
Investigating the Relationship Between Student Performance and Average Time Spent On Chemistry Exams

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Abstract During an examination period, one can find students who take noticeably less time than average to complete the exam, as well as students who require more time than average to finish the exam. This study examined these two groups of students to answer the following: 1) Is the amount of time that a student spends taking an exam a habit? 2) Is there any correlation between examination scores and the length of time it took to complete the exam? The results of the study answered both of the above questions. In response to the first question, of the students who took either more or less than the average examination time to complete their exam, twenty-five or higher percent were the same students each time. As these particular students demonstrated a consistent pattern in how long it took them to finish from one exam period to the next, the results indicate that the time spent taking an exam is due to habit, where habit is defined as "A settled tendency or usual manner of behavior" (1). In response to the second question, the study shows that no significant and consistence correlation exists between examination score and the length of time it took to complete the exam.

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Introduction

Regardless of the subject or discipline, it is not uncommon for instructors to observe that not all students spend the same amount of time taking an exam. There are students who stand as outliers as they take significantly more or less time than average to complete an exam. From the observation of these outliers, many questions may arise for an instructor, for example: Is the amount of time one spends taking an exam a matter of how challenging one finds the exam? Do those who spend less time on an exam do so because they have difficulty with the exam and simply give up, or rather, is it the case that they find the exam less challenging thus completing the exam more quickly? Do those students who take the most time finishing an exam do so because they are searching for answers or is it instead that they are done with their work and simply double-checking their answers? The purpose of the study is to answer the following two specific questions as they relate to students who take more or less time than average to complete an exam:

- 1) Is the amount of time that a student spends taking an exam a habit?
- 2) Is there any correlation between examination scores and the length of time it took to complete the exam?

The second question has been addressed by previous studies; however, the results of these studies vary. In the Feinberg study, a sample of macroeconomic students over the course of several exams show increased performance with increased examination time (2), meaning, the longer a student took to finish an exam, the better he or she performed on

the exam and the higher the exam score. Additionally, the *Frisby and Traffanstedt* study shows a correlation between longer test taking times and higher CCTST (California Critical Thinking Skills) scores (3). Yet, the results of a study by Bridges suggest that there is no relationship between test-completion speed on an untimed test and test performance (4). Further, Landrum and et.al observed a negative correlation between exam time and performance (5). A major differentiation between this study and previous research, is that the subject group in this study is solely comprised of students who take more or less time than average to complete their exams. The first question is answerable depending on the definition of habit utilized. For the purposes of this study, habit is defined as, "A settled tendency or usual manner of behavior" (1). If the amount of time an outlying student takes to finish his or her exam is a matter of habit, then regardless of how the student performs on exams, he or she will consistently take more or less time than average to complete the exams. By answering these two questions, other questions an instructor may have regarding the test-taking behavior of outlying students may also be resolved.

Methodology

For the purposes of this study, the students (subjects) are grouped as follows:

- Early
- Average
- Late

For an exam of 40-50 minutes in length, there are some students who complete the exam during the average duration (Average), some who leave too early compared to the rest (Early), some students who stay until the last minute or ask for extensions (Late).

A freshmen chemistry class was observed for purposes of this study. The class selected was Principals of General Chemistry I due to the fact that a much larger and diverse population of students could be observed. The majority of students in this class were female pre-nursing students combined with a significant number of nontraditional students.

The exams conducted in this class included two sectional exams and a comprehensive final exam each quarter. The two sectional exams were designed for a 50 minute class, and the comprehensive final was designed

for a 90 minute class. The students were allowed as much time as needed to complete all three of those exams. Each student's exam duration was recorded for all three exams. The general behavior that was observed was that students were not inactive during the exam time. Thus, the exam duration of each student's exam served as a valid indication of how long they spent on each exam. Whether they went over the exam once or reviewed and reconsidered their answers, was not one of the objectives of this study.

Students with documented disabilities were not part of this study. These students take their test at our testing center that provides proper environment for students with special needs.

The number of students in each exam varies between 49-53 due to excused absences. However, those students who attend at least 2 out of 3 exams are included in this study.

I decided to divide the time into three categories, a) Early, approximately average time minus 25 percent of average time wherever there was a significant gap in time (5 or more minutes) b) Average, approximately class average time \pm 25 percent, and c) Late, approximately average time plus 25 percent of average time wherever there was a significant gap in time (5 or more minutes).

Results

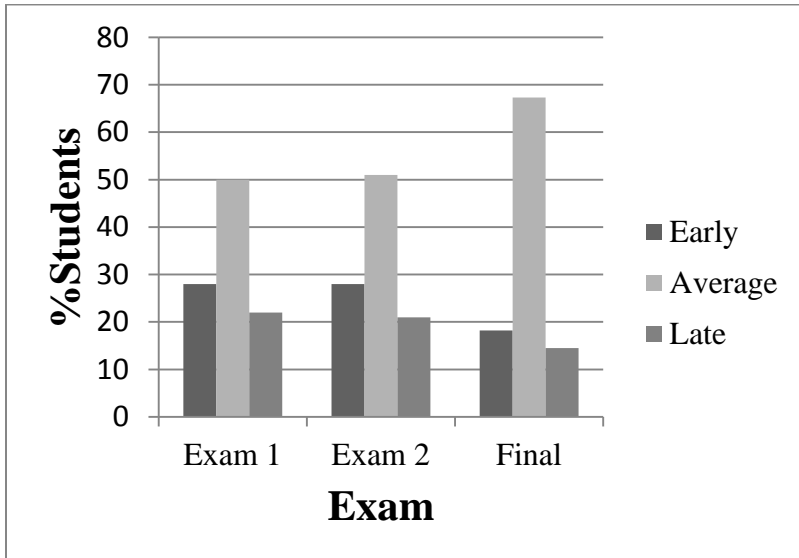
The summary of data collected during a quarter from 3 exams are presented in Table 1. As the difficulty of exam increases so does the average time students spend in the exam. The lowest grades and highest grades are not associated with shortest and longest times.

Table 1. Summary of Collected Data

	Exam 1	Exam 2	Final Exam
Lowest Grade (%)	44	18	19
Highest Grade (%)	84	91	85
Shortest Time, min	10	24	31
Longest Time, min	85	100	107
Average Time, min	45	57	80

The increased change in average times as indicated in *Table 1* is due to the increase in the number of questions and difficulty of the test.

The percentage of students in each group for each exam is presented by *Graph 1*. The number of students who leave earlier is more than the number of students who stay longer in all three exams. However, due to the length and difficulty of each exam, the average time increases, which affects both Early and Late groups' percentiles.

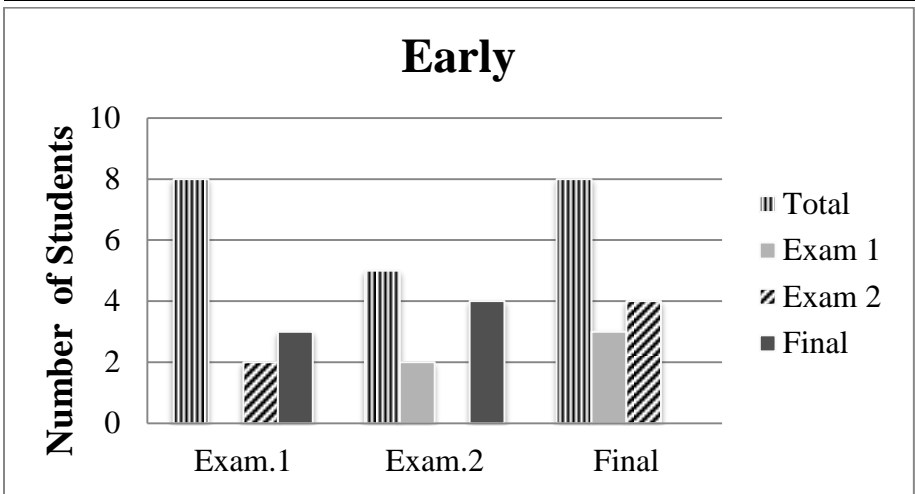


Graph 1. Percentage of Students in Each Group.

I. Study of Time Spent in Exam as a Habit

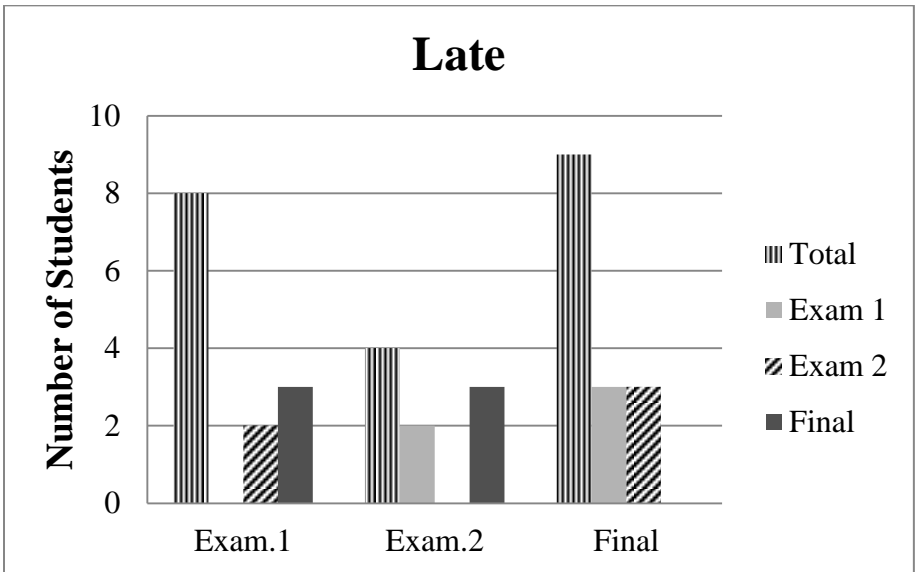
To be able to answer this question, only those who attended all three exams were selected. There were 43 students who fall in this category.

The result of the study indicates there are some students who are showing in either the Early Group or the Late Group from exam to exam. For example, from eight in Early Group of Exam 1, two appear in the Early Group of Exam 2, and three appear in the Early Group of the Final Exam (*Graph 2*).



Graph 2. Comparing Early Students in All Exams.

In case of the Late Group, three out of four from the Late Group of Exam 2 also appear in the Late Group of the Final Exam and two in Exam 1 (Graph 3).



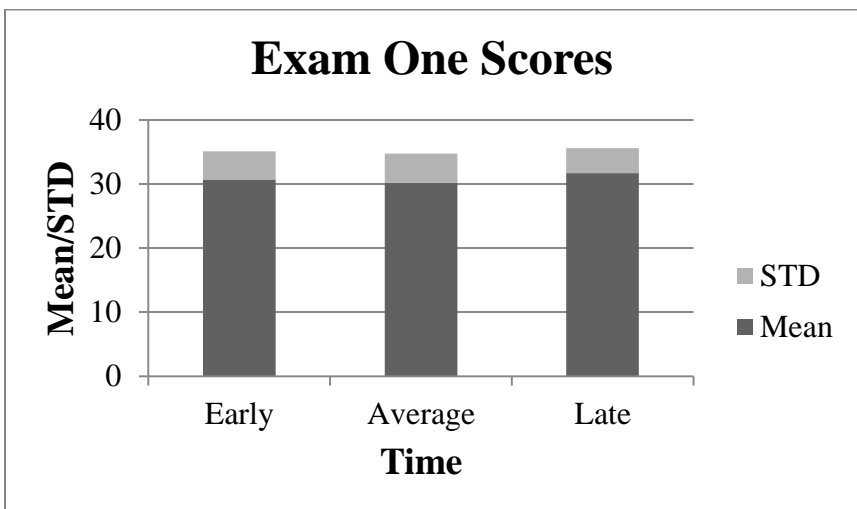
Graph 3. Comparing Late Students in All Exams.

Although the results indicate that there are some students who are constantly either Late or Early but there is not enough data to support whether this is a habit or not.

II. Relation Between Time Spent in Each Exam and the Scores

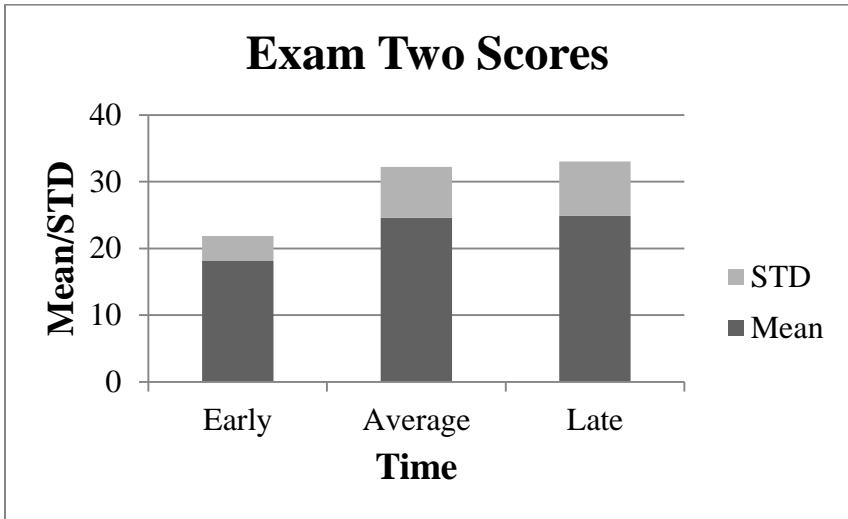
The same data was used to study the relationship between the time spent in the exam and students' performance.

Mean and standard deviation of each group in all three exams were calculated using the number of correct answers in each exam and are presented in Graph 4 – 6.



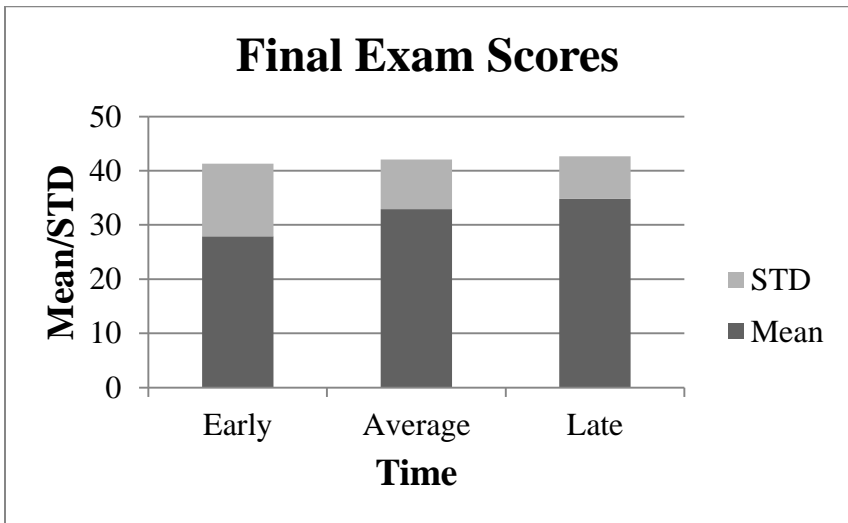
Graph 4. Scores for Each Group in Exam One.

For Exam 1, there exists an insignificantly negative correlation between scores and time spent in the exam ($r = -0.146$, $t = -0.981$, $p > 0.2$). Also, a two-tailed t-test indicates no association exists between the variables time and score.



Graph 5. Scores for Each Group in Exam Two

For Exam 2, there is an insignificantly positive correlation between scores and time spent in exam ($r = 0.077$, $t = 0.497$, $p > 0.5$). Also, a two-tailed t-test indicates no association exists between the variables time and score.



Graph 6. Scores for Each Group in Final Exam

For the Final Exam, there is an insignificantly negative correlation between scores and the time spent in the exam ($r = -0.050$, $t = -0.368$, $p > 0.5$). Also, a two-tailed t-test indicates no association exists between the variables time and score.

The means of each group in every exam were compared applying the students' t-test. The results of two-tailed tests indicate no difference between means.

Overall, there is no significant correlation between time students spent in the exams and their performance (scores).

Future studies might be conducted in the areas of the relationship between time, scores, and students' personal justification for time they spend in the exam. The methodology for this could include giving them a short questionnaire to complete at the end of each exam.

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Bibliography

Shahrokh Ghaffari is an Associate professor of chemistry.

References

- Bridges K. R., *Educational and Psychological Measurements*, 1985, 29.
Feinberg, R. M., *Applied Economics Letters*, 2004, 11, 865.
Frisby, C. and Traffanstedt, B. K., *Journal of College Reading and Learning*, 2003, 34(1), 24.
Landrum, R. E., Carlson, H., and Manwaring W., *Psychology Learning and Teaching*, 2009, 53.
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