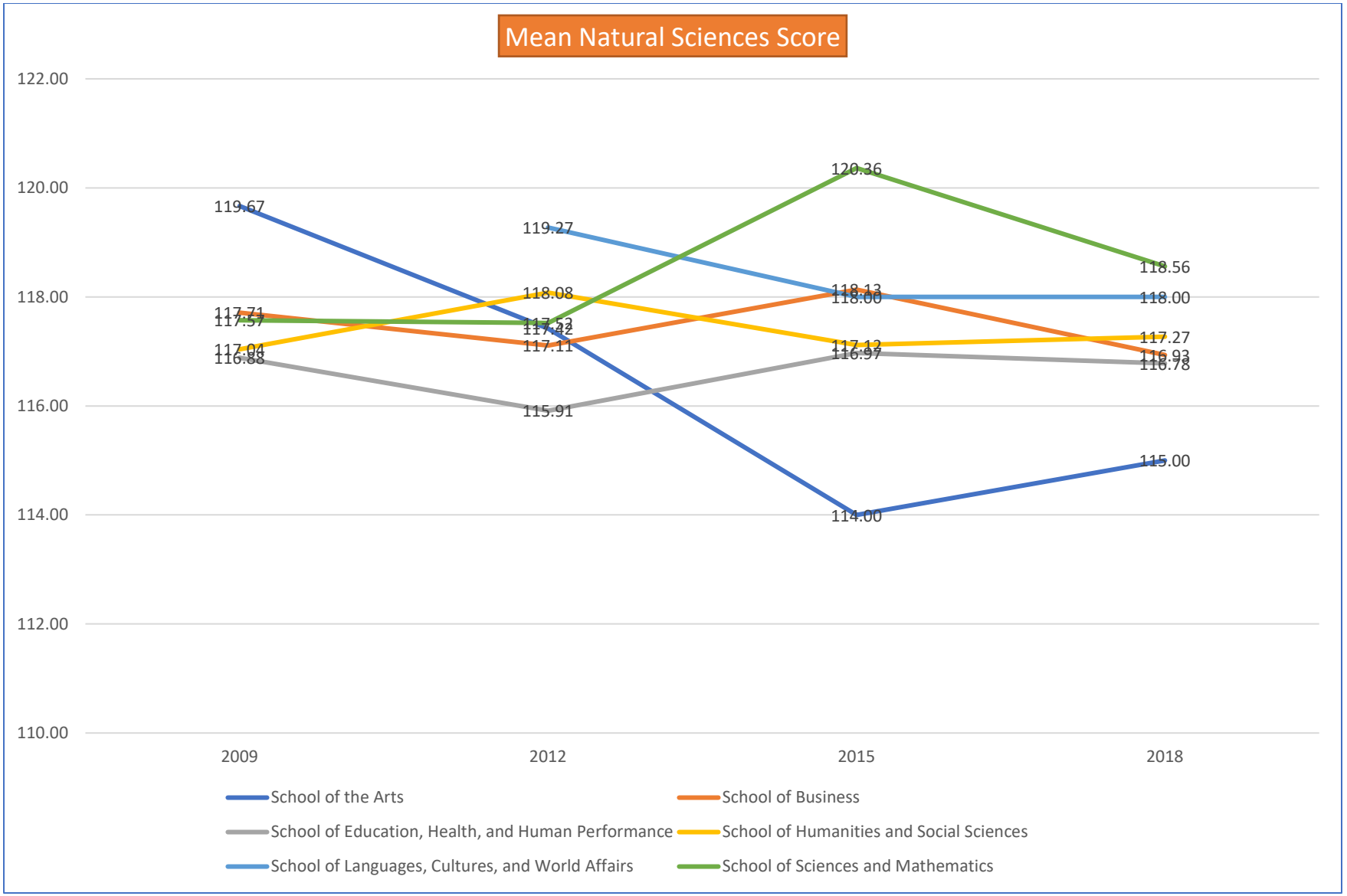
- School of Science and Mathematics showed a clear increase from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts witnessed an 8-points decrease from 2009 to 2015.
- School of Education, Health and Human Performance was relatively stable over the years.
- School of Languages, Cultures and World saw a decrease from 2012 to 2015 and then a 4-points increased from 2015 to 2018.
- School of Humanities and Social Sciences was relatively stable over the years.
- School of Business was trending slightly downward over the years.

Figure 64. Mean Writing Score by school and by Year



- School of Science and Mathematics showed a clear increase from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts witnessed a 5-points decrease from 2009 to 2012.
- School of Education, Health and Human Performance performed slightly better over the years.
- School of Languages, Cultures and World saw a 3-points increase from 2015 to 2018.
- School of Humanities and Social Sciences was relatively stable over the years.
- School of Business was relatively stable over the years.

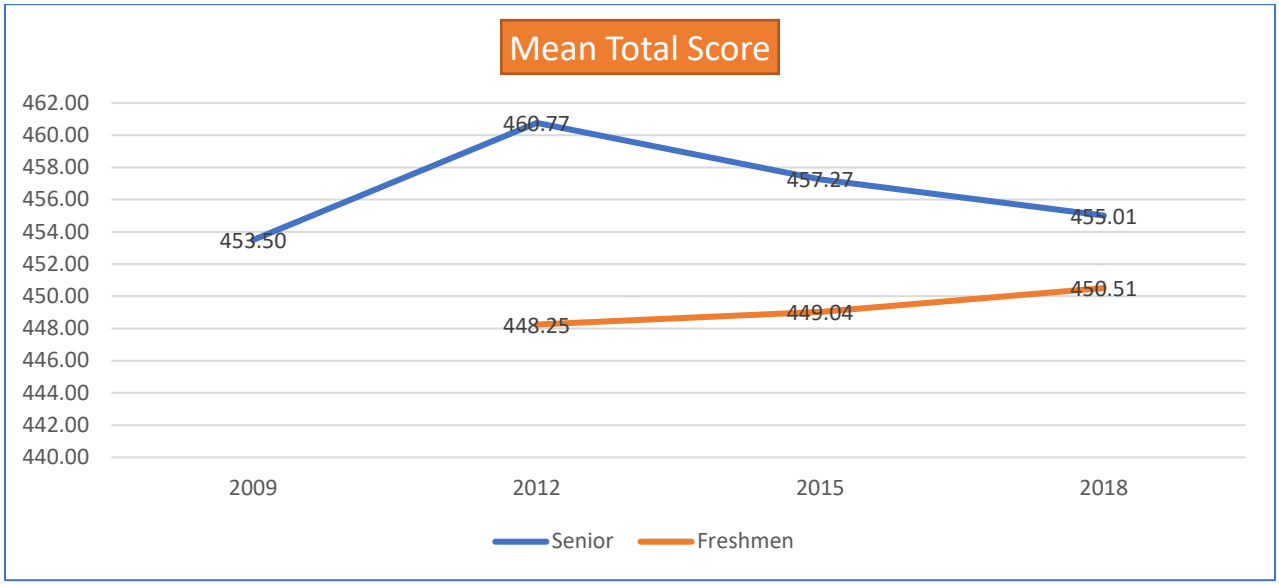
Figure 65. Mean Natural Science Score by school and by Year



- School of Science and Mathematics showed a clear increase from 2012 to 2015 and a slight decrease from 2015 to 2018.
- School of Arts witnessed a 5-points decrease from 2009 to 2015.
- School of Education, Health and Human Performance was relatively stable over the years.
- School of Languages, Cultures and World Affairs was relatively stable over the years.
- School of Humanities and Social Sciences was relatively stable over the years.
- School of Business was relatively stable over the years.

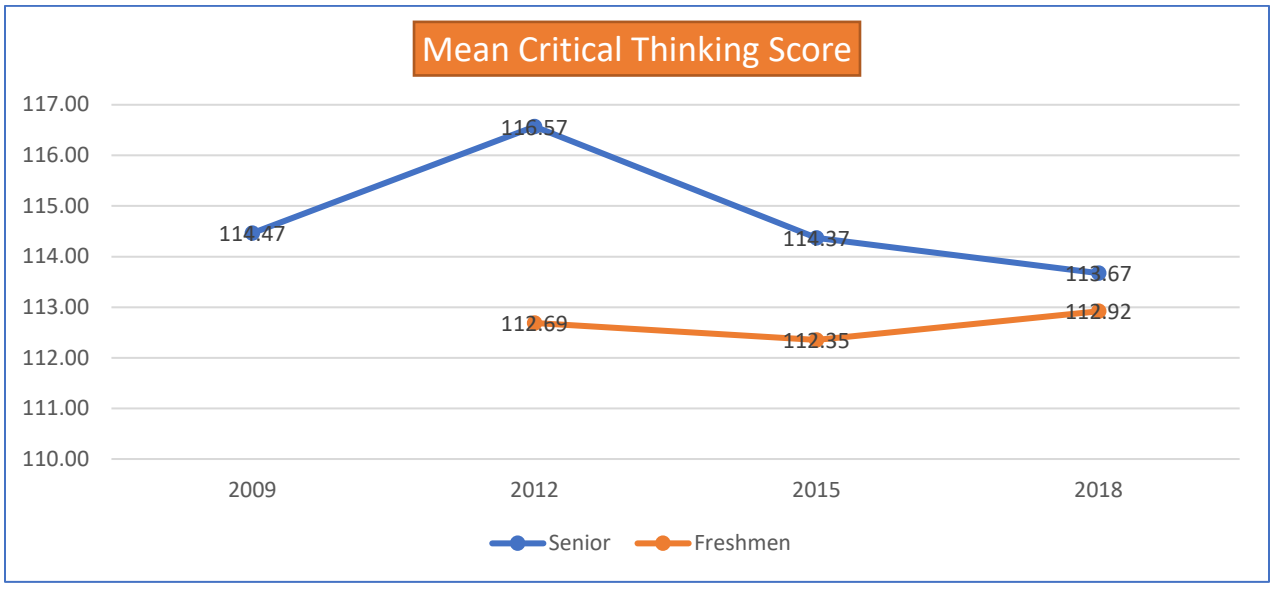
## EPP Scale Score by Undergraduate Student Status and by Year

Figure 66. Mean Total Score by Undergraduate Student Status and by Year



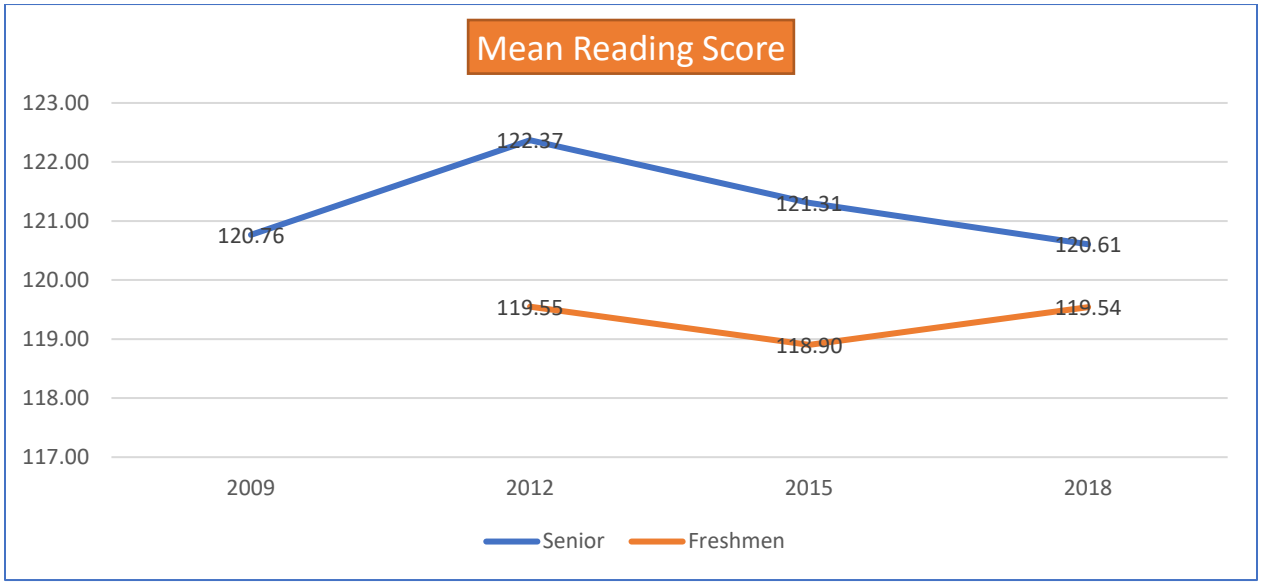

- As expected, seniors performed better than freshmen over the years in the total score.
- The largest gap was 12 points apart, favoring seniors in 2012.

Figure 67. Mean Critical Thinking Score by Undergraduate Student Status and by Year



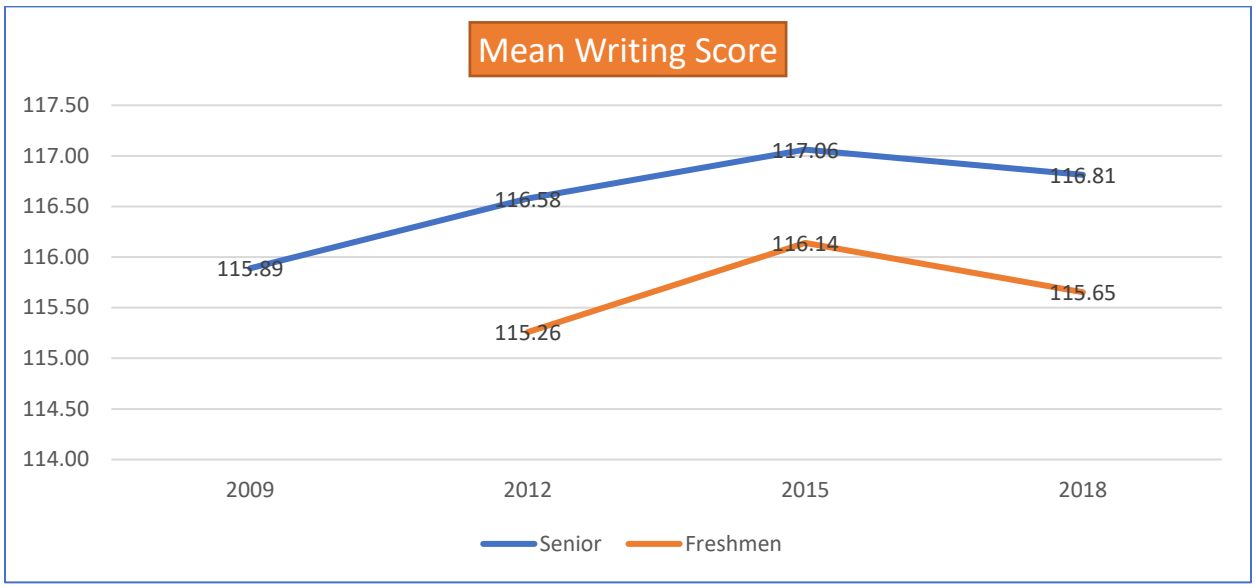

- Seniors performed better than freshmen over the years.
- The gap was largely reduced from a 4 points difference in 2012 to a 1-point difference in 2018.

Figure 68. Mean Reading Score by Undergraduate Student Status and by Year



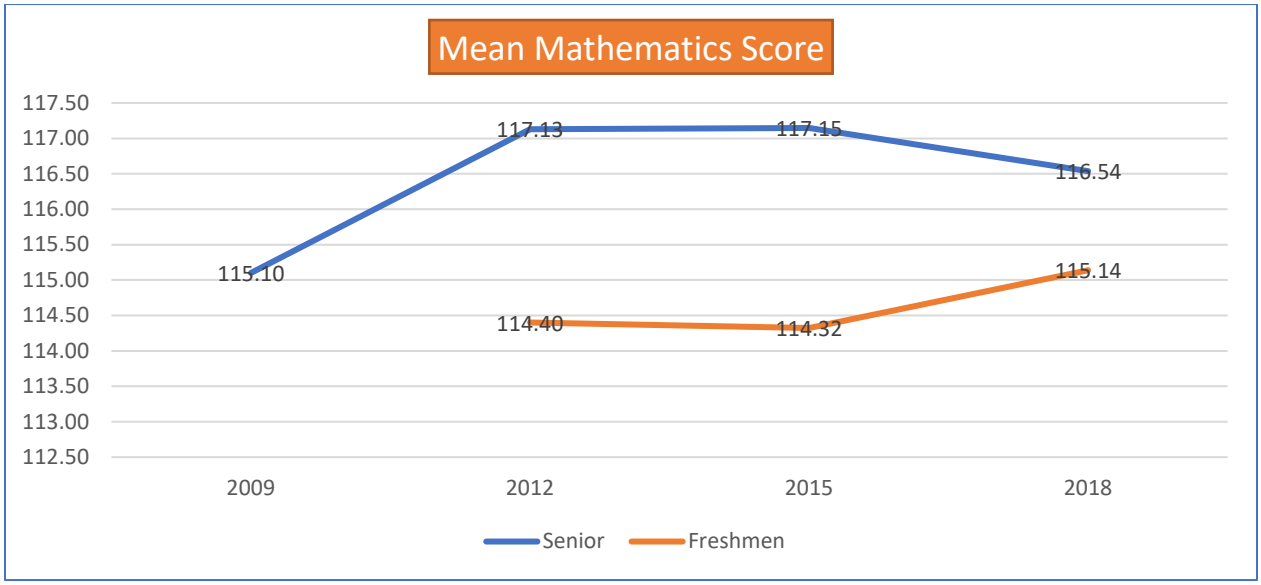

- Seniors performed better than freshmen over the years.
- The gap was largely reduced from a 3 points difference in 2012 to a 1-point difference in 2018.

Figure 69. Mean Writing Score by Undergraduate Student Status and by Year



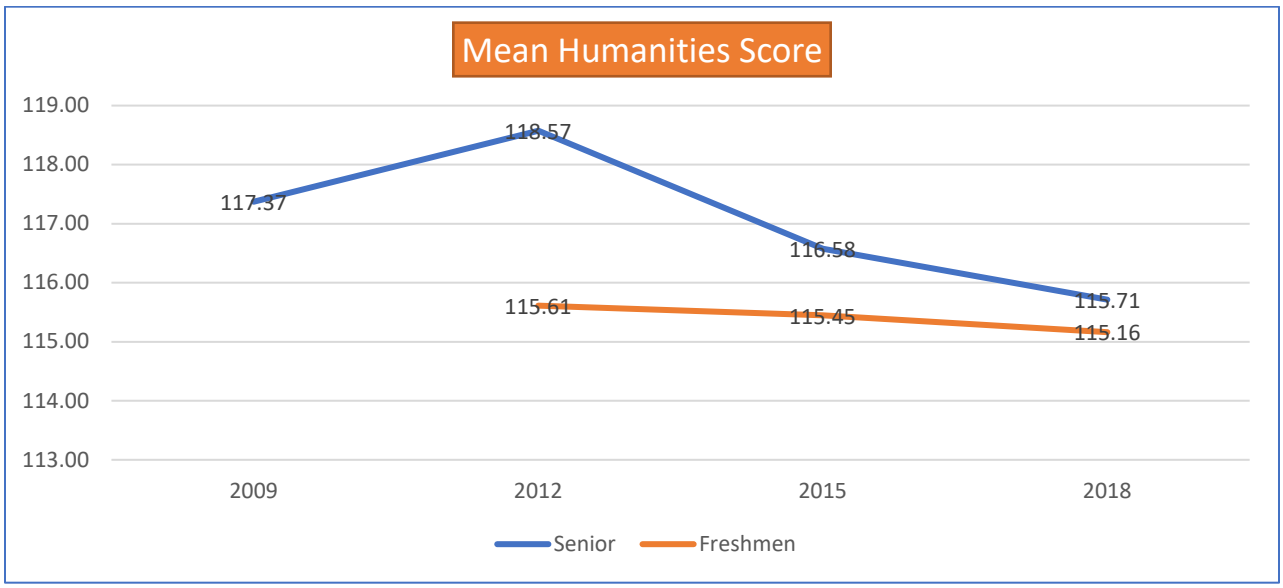

- Seniors consistently performed better in writing score than freshmen over the years.
- The gap between freshmen and seniors was relatively small.

Figure 70. Mean Mathematics Score by Undergraduate Student Status and by Year



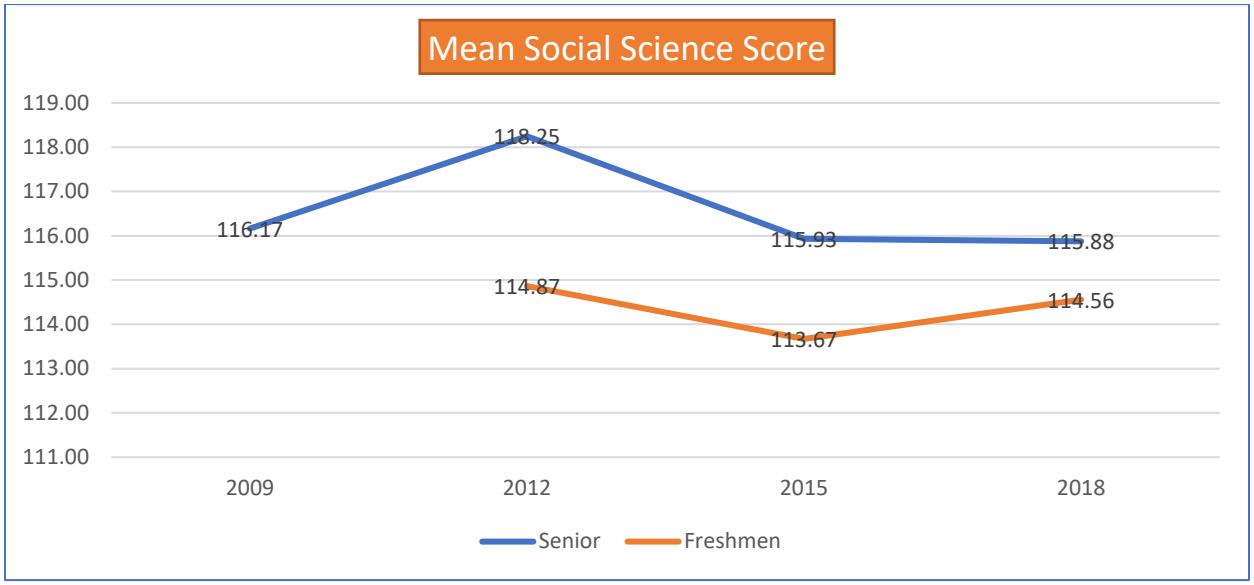

- Seniors consistently performed better in math score than freshmen over the years.
- The gap between freshmen and seniors was reduced in 2018.

Figure 71. Mean Humanities Score by Undergraduate Student Status and by Year



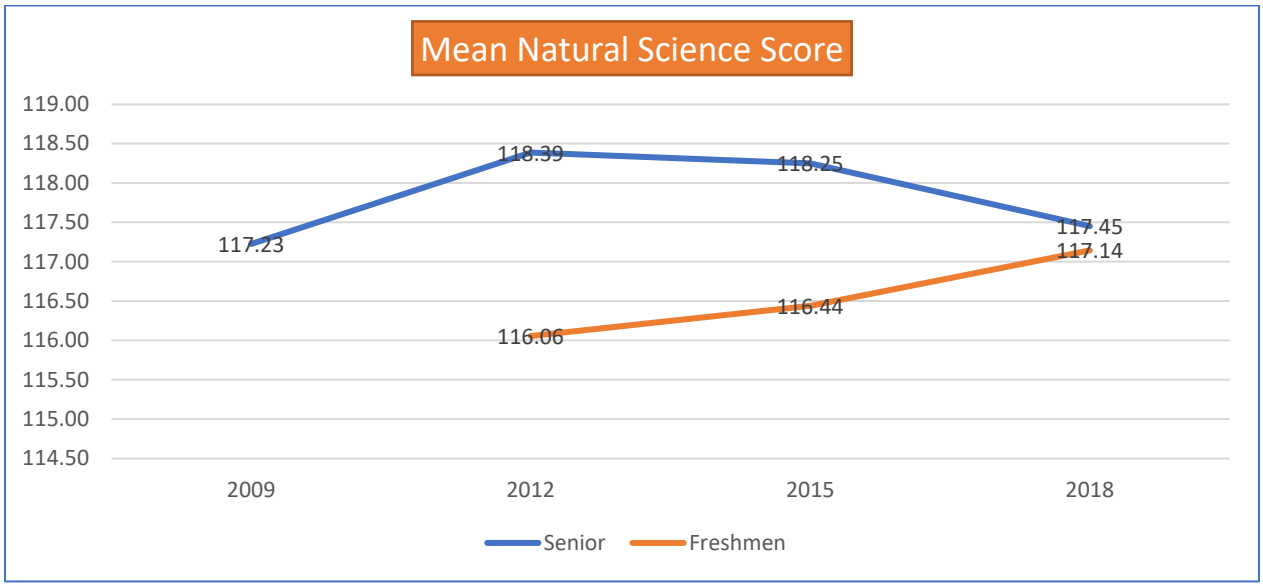

- Seniors consistently performed better in humanities score than freshmen over the years.
- The gap between freshmen and seniors was the largest in 2012, but it was greatly reduced in 2018.

Figure 72. Mean Social Science Score by Undergraduate Student Status and by Year




- Seniors consistently performed better in social science score than freshmen over the years.
- The gap between freshmen and seniors was largest in 2012, but greatly reduced in 2018.

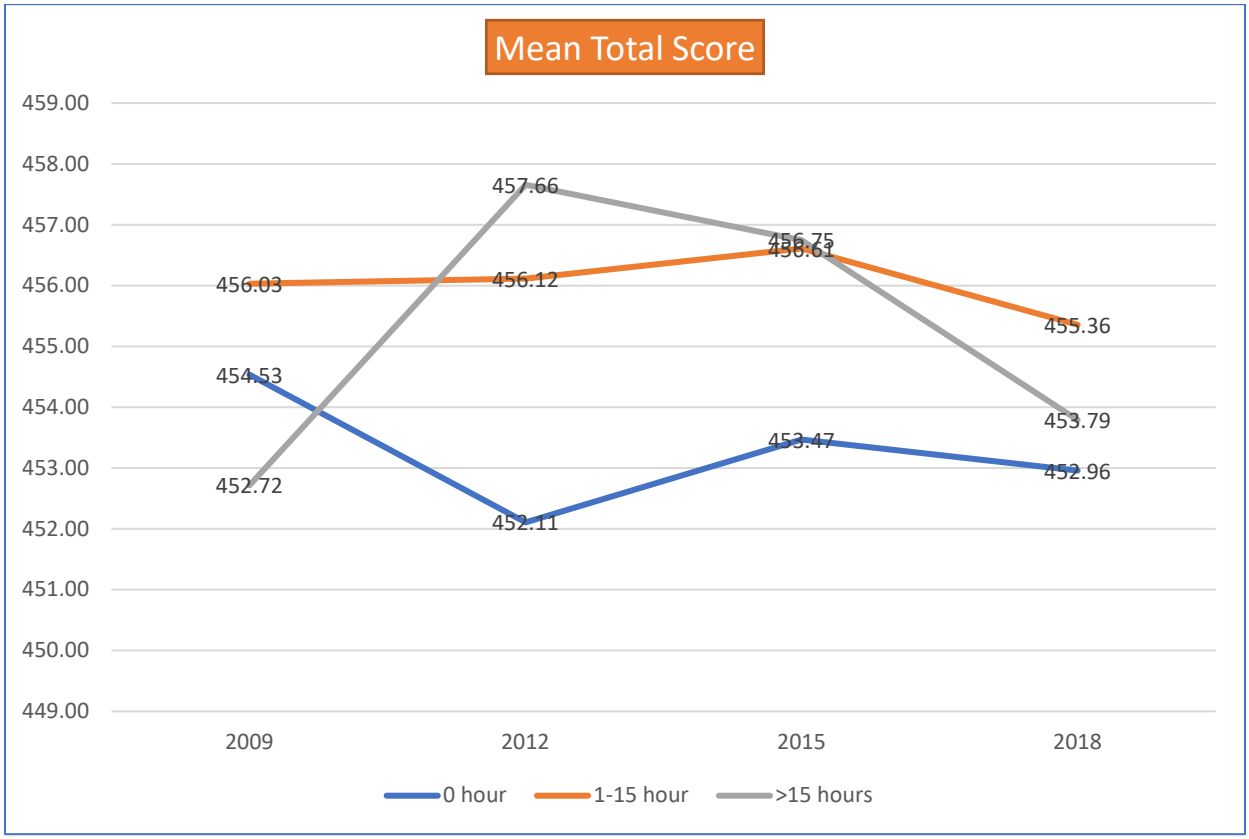
Figure 73. Mean Natural Science Score by Undergraduate Student Status and by Year




- Seniors consistently performed better in natural science score than freshmen over the years.
- The gap between freshmen and seniors was largest in 2012, but greatly reduced in 2018.

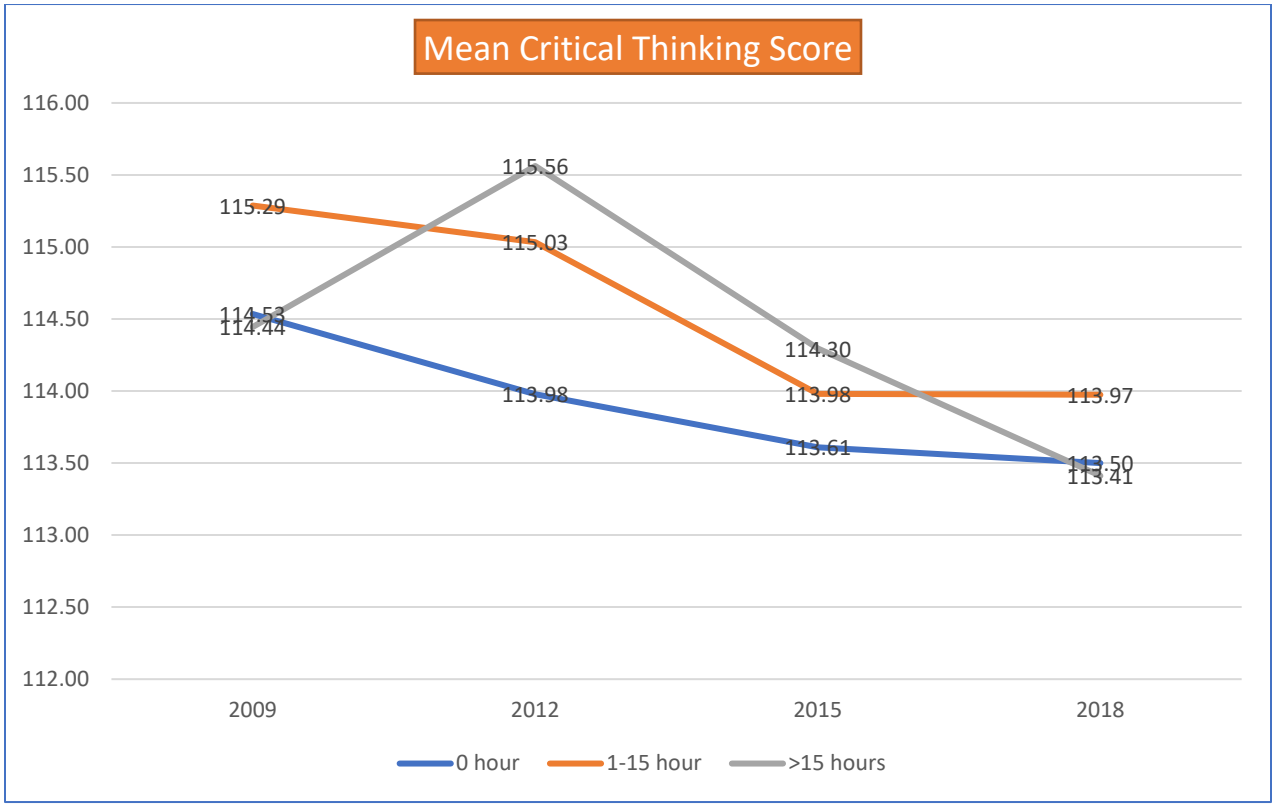
EPP Scale Score by Hours Worked Per Week and by Year

Figure 74. Mean Total Score by Hours Worked Per Week and by Year



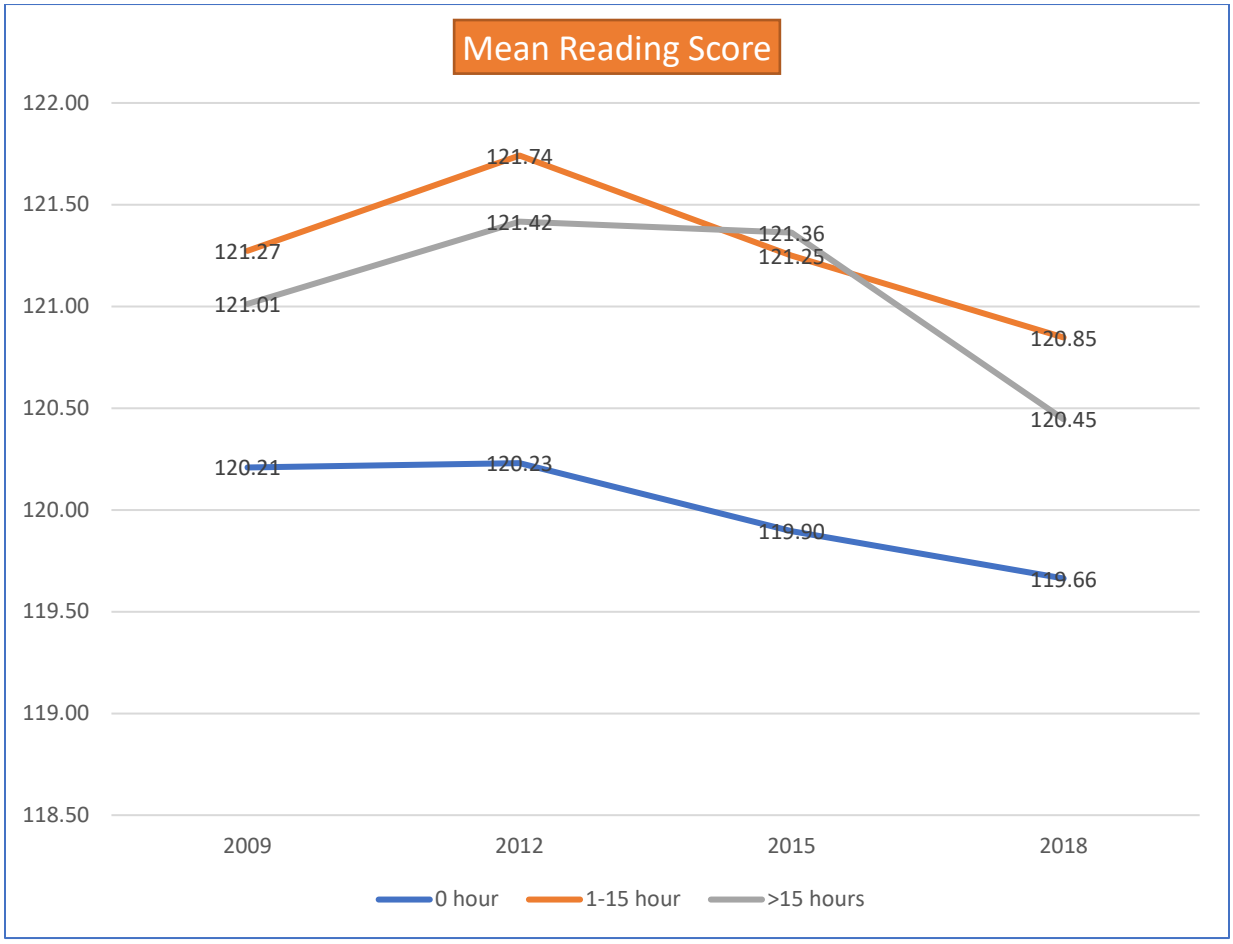

- Students who worked at least 1 hour per week performed better in 2012, 2015 and 2018.
- Students who did not work at all showed a 4-points deficiency in the total score than ones who worked at least one hour per week since 2012.

Figure 75. Mean Critical Thinking Score by Hours Worked Per Week and by Year



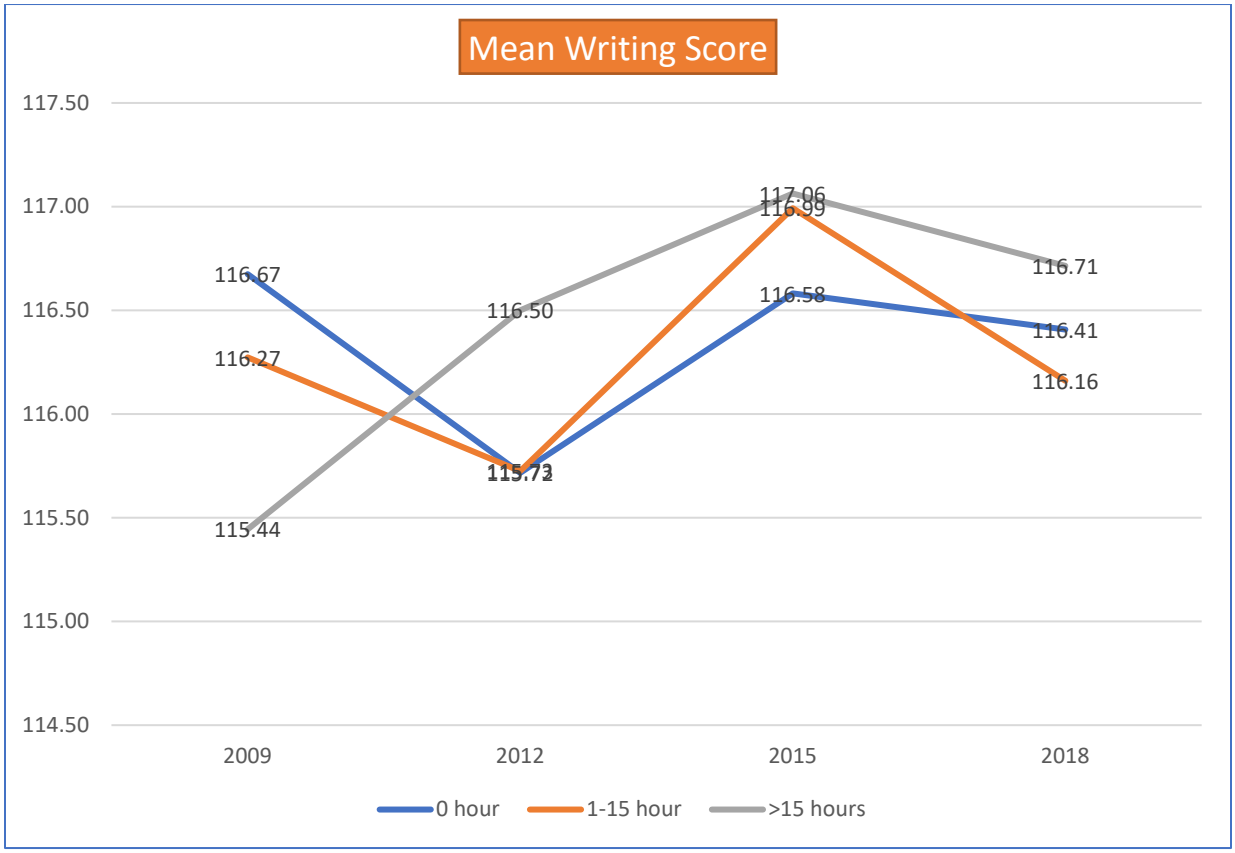

- Students who worked at least 1 hour per week performed better than ones who did not work at all in critical thinking score in 2012 and 2015.
- The difference was not considerable over the years.

Figure 76. Mean Reading Score by Hours Worked Per Week and by Year



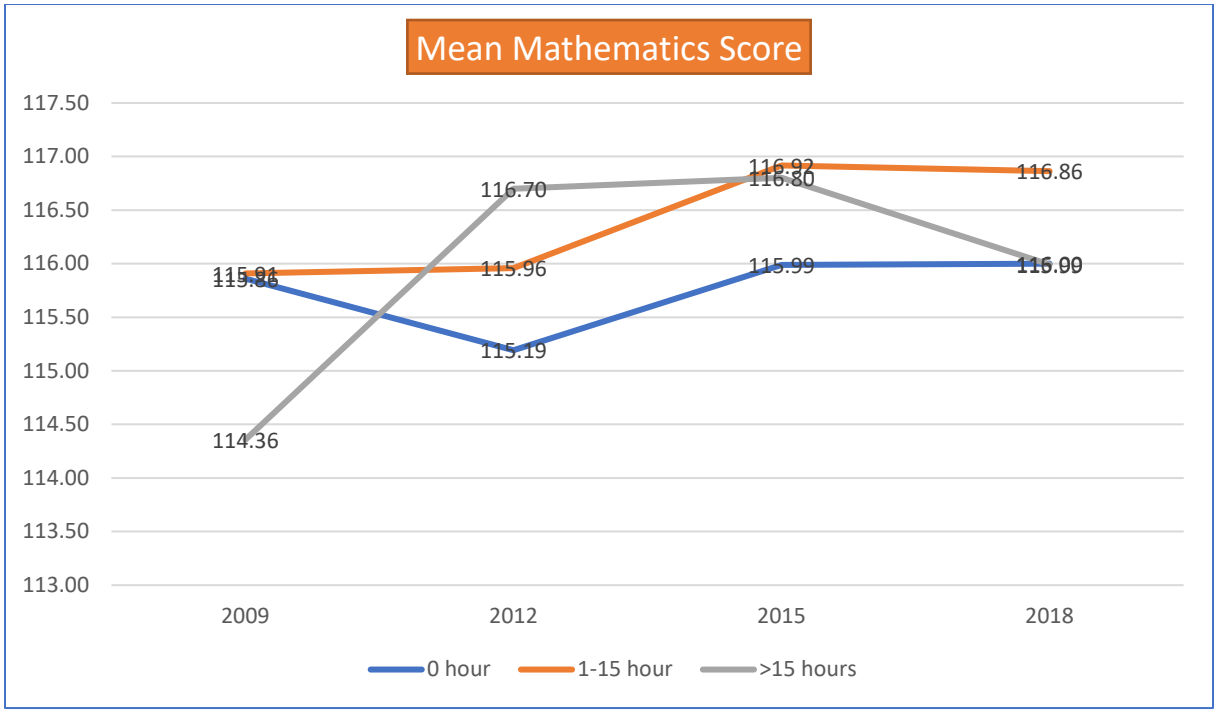

- Students who worked at least 1 hour per week consistently performed better than ones who did not work at all in reading score over the years.
- The difference, however, was not considerable over the years.

Figure 77. Mean Writing Score by Hours Worked Per Week and by Year



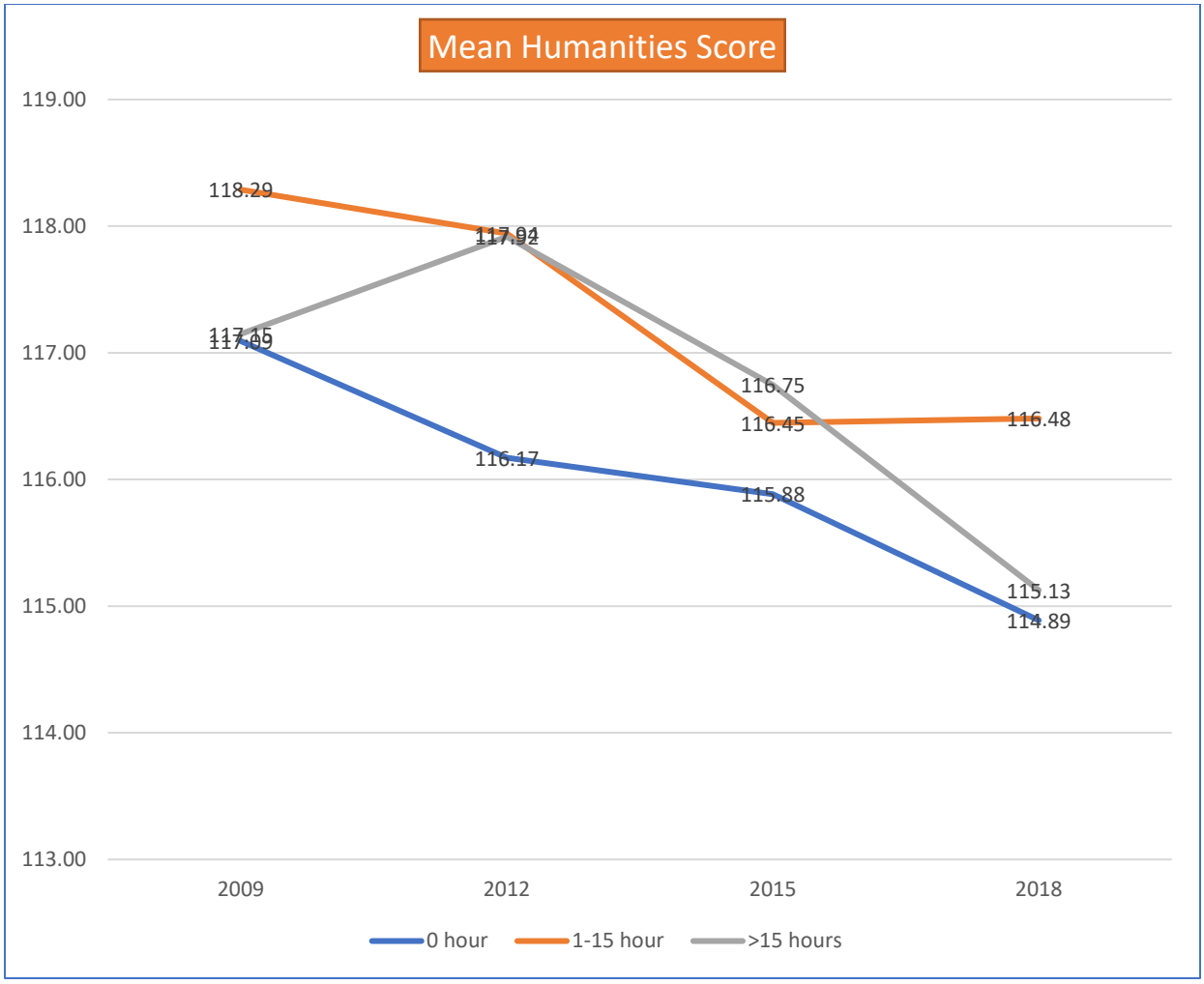

- No considerable differences between these three groups were observed over the years in the writing score.

Figure 78. Mean Mathematics Score by Hours Worked Per Week and by Year



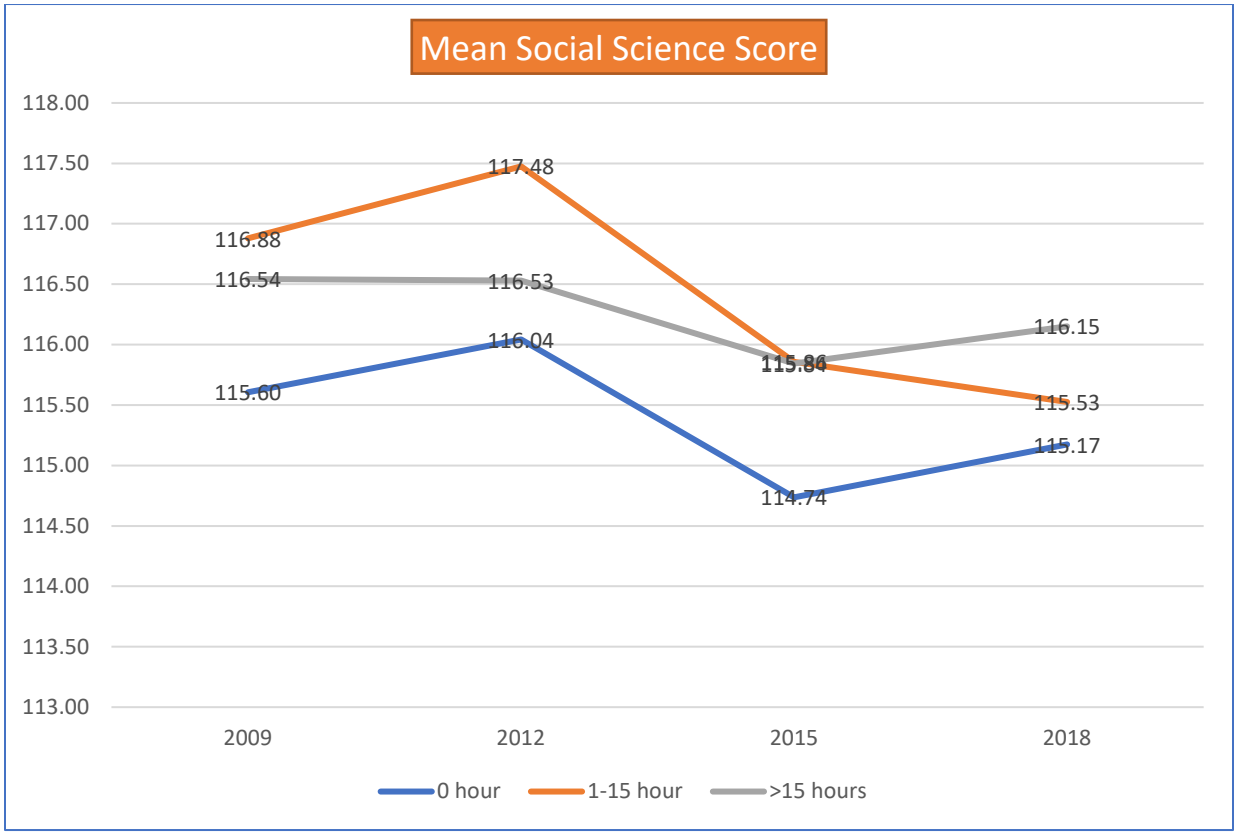

- Students who worked at least 1 hour per week performed slightly better in math score than ones who did not work at all in math score in 2012, 2015 and 2018.
- The difference, however, was not considerable.

Figure 79. Mean Humanities Score by Hours Worked Per Week and by Year



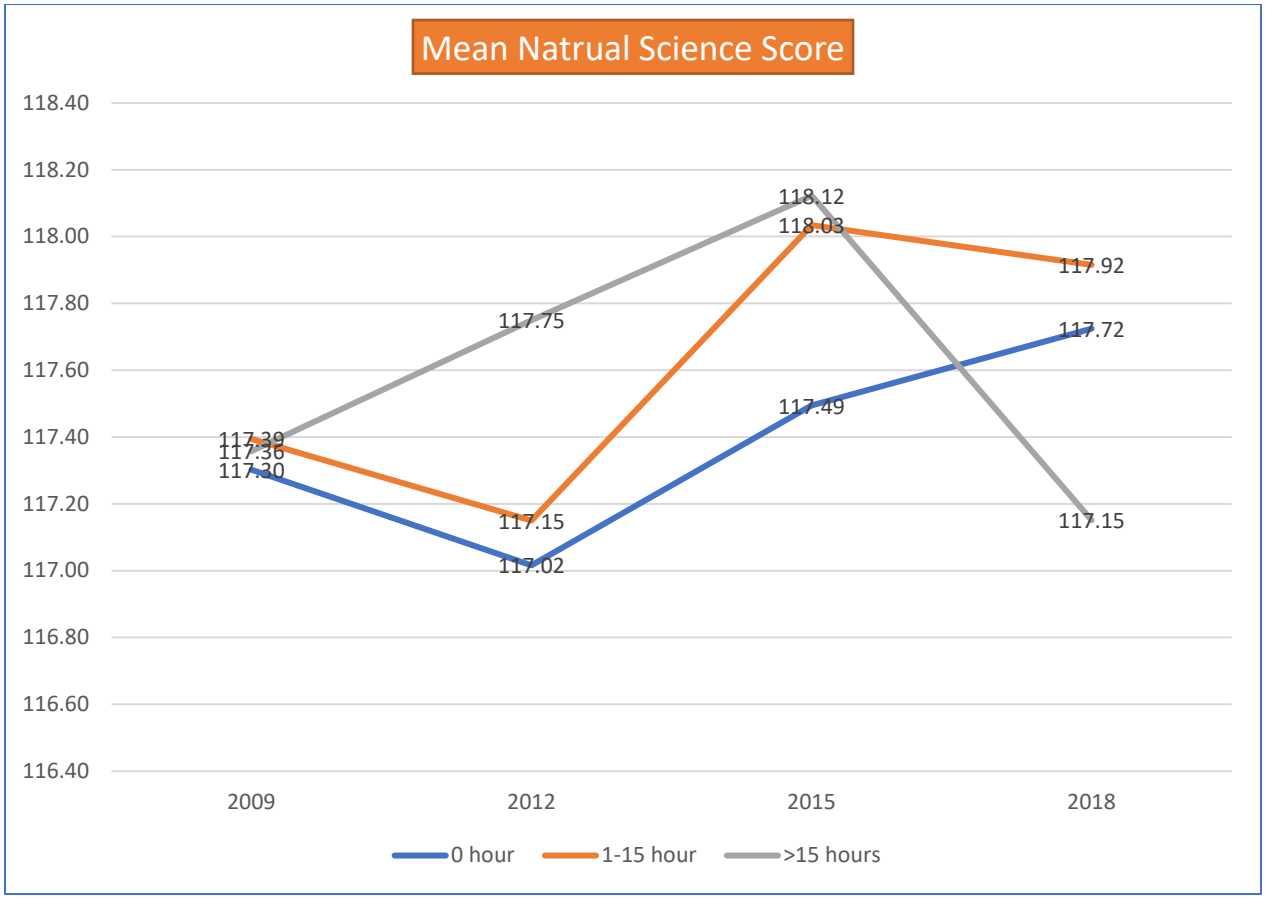

- Students who worked at least 1 hour per week performed slightly better in humanities score than ones who did not work at all in humanities score over the years.
- The difference was not considerable.

Figure 80. Mean Social Science Score by Hours Worked Per Week and by Year




- Students who worked at least 1 hour per week performed slightly better than ones who did not work at all in social science score over the years.
- The difference was not considerable.

Figure 81. Mean Natural Science Score by Hours Worked Per Week and by Year




- Students who worked at least 1 hour per week performed slightly better than ones who did not work at all in natural science score in 2012 and 2015.
- The difference was not considerable.

## Results of the Multiple Regression-Effects of Demographic and Educational Background Variables on ETS Proficiency Total Score

Table 1. Results of the Multiple Regression-Effects of Demographic and Educational Background Variables on ETS Proficiency Total Score

| | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| Variables | Coef (Std.err) | Coef (Std.err) | Coef (Std.err) |
| Age | 0.38* (0.16) | -0.4 (0.19) | -0.1 (0.2) |
| Male (female as the reference group) | 3.66*** (0.99) | 4.38*** (0.91) | 2.86*** (0.95) |
| White (non-White as the reference group) | 6.2*** (1.28) | 4.63*** (1.21) | 5.31*** (1.23) |
| Non-transfer students (transfer students as the reference group) | | 1.75 (1.12) | 1.46 (1.13) |
| Honors (non-honors students as the reference group) | | 21.8*** (1.89) | 18.6*** (2.1) |
| Freshmen (seniors as the reference group) | | -8.78*** (1.13) | -8.7*** (1.32) |
| English not as the primary language (English as the primary language as the reference group) | | -1.39 (1.03) | -1.36 (1.03) |
| Speaking English and other languages equally well (English as the primary language as the reference group) | | -1.12 (3.43) | -1.65 (3.54) |
| Enrolled Part-time (Enrolled full-time as the reference group) | | 1.08 (1.9) | 1.23 (1.98) |
| GPA>3.5(GPA<3.5 as the reference group) | | 11.9*** (0.93) | 10.9*** (0.94) |
| 1-15 hours worked (0 hours worked as the reference group) | | 1.12 (1.04) | 1.47 (1.04) |

| | | | |
|---|---|---|---|
| >15 hours worked (0 hour worked as the reference group) | | 1.73<br>(1.14) | 2.47*<br>(1.16) |
| Major | | | x |
| Year | | | x |
| R-Squared | 0.027 | 0.216 | 0.271 |

*** p<0.001, ** p<0.01, * p<0.05; Coef represents coefficients.
Std.err represents standard error.

Table 1 presents the results of model 1, model 2 and model 3. Model 1 included demographic variables, including age, gender and race. The effects of age, gender, and race on the EPP total score are presented in the second column. Model 2 included both demographic and educational background factors, including age, gender, race, transfer student status, honors student status, undergraduate student status, if English is the primary language, enrolled part-time or full-time, GPA, and hours worked per week. The effects of demographic and educational background factors in Model 3are presented in the third column. On top of the variables in the Model 1 and Model 2, Model 3 consisted of majors and year when students took the EPP test. The final results of the Model 3 are presented in the fourth column.

The rationale of adding major and year in the multiple regression is worth more discussion. Students' performance in EPP test is not an isolated event, but in general can be characterized by group. For instance, students in math department are most likely to perform significantly better than students in English department on the math scale score in the EPP test. This group difference is usually called cluster effect in the field of applied statistics. This cluster effect is likely to make the estimates in the regression model biased, if not

properly controlled. One strategy of overcoming this cluster effect is to use the fixed effects regression model by including all majors in one equation. That was how it was conducted in the final model, Model 3. The rationale of adding year in the equation is to mitigate the possible year effect on the EPP total score in that different cohorts of students might demonstrate different abilities in writing, reading and critical thinking. Although Model 3 demonstrated that this cohort effect was not statistically significant, it is still necessary to get it included in the equation for the reason stated above.

Only interpreting the final model, table 1 suggests that demographic factors matter in predicting students' EPP test performance. Age does not have a significant effect on students' performance in the EPP total score, all other things being equal. After taking into account the effects of demographic and educational background factors, male students on average performed significantly better than their female counterparts, with an advantage of 2.86 points. Similarly, white students on average held a 5.31 points advantage than non-white students.

Several educational background variables had significant effects on students' EPP total score. Being a transfer student does not affect students' performance in the EPP total score, all things being equal. Being an Honors student, however, performs much better than a non-Honors student in the EPP total score. Specifically, after controlling for demographic and educational background factors, Honors students on average gained 18.6 points more than the non-Honors students. It is not surprising that all else being equal, freshmen were 8.7 points lower than seniors, which is expected and understandable. All else being equal, students who had a GPA 3.5 or higher demonstrated a 10.9 points advantage as compared to the group with a GPA 3.5 lower than 3.5. The more interesting finding is that all

else being equal, students who worked more than 15 hours per week were 2.5 points higher in the EPP total score than their peers who did not work at all, while this significant difference was not found between the group who worked between 1 to 15 and the group who worked 0 hour.

# Appendixes

## Appendix A: Proficiency Classifications and Proficiency Level Statistics

**Proficiency Levels**

The skills measured by the ETS Proficiency Profile test are grouped into three skill areas:

• Reading and critical thinking

• Writing

• Mathematics

Within each of these three skill areas, the specific skills tested by the ETS Proficiency Profile test are classified into three proficiency levels, identified simply as Level 1, Level 2, and Level 3. Each proficiency level is defined in terms of a set of specific competencies expected of students.

**Skills Tested at Each Level**

***Reading and Critical Thinking***

To be considered proficient at Level 1, a student should be able to:

• recognize factual material explicitly presented in a reading passage

• understand the meaning of particular words or phrases in the context of a reading passage

To be considered proficient at Level 2, a student should be able to:

• synthesize material from different sections of a passage

• recognize valid inferences derived from material in the passage

• identify accurate summaries of a passage or of significant sections of the passage

• understand and interpret figurative language

• discern the main idea, purpose, or focus of a passage or a significant portion of the passage

To be considered proficient at Level 3, a student should be able to:

• evaluate competing casual explanations

• evaluate hypothesis for consistency with known facts

• determine the relevance of information for evaluating an argument or conclusion

• determine whether an artistic interpretation is supported by evidence contained in a work

• recognize the salient features or themes in a work of art

• evaluate the appropriateness of procedures for investigating a question of causation

• evaluate data for consistency with known facts, hypotheses or methods

***Writing***

To be considered proficient at Level 1, a student should be able to:

• recognize agreement among basic grammatical elements (e.g., nouns, verbs, pronouns and conjunctions)

• recognize appropriate transition words

• recognize incorrect word choice

• order sentences in a paragraph

• order elements in an outline

To be considered proficient at Level 2, a student should be able to:

• incorporate new material into a passage

• recognize agreement among basic grammatical elements (e.g., nouns, verbs, pronouns and conjunctions) when these elements are complicated by intervening words or phrases

• combines simple clauses into single, more complex combinations

• recast existing sentences into new syntactic combinations

To be considered proficient at Level 3, a student should be able to:

• discriminate between appropriate and inappropriate use of parallelism

• discriminate between appropriate and inappropriate use of idiomatic language

• recognize redundancy

• discriminate between correct and incorrect constructions

• recognize the most effective revision of a sentence

***Mathematics***

To be considered proficient at Level 1, a student should be able to:

• solve word problems that would most likely be solved by arithmetic and do not involve conversion of units or proportionality (These problems can be multi-step if the steps are repeated rather than embedded.)

• solve problems involving the informal properties of numbers and operations, often involving the Number Line, including positive and negative numbers, whole numbers and fractions (including conversions of common fractions to percent, such as converting ¼ to 25%)

• solve problems requiring a general understanding of square roots and the squares of numbers

• solve a simple equation or substitute numbers into an algebraic expression

• find information from a graph (This task may involve finding a specified piece of information in a graph that also contains other information.)

To be considered proficient at Level 2, a student should be able to:

• solve arithmetic problems with some complications, such as complex wording, maximizing or minimizing and embedded ratios (these problems include algebra problems that can be solved by arithmetic [the answer choices are numeric])

• simplify algebraic expressions, perform basic translations and draw conclusions from algebraic equations and inequalities (these tasks are more complicated that solving a simple equation, though they may be approached arithmetically by substituting numbers.)

• interpret a trend represented in a graph, or choose a graph that reflects a trend

• solve problems involving sets (the problems would have numeric answer choices.)

To be considered proficient at Level 3, student should be able to:

• solve word problems that would be unlikely to be solved by arithmetic; the answer choices are either algebraic expressions or are numbers that do not lend themselves to back-solving

• solve problems involving difficult arithmetic concepts such as exponents and roots other than squares and square roots and percent of increase or decrease

• generalize about numbers, e.g., identify the values of (x) for which an expression increases as (x) increases

• solve problems requiring an understanding of the properties of integers, rational numbers, etc.

• interpret a graph in which the trends are to be expressed algebraically or in which one of the following is involved: exponents and roots other than squares and square roots, percent of increase or decrease

• solve problems requiring insight or logical reasoning

## Appendix B. Detailed Model 3 Results.

Table 2. Regression Results of Model 3

| totalscore | Coef. | St.Err. | t-value | p-value | [95% Conf | Interval] | Sig |
|---|---|---|---|---|---|---|---|
| age | -0.109 | 0.177 | -0.62 | 0.537 | -0.457 | 0.238 | |
| 0b.gender | 0.000 | . | . | . | . | . | |
| 1.gender | 2.870 | 0.931 | 3.08 | 0.002 | 1.044 | 4.696 | *** |
| 0b.race_re | 0.000 | . | . | . | . | . | |
| 1.race_re | 5.319 | 1.235 | 4.31 | 0.000 | 2.896 | 7.742 | *** |
| 0b.transfer_re | 0.000 | . | . | . | . | . | |
| 1.transfer_re | 1.463 | 1.107 | 1.32 | 0.187 | -0.709 | 3.634 | |
| 1b.major | 0.000 | . | . | . | . | . | |
| 2.major | -7.166 | 5.025 | -1.43 | 0.154 | -17.022 | 2.691 | |
| 3.major | 0.217 | 8.432 | 0.03 | 0.980 | -16.324 | 16.757 | |
| 4.major | 22.263 | 11.799 | 1.89 | 0.059 | -0.882 | 45.409 | * |
| 5.major | -9.327 | 4.054 | -2.30 | 0.022 | -17.279 | -1.376 | ** |
| 6.major | 1.424 | 3.501 | 0.41 | 0.684 | -5.444 | 8.293 | |
| 7.major | 1.632 | 2.320 | 0.70 | 0.482 | -2.918 | 6.183 | |
| 8.major | -3.192 | 1.973 | -1.62 | 0.106 | -7.061 | 0.678 | |
| 9.major | 11.676 | 3.077 | 3.79 | 0.000 | 5.641 | 17.711 | *** |
| 10.major | -6.428 | 2.195 | -2.93 | 0.003 | -10.733 | -2.123 | *** |
| 11.major | 0.661 | 6.986 | 0.10 | 0.925 | -13.043 | 14.364 | |
| 12.major | 7.148 | 3.524 | 2.03 | 0.043 | 0.236 | 14.059 | ** |
| 13.major | -5.932 | 2.207 | -2.69 | 0.007 | -10.262 | -1.602 | *** |
| 14.major | -8.460 | 16.539 | -0.51 | 0.609 | -40.902 | 23.983 | |
| 15.major | 7.052 | 4.883 | 1.44 | 0.149 | -2.527 | 16.631 | |
| 16.major | -16.497 | 11.850 | -1.39 | 0.164 | -39.740 | 6.747 | |
| 17.major | 0.608 | 4.076 | 0.15 | 0.881 | -7.387 | 8.604 | |
| 18.major | 4.654 | 4.745 | 0.98 | 0.327 | -4.653 | 13.962 | |
| 19.major | -4.975 | 2.488 | -2.00 | 0.046 | -9.856 | -0.093 | ** |
| 20.major | -0.799 | 4.450 | -0.18 | 0.857 | -9.528 | 7.929 | |
| 21.major | 0.413 | 16.595 | 0.03 | 0.980 | -32.139 | 32.965 | |
| 22.major | -3.274 | 3.602 | -0.91 | 0.363 | -10.339 | 3.790 | |
| 23.major | 11.529 | 6.491 | 1.78 | 0.076 | -1.203 | 24.261 | * |
| 24.major | -3.947 | 6.103 | -0.65 | 0.518 | -15.918 | 8.023 | |
| 25.major | 10.460 | 7.552 | 1.39 | 0.166 | -4.353 | 25.274 | |
| 26.major | 0.153 | 8.491 | 0.02 | 0.986 | -16.503 | 16.810 | |
| 27.major | 5.411 | 2.915 | 1.86 | 0.064 | -0.306 | 11.129 | * |
| 28.major | 0.336 | 3.257 | 0.10 | 0.918 | -6.052 | 6.725 | |
| 29.major | 17.223 | 16.549 | 1.04 | 0.298 | -15.238 | 49.684 | |
| 30.major | -2.237 | 3.829 | -0.58 | 0.559 | -9.748 | 5.274 | |
| 31.major | -5.529 | 2.609 | -2.12 | 0.034 | -10.647 | -0.410 | ** |
| 32.major | -2.314 | 1.966 | -1.18 | 0.239 | -6.170 | 1.542 | |
| 0b.honor_recd | 0.000 | . | . | . | . | . | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1.honor_recd | 18.690 | 2.445 | 7.64 | 0.000 | 13.894 | 23.487 | *** |
| 1b.year | 0.000 | . | . | . | . | . | |
| 2.year | 2.735 | 1.792 | 1.53 | 0.127 | -0.780 | 6.250 | |
| 3.year | 1.044 | 1.585 | 0.66 | 0.511 | -2.066 | 4.153 | |
| 4.year | 0.493 | 1.794 | 0.28 | 0.784 | -3.026 | 4.012 | |
| 1b.workhour_re | 0.000 | . | . | . | . | . | |
| 2.workhour_re | 1.479 | 1.050 | 1.41 | 0.159 | -0.580 | 3.539 | |
| 3.workhour_re | 2.471 | 1.142 | 2.16 | 0.031 | 0.230 | 4.711 | ** |
| 0b.studstat | 0.000 | . | . | . | . | . | |
| 1.studstat | -8.701 | 1.274 | -6.83 | 0.000 | -11.200 | -6.202 | *** |
| 1b.english | 0.000 | . | . | . | . | . | |
| 2.english | -1.370 | 1.025 | -1.34 | 0.182 | -3.381 | 0.641 | |
| 3.english | -1.658 | 3.150 | -0.53 | 0.599 | -7.837 | 4.521 | |
| 0b.enroll | 0.000 | . | . | . | . | . | |
| 1.enroll | 1.230 | 2.066 | 0.59 | 0.552 | -2.822 | 5.283 | |
| 0b.gpa_re | 0.000 | . | . | . | . | . | |
| 1.gpa_re | 10.957 | 0.982 | 11.16 | 0.000 | 9.031 | 12.883 | *** |
| Constant | 447.892 | 5.473 | 81.83 | 0.000 | 437.156 | 458.628 | *** |

| | | | |
|---|---|---|---|
| Mean dependent var | 455.068 | SD dependent var | 18.921 |
| R-squared | 0.272 | Number of obs | 1539.000 |
| F-test | 12.099 | Prob > F | 0.000 |
| Akaike crit. (AIC) | 13022.697 | Bayesian crit. (BIC) | 13273.624 |

*** $p<0.001$, ** $p<0.01$, * $p<0.05$

## Appendix C. Majors

Table 3. Majors included in the analysis and codes

| | |
|---|---|
| Accounting | 1 |
| Allied Health | 2 |
| Anthropology & Archeology | 3 |
| Architecture & Environmental Design | 4 |
| Art & Art History | 5 |
| Banking & Finance | 6 |
| Biological Sciences | 7 |
| Business Administration | 8 |
| Chemistry | 9 |
| Communications | 10 |
| Computer & Information Sciences | 11 |
| Economics | 12 |
| Education | 13 |
| Engineering & Engineering Technologies | 14 |
| English | 15 |
| Environmental Sciences | 16 |
| Foreign Languages & Literature | 17 |
| Geological Sciences | 18 |
| Health & Medical Sciences | 19 |
| History | 20 |
| Liberal Studies | 21 |
| Marketing | 22 |
| Mathematical Sciences | 23 |
| Music | 24 |
| Philosophy | 25 |
| Physics & Astronomy | 26 |
| Political Science | 27 |
| Psychology | 28 |
| Religion & Theology | 29 |
| Sociology | 30 |
| Undecided | 31 |
| Other | 32 |