

# STATS 141XP Final Report

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## Abstract

Every year, incoming UCLA students take the Analytical Writing Placement Exam (AWPE) to be assessed on their mastery of entry-level writing skills. While self-placement directly from students reduces the amount of administrative work of the department, it remains crucial to examine the reliability of self-reported information. In this report, we present an analysis of student placement data [1], focusing on the alignment between self-placement and true placement scores. Then we can derive further insights and offer suggestions to this examination process. First, data cleaning procedures were employed to clear inconsistencies and missing values within the dataset. Following this, an exploratory analysis was conducted, shedding light on an interval of AWPE scores with the highest correlation with aligned scores, which we study further. Results from statistical techniques such as Logistic Regression indicate that students falling within this interval tend to have a higher proportion of aligned self-placement scores compared to those outside the interval. Additionally, the distribution of AWPE scores within this interval suggests a potential relationship between AWPE scores and alignment. These findings underscore the importance of considering AWPE scores within specific intervals when assessing the alignment of student self-placement.

## 1 Introduction

As standardized testing scores are no longer required for UCLA admission, alternative testing starts taking an increasingly important role in determining whether students satisfy entry-level writing requirements. This assessment is generally structured as a timed-writing exam on a particular prompt. With hundreds of papers to read and grade, placing students in the appropriate courses is often a tedious task for the department to do. Hence, alternative schemes of conducting the same assessment are in favor; one of them, although controversial in nature, can be potentially beneficial for alleviating the administrative burden: we can take into the consideration the self-placements from students through the AWPE scores.

There are mainly two concerns in this approach: first, students might not always provide factual information, and second, students might make drastically different judgments from professional writing lecturers. Therefore, we consider the alignment between self-placement and true placement scores as a crucial metric for measuring how effective this approach is. In this report, we analyze a dataset provided by Dr. Christine Holten, which contains information about students' GPA, post-AWPE survey responses, AWPE scores, true placements, self-placements, and other relevant information. The main objective of this report is to identify an interval of AWPE scores where self-placements are more reliable and find ways to incorporate self-placements in the evaluation process.

This report begins with the data cleaning process. Notably, efforts were made to minimize differences across high, low, and aligned scores, as well as addressing missing values in the GPA column and self-placement or true placement scores. Following data cleaning, an exploratory analysis was conducted to identify patterns and correlations within the dataset. Of particular interest was the relationship between AWPE scores and alignment, which motivated us to investigate specific intervals of AWPE scores. Through our analysis, the interval [41, 48] emerged as significantly correlated with aligned scores, indicating its potential relevance in assessing student placement accuracy.

The rest of this report is structured as follows: Section 2 describes fundamental information about this dataset. Section 3 outlines our methods step by step to provide comprehensive details into our insights. In Section 4, we interpret results obtained from our statistical analysis and discuss how they give rise to potential improvements to English placement. Lastly, we summarize our report and identify several limitations and future directions in Section 5.

## 2 Dataset

The dataset [1] for our analysis comprises 1067 entries, each representing a UCLA student who has taken the Analytical Writing Placement Exam (AWPE). The data was collected from a group of incoming students and had various metrics assessing their writing skills and appropriate course placement. The attributes of the dataset are as follows:

- **UID:** A unique identifier for each student.
- **ENG\_Place:** The English course placement as determined by the examiners, ranging from 1 to 3, where higher values represent more advanced placement.
- **Self\_Place:** The course placement chosen by students themselves, which also ranges from 1 to 5.
- **AWPE:** The score obtained in the AWPE, with a range from 24 to 48, where higher scores suggest stronger writing proficiency.
- **Category:** A categorical variable that represents an assessment category.
- **GPA:** The Grade Point Average of the student.
- **interval:** A boolean variable indicating whether the student's AWPE score falls within a particular interval identified as critical in the study.
- **accurate:** A boolean variable indicating whether the self-reported placement was accurate when compared to the official placement.

## 3 Methods

### 3.1 Data Cleaning

Our dataset came in with inconsistencies and missing values in the high, low, aligned scores, missing values and 0 in the GPA column, and missing values in the self-placement or true placement scores. To clean our data, we first filtered out any observations that did not have a self-placement or true placement score as it would be impossible to run analysis without a measure of alignment. We then filled and fixed the high, low, aligned column, assigning a high score if self placement was greater than true placement, low if self placement was less than true placement, and aligned if they were equal. Finally, we filled in missing and zero GPAs by using imputation via classification and regression trees via the mice package.

### 3.2 Extracting the interval

We began with an exploratory analysis of the data, including the following plot displaying the distribution of AWPE scores across the different categories of alignments.

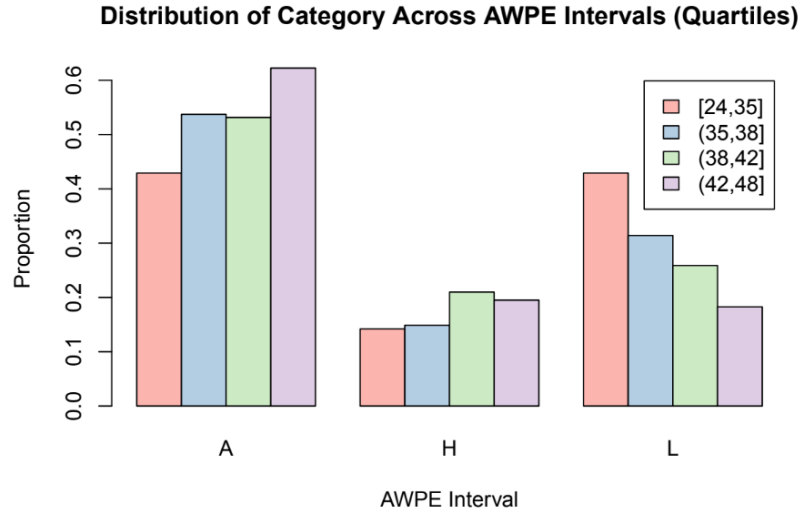


Figure 1: Distribution of Category Across AWPE Intervals

Figure 1 displays the proportion of aligned, high, and low self-placement scores within each quartile of the AWPE scores. The interval with the highest proportion of aligned self-placement scores is  $(42,48]$ , shown in purple.

As there appeared to be an interval that had a highest proportion of aligned scores, we decided to run an approximately exhaustive algorithm to determine which interval of AWPE scores had the highest correlation with aligned scores. We created every possible interval of every possible size between the minimum AWPE score of 24 and maximum AWPE score of 48, and concluded that the interval  $[41,48]$  had the highest correlation with aligned scores.

## 4 Results

### 4.1 Description of the Interval

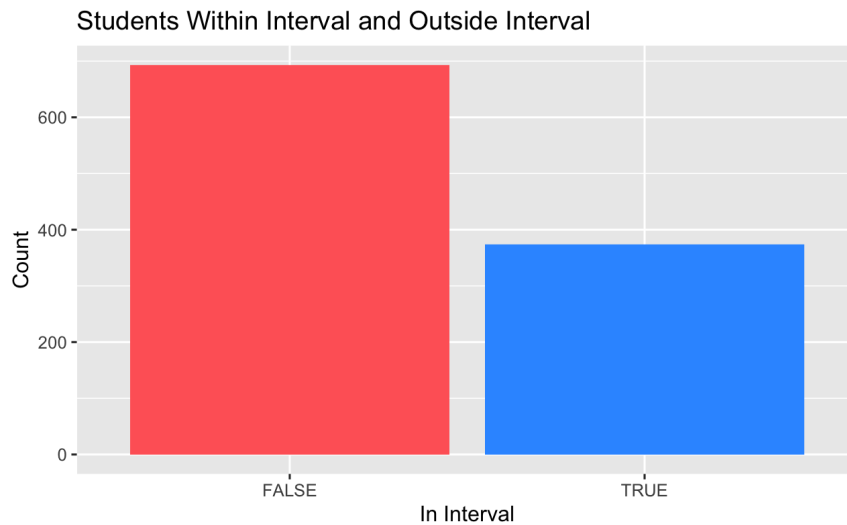


Figure 2: Number of Students who Fall in our Interval and Outside of the Interval

In Figure 2, we can see how many students fall into our chosen interval compared to the amount of students

that do not fall into our chosen interval. In our data set, there are 374 students who fall within our interval while there are 693 students who fall outside our interval.

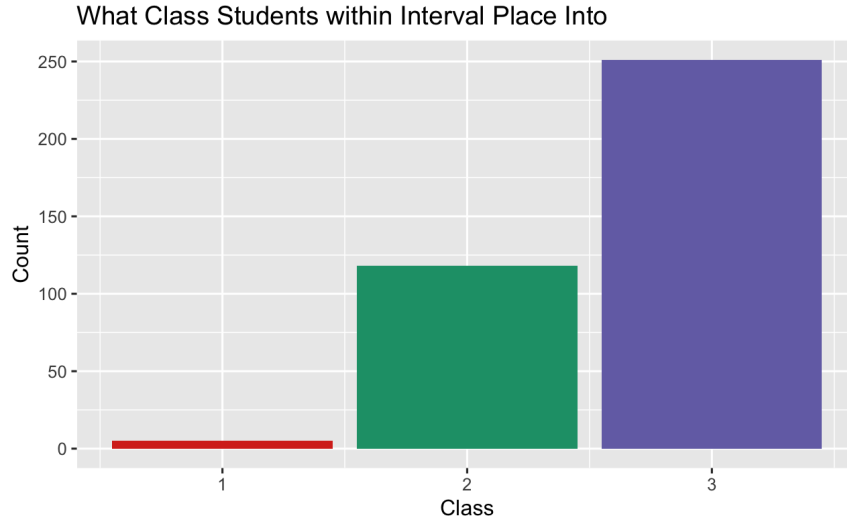


Figure 3: What Class Students in our Interval Place Into

In Figure 3, we are seeing what class students who fall within our interval are placed into by the English Department. Of the 374 students who fall within our interval, 5 students were placed into Class 1 by the English Department, 118 students were placed into Class 2 by the English department, and 251 students were placed into Class 3 by the English Department.

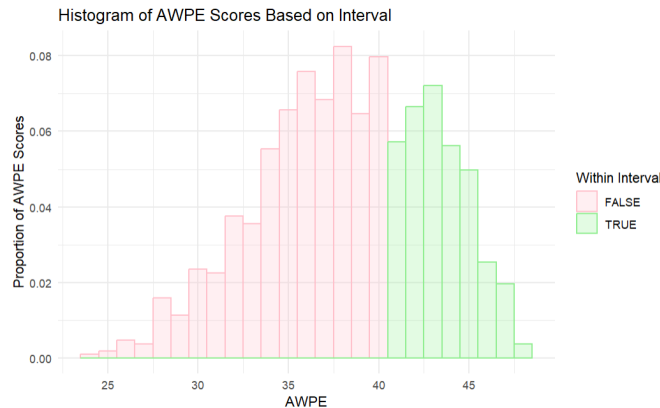


Figure 4: Distribution of AWPE Scores With Interval Highlighted

Figure 4 displays the distribution of AWPE scores, with the specified interval highlighted in green. We can see that the AWPE scores that fall within the interval appear to be among the highest scores.

## 4.2 Analysis of the Interval

Through our methods we determined that students who have AWPE scores that fall within an interval of  $[41, 48]$  can be trusted to self place into the correct class. Approximately 35% of students in our given data fall within this interval. Within our interval, students have a higher tendency to place into Class 3. Within our interval, 227 students self placed into the class that the English Department placed them into. This means that roughly 61% of students in our interval correctly self placed. In order to determine what variables are significant, we ran different logistic regression models accounting for different combinations of our variables.

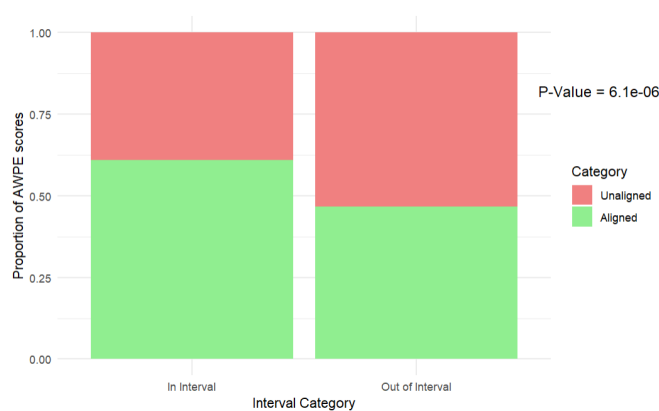


Figure 5: Proportion of Aligned and Unaligned Scores In/Out of Interval

	In Interval	Out of Interval
Aligned	227	322
Not Aligned	147	371

Table 1: Raw counts of Aligned and Not Aligned predictions

	In Interval	Out of Interval
Aligned	0.6069519	0.4646465
Not Aligned	0.3930481	0.5353535

Table 2: Proportions of Aligned and Not Aligned predictions

Figure 5 displays the proportion of aligned and unaligned scores within the interval and out of the interval. We can see that the proportion of aligned scores is much higher for individuals within the interval than outside of it, with a p-value of 6.1e-06.

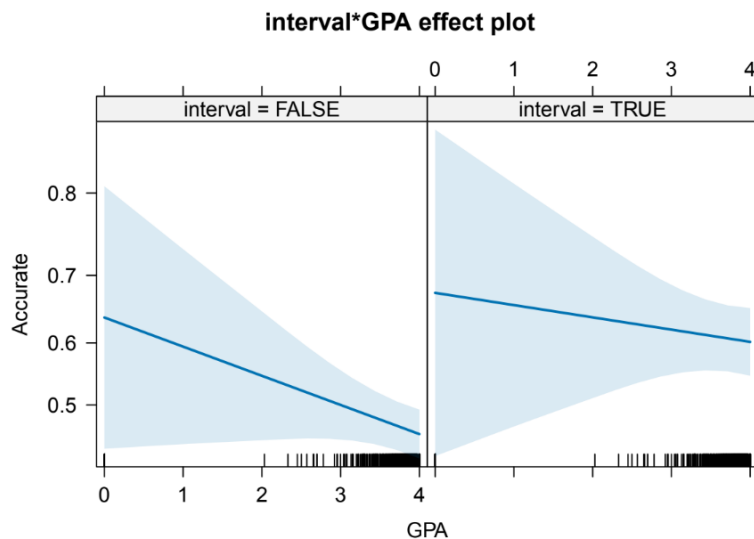


Figure 6: Interval\*GPA effect plot

This plot was made from our logistic regression model that predicted accuracy across interval and GPA, accounting for their interaction effect. This plot is showing us how the probability of an aligned self placement changes

across different combinations of interval value and GPA value. When we are not in our selected interval of  $[41, 48]$ , predicted probability of aligned self placing decreases as GPA increases. Similarly for when we are in our selected interval of  $[41, 48]$ , predicted probability of aligned self placing decreases as GPA increases, though it has a slightly less negative slope compared to our graph for when we are not in our interval. From our model, our intercept is 0.5719, meaning that when we are not in our interval and our GPA is 0, then the log odds of getting an aligned self placement is 0.5719. When we go from outside to inside of our interval, holding GPA constant, the log odds of an aligned self placement increase by 0.1611. If we hold interval constant and increase GPA by one unit, the log odds of an aligned self placement decrease by 0.1907. For our interaction term, we get a value of 0.1106. This means that when we are inside of our interval, as GPA increases by one unit the log odds of an aligned self placement increase by an additional 0.1106. Many of these coefficients are not statistically significant, so this may not be the most efficient model.

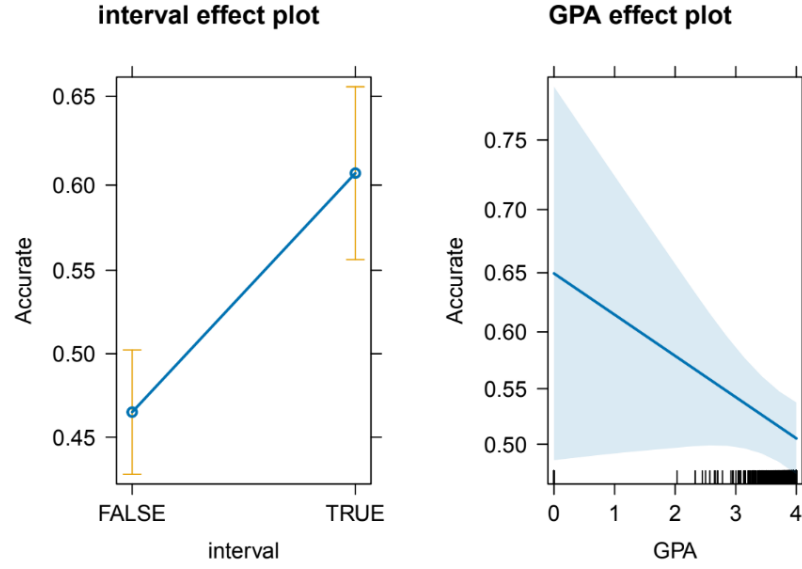


Figure 7: Distribution of Category Across AWPE Intervals

These plots are made from our logistic regression model that modelled accuracy across interval and GPA, not accounting for their interaction effect. The left plot shows us the predicted probabilities based off of whether the AWPE score is in our interval ( $[41, 48]$ ) or not. Being in the interval (TRUE) has a higher expected probability (0.60) of aligned self placing than not being in the interval (about 0.47). The right plot displays the predicted probabilities of accuracy based off of different GPA values. As GPA increases, expected probability of aligned self placing decreases. For this model, when we are not in our interval and our GPA is 0, the log odds of an aligned self placement is 0.4153. When we go from outside of our interval to inside, holding GPA constant, the log odds of an aligned self placement increase by 0.57465. Holding interval constant, the log odds of an aligned self placement decrease by 0.14893 for every unit increase of GPA.

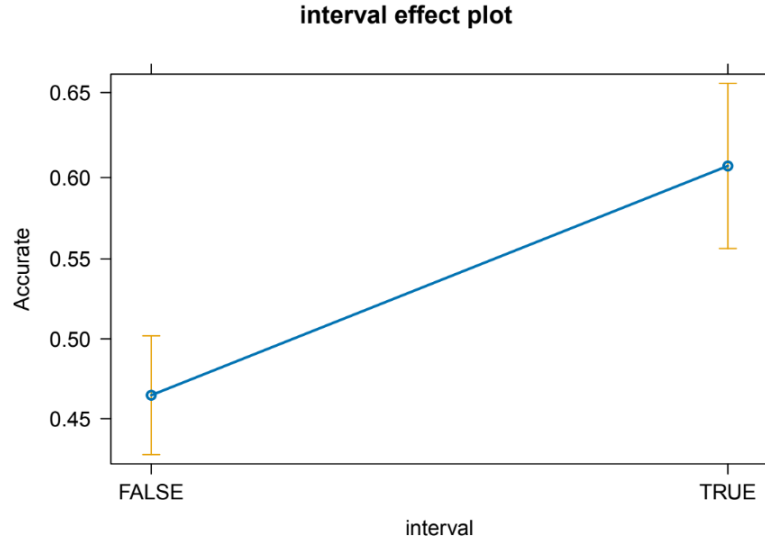


Figure 8: Distribution of Category Across AWPE Intervals

This plot was made from a logistic regression model that modelled accuracy across interval only. This plot is showing us very similar information as our previous model's left plot. Accuracy is higher when we are in our selected interval than when we are not in our interval. From our model, we get an intercept value of -0.14165. This means that when we are not in our interval, the log odds of an aligned self placement is -0.14165. When we go from outside of our interval to inside of our interval, the log odds of an aligned self placement increase by 0.57617.

Using partial f tests we were able to determine that our reduced logistic regression model, only including accuracy across interval, was a statistically sufficient model to represent our data.

## 5 Conclusion

In conclusion, self-placement scores provide some clue for students' writing skills, particularly for those whose AWPE scores fall within the interval [41, 48]. Our finding is statistically significant, as a p-value of 6.1e-06 indicates a strong correlation between AWPE scores in this range and reliable self-placement scores.

There are some limitations to our study. First, the proportion of aligned self-placement scores with the interval [41, 48] is only 0.61. A higher proportion would strengthen the reliability of our conclusions. Incorporating more factors beyond the AWPE score interval, such as students' prior writing experience, to make self-placement assessment a more reliable one would be a future direction.

Secondly, we can increase sample size to avoid impact of missing values while achieving more statistical power to our results. Larger samples might reveal additional patterns that were not found in our analysis.

Lastly, since the majority of students placed themselves in class 3 and 2, with only few in 1, this results in an imbalanced dataset. We should have a more balanced dataset, as it would then reduce bias and achieve more reasonable conclusions.

## References

- [1] Christine Holten. *Analytical Writing Placement Exam (AWPE) Dataset*. URL: <https://ucla.app.box.com/s/vxbc3y0iduh8hfva56nstshx5y4n510c>.