

Formative Pilot Study Report

Study Type: ESSA Evidence Level III

Prepared for:
Formative

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EXECUTIVE SUMMARY

Formative contracted with LearnPlatform, a third-party educational technology (edtech) research company, to examine the relationship between teachers' usage of Formative and student learning outcomes. LearnPlatform designed the study to satisfy Level III requirements (*Promising Evidence*) according to the Every Student Succeeds Act.

Study Sample and Measures

This treatment-only, correlational study occurred in Fall 2021, using data from the 2020–2021 school year, and included 205 math-related (i.e., elementary, math, and science) classrooms and 160 reading-related (i.e., elementary, English, history) classrooms. Researchers used Formative usage data (i.e., number of Formatives assigned, number of graded answers) and Fastbridge aMath and aReading scores to assess student outcomes identified in the Formative logic model.

The study examined the relationship between teachers' Formative usage and student reading and math outcomes by computing descriptive statistics and partial correlations.

Findings

Teacher usage. On average, 23 Formatives were assigned to students in math classrooms and 18 Formatives were assigned to students in reading classrooms. In addition, an average of 682 students' answers to Formatives were graded in math classrooms and an average of 710 students' answers to Formatives were graded in reading classrooms.

Student outcomes. Researchers computed partial correlations to examine the relationship between usage and student learning outcomes. While controlling for grade level and percentage of English language learners in a classroom, greater classroom assignment of Formatives was statistically significantly related to greater student achievement on the Fastbridge aMath assessment in secondary grades (grades 6-12).

Student Outcomes



Greater classroom usage of Formative, as measured by Formatives assigned, was statistically significantly related to:

✓ *Greater post-achievement performance in math for secondary grades (grades 6-12)*

Conclusions

This study provides results to satisfy ESSA evidence requirements for Level III (*Promising Evidence*) given the study design and single, positive, statistically significant finding. It is possible that the statistically significant, positive correlation between the number of Formatives assigned and Fastbridge aMath assessment scores could be related to implementation.

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Introduction

Formative contracted with LearnPlatform, a third-party edtech research company, to examine the relationship between teachers' usage of Formative and student learning outcomes. LearnPlatform designed the study to satisfy Level III requirements (*Promising Evidence*) according to the Every Student Succeeds Act.¹

LearnPlatform developed the following evaluation questions to align with the Formative logic model:

Evaluation Questions

- 1 To what extent did teachers use the Formative platform during the 2020–2021 school year to:
 - assign Formatives to their students?
 - grade students' answers to Formatives?

- 2 How does the number of Formatives assigned by teachers relate to classroom Fastbridge spring assessment scores during the 2020–2021 school year?

- 3 How does the number of graded answers to Formatives by teachers relate to classroom Fastbridge spring assessment scores during the 2020–2021 school year?

Study Design and Methods

This section of the report briefly describes the study participants, measures, and analyses.

Participants

The study sample included 205 math-related (elementary, math, and science) and 160 reading-related (elementary, English, history) classrooms.² Demographic information for the final sample is presented in the table below. Additional demographic information on the participating district is in Appendix A.

¹ Level III indicates that the intervention has one or more, "well-designed and well-implemented correlational study with statistical controls for selection bias." The study must also have a positive, statistically significant effect. (p. 9, U.S. Department of Education, 2016).

² A *classroom* is the unique combination of a teacher and grade level. For example, a teacher or grade level may repeat in the sample, but the specific combination of the two quantifies it as a unique classroom.

Demographics	Math Classrooms (n = 205)	Reading Classrooms (n = 160)
<i>Number of students in classrooms</i>		
Average	27	27
<i>Number of schools</i>		
Sum	28	25
<i>Grade</i>		
Primary (grades 3-5)	66%	81%
Secondary (grades 6-12)	34%	19%
<i>Subjects</i>		
Elementary	65%	81%
Math	18%	NA
Science	17%	NA
English	NA	10%
History	NA	9%
<i>Section 504</i>		
Yes	38%	2%
No	62%	98%
<i>Special education services</i>		
Receives services	1%	7%
Does not receive services	99%	93%
<i>English language learners</i>		
Yes	27%	18%
No	73%	82%
<i>Gifted students</i>		
Yes	15%	11%
No	85%	89%

Measures

Researchers used multiple measures in this study. In addition to the measures below, researchers also collected classroom demographic data from the school district. Using classroom demographic data —grade and English language learners— allowed researchers to statistically control for selection bias while examining the relationship between Formative usage and student outcomes.

Measures

Formative Usage
Metrics



Researchers collected 2020–2021 teacher-level Formative usage data (i.e., Formatives assigned and answers graded). Researchers examined this usage data, by classrooms, to understand the extent to which teachers provided students with Formatives and grading feedback using the Formative platform.

Standardized
Assessment





To assess students' outcomes, researchers collected spring 2021 scaled scores from the standardized assessment, Fastbridge aReading and aMath. A standardized assessment provided valid and reliable student outcome data. Students' vertically scaled scores were averaged by classroom to allow for classroom-level analyses.

Study Procedures and Timeline

This study occurred in Fall 2021. Researchers collected usage data in October 2021 from Formative. All students completed the standardized assessment at the end of the 2020–2021 school year (i.e., posttest, Spring 2021). The school district provided researchers with student assessment data and demographic data in October 2021.

Implementation Findings

The table below highlights average usage of Formative during the 2020–2021 school year. On average, classroom teachers assigned 23 Formatives in math and 18 Formatives in reading, with a range of 1 to 186 Formatives assigned. In addition, classroom teachers graded an average of 682 answers in math and 710 answers in reading, with a range of 1 to 10,419 answers graded.³

Average Formative Usage		
	Math	Reading
 Average number of Formatives assigned	23	18
 Average number of answers graded	682	710

There were no statistically significant differences in the number of Formatives assigned for math classrooms between primary and secondary grades; however, there was a statistically significant difference for reading classrooms (Figure 1). More specifically, primary grades (grades 3-5) had more Formatives assigned than secondary grades (grades 6-12) for reading classrooms. Appendix B provides additional information regarding this analysis.

³ Data were examined for outliers because outliers can increase the variability in the data and decrease the chance of finding statistically significant findings. Researchers decided to keep outliers in the dataset because they were likely from natural variation.

Number of Formatives Assigned

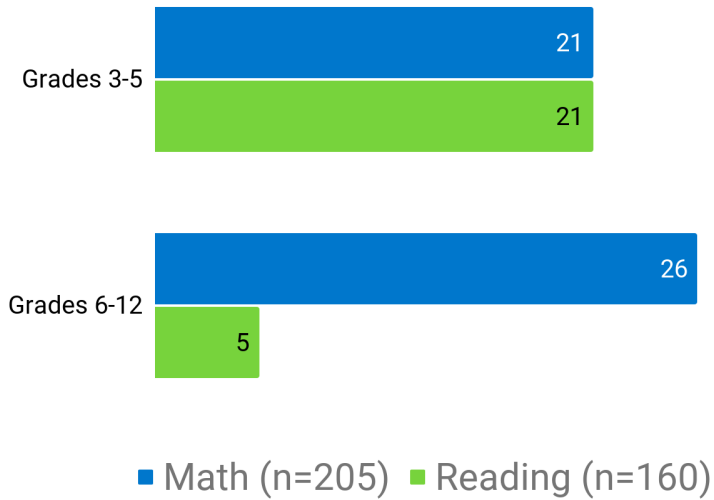


Figure 1. Primary grades had more Formatives assigned than secondary grades in reading classrooms.

There were statistically significant differences in the number of graded answers to Formatives between primary and secondary grades (Figure 2). For math and reading classrooms, primary grades (grades 3-5) had more graded answers to Formatives than secondary grades. Appendix B provides additional information regarding this analysis.

Number of Answers Graded

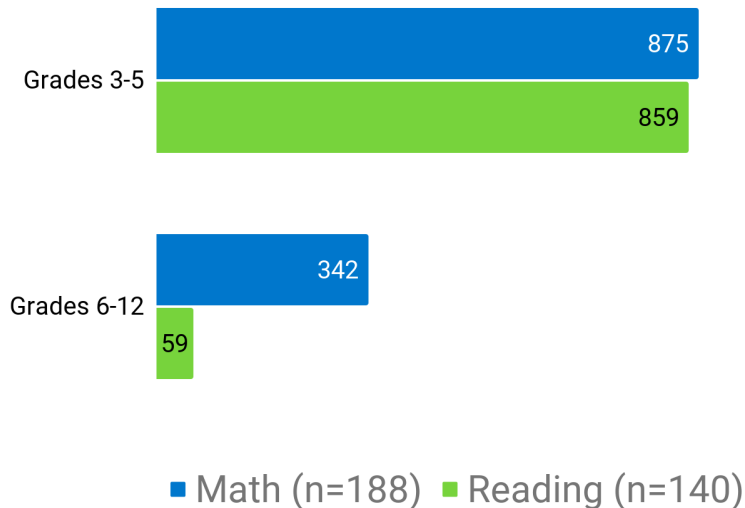


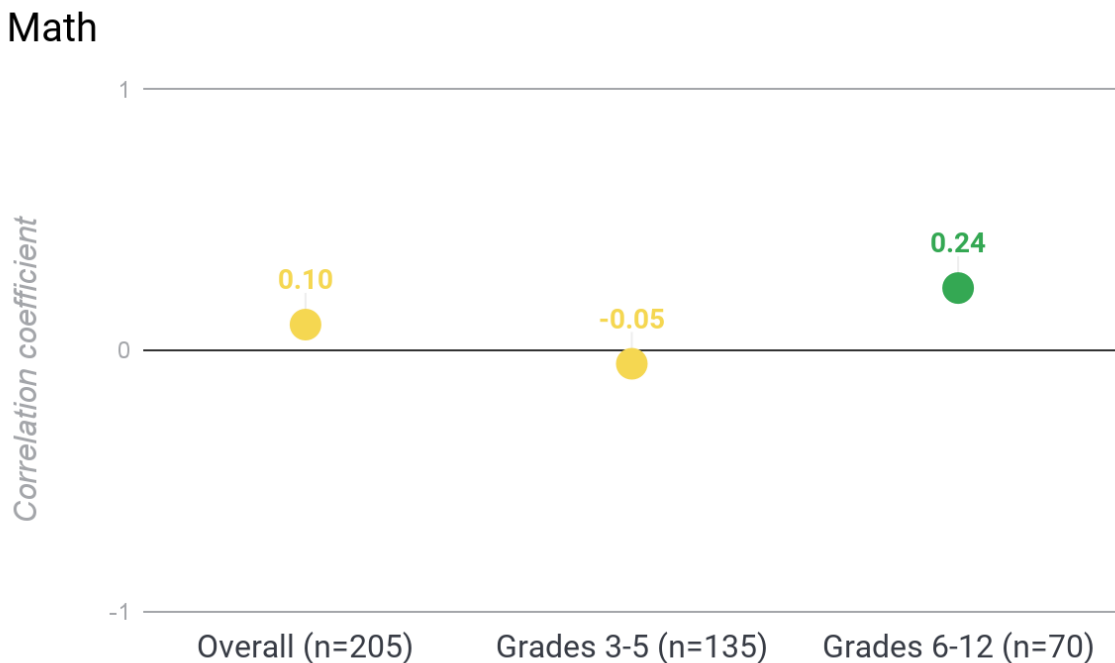
Figure 2. Primary grades had more graded answers to Formatives than secondary grades in math and reading classrooms.

Outcome Findings

To answer the study research questions, researchers conducted descriptive statistics and partial correlations. Researchers report statistically significant findings at the $p = .05$ level. For this correlative study, statistical significance means that there is likely a relationship between usage and student outcomes that is not caused by randomness. Statistically significant findings are highlighted in green (positive correlation) or red (negative correlation) in graphs. Findings that are not statistically significant are yellow. The following sections detail the analyses related to usage and student outcomes.

Relationship Between Formatives Assigned and Student Outcomes

Researchers conducted a partial correlation examining the relationship between the number of Formatives assigned and aMath assessment scores, while controlling for grade level and percentage of English language learners. Overall, there was one statistically significant, positive correlation between the number of Formatives assigned and Fastbridge aMath assessment scores (correlations range from $-.05$ to $.24$). Specifically, secondary grade (6-12) teachers who assigned more Formatives to their students had, on average, students with higher achievement in math during spring 2021 (Figure 3).

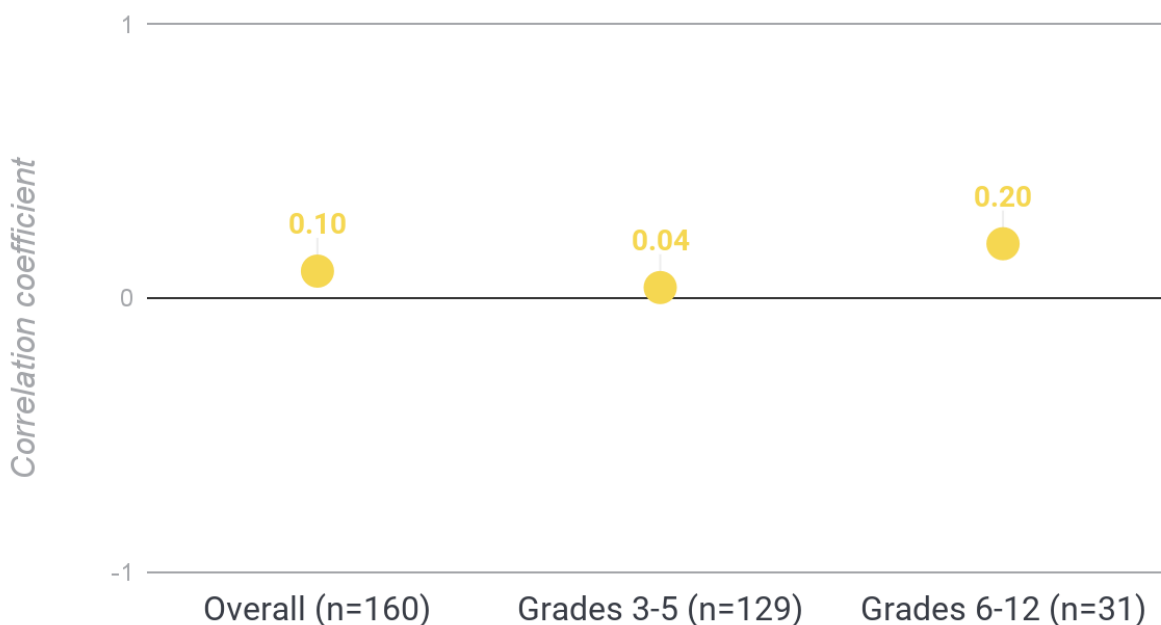


Notes: Statistically significant findings are green (positive correlation) or red (negative correlation) in correlation coefficient graphs. Findings that are not statistically significant are yellow.

Figure 3. Greater classroom assignment of Formatives was statistically significantly related to greater student achievement on the Fastbridge aMath assessment in secondary grades.

In addition, researchers conducted a partial correlation examining the relationship between the number of Formatives assigned and aReading assessment scores, while controlling for grade level and percentage of English language learners. There were no statistically significant, positive correlations between the number of Formatives assigned and Fastbridge aReading assessment scores (correlations ranged from .04 to .20; Figure 4).

Reading



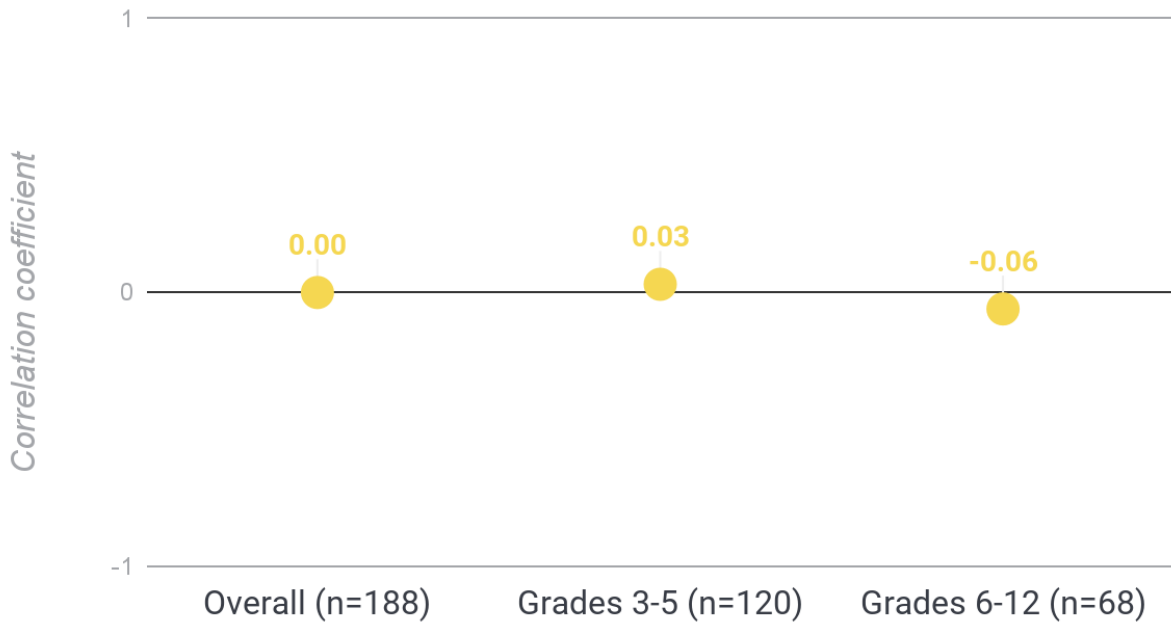
Notes: Statistically significant findings are green (positive correlation) or red (negative correlation) in correlation coefficient graphs. Findings that are not statistically significant are yellow.

Figure 4. Greater classroom assignment of Formatives was not statistically significantly related to greater student achievement on the Fastbridge aReading assessment.

Relationship Between Answers Graded and Student Outcomes

While controlling for grade level and percentage of English language learners, researchers also conducted a partial correlation examining the relationship between the number of answers graded by teachers and student outcomes. There were no statistically significant, positive correlations between the number of students' answers to Formatives graded and Fastbridge aMath assessment scores (correlations range from -.06 to .03; Figure 5).

Math

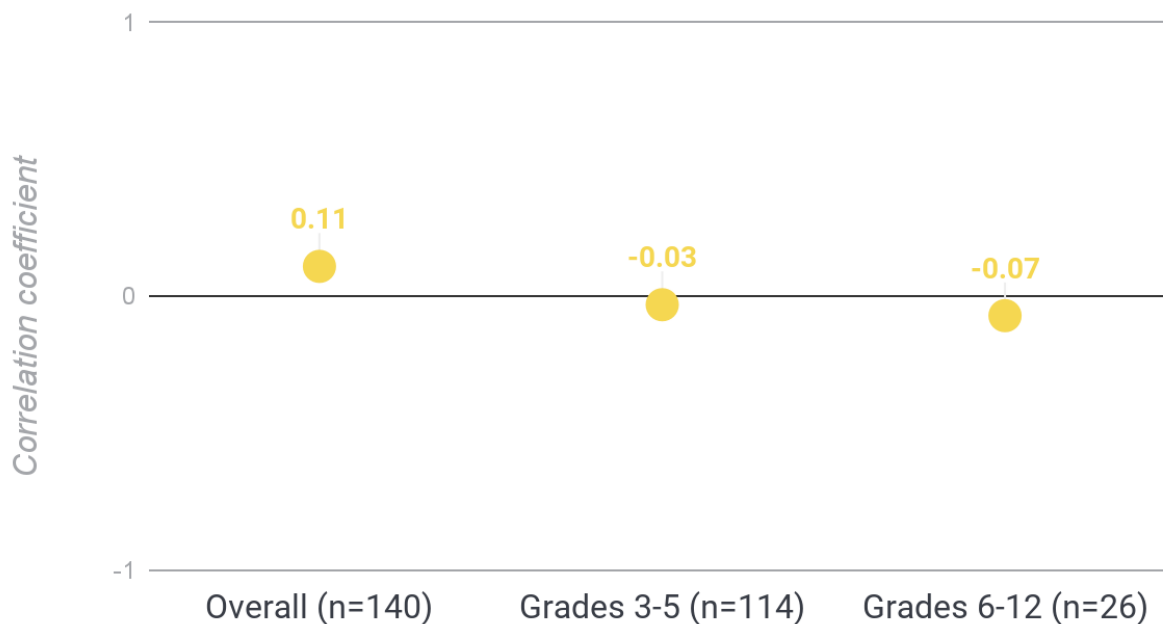


Notes: Statistically significant findings are green (positive correlation) or red (negative correlation) in correlation coefficient graphs. Findings that are not statistically significant are yellow.

Figure 5. More students' answers to Formatives graded by teachers was not statistically significantly related to greater student achievement on the Fastbridge aMath assessment.

Lastly, researchers also conducted a partial correlation examining the relationship between the number of answers graded by teachers and student outcomes, while controlling for grade level and percent of English language learners. There were no statistically significant, positive correlations between the number of students' answers to Formatives graded and Fastbridge aReading assessment scores (correlations range from -.07 to .11; Figure 6).

Reading



Notes: Statistically significant findings are green (positive correlation) or red (negative correlation) in correlation coefficient graphs. Findings that are not statistically significant are yellow.

Figure 6. More students' answers to Formatives graded by teachers was not statistically significantly related to greater student achievement on the Fastbridge aReading assessment.

Conclusions

Since the study yielded a single statistically significant finding, the results satisfied ESSA evidence requirements for Level III (*Promising Evidence*). Specifically, this correlative study met the following criteria for Level III:

- ✓ Correlational study
- ✓ Proper design and implementation
- ✓ Statistical controls through covariates
- ✓ At least one statistically significant, positive finding relating to student outcomes

Usage and Student Outcomes



Greater classroom usage of Formative, as measured by Formatives assigned, was statistically significantly related to:

- ✓ *Greater post-achievement performance in math for secondary grades (grades 6-12)*

It is possible that the statistically significant, positive correlation between the number of Formatives assigned and Fastbridge aMath assessment scores could be related to implementation. More specifically, reading classrooms in the secondary grades had a lower number of Formatives assigned, on average, than math classrooms. It is possible that if reading teachers adjust their implementation, based on increasing the number of Formatives that they assign, that effect size might become significant and positive. Other recommendations and next steps include:

- ❖ Have conversations with reading classrooms in secondary grades (grades 6-12) to better understand why they had significantly lower usage, as measured by average Formatives assigned, when compared to primary classrooms. There might be support that Formative could offer to help increase implementation.
- ❖ Facilitate conversations with secondary grades (grades 6-12) to gain insights into why they had, on average, less graded students' answers to Formatives than primary grades (grades 3-5). In addition, have conversations with all teachers about the large variability in the graded students' answers to Formatives to better understand implementation.
- ❖ Conduct focus groups with teachers and students to understand the quality of feedback associated with graded students' answers to Formatives. For example, do teachers use the information from graded answers to Formatives to identify student needs and adjust instruction? What is the average time between Formative submission and students receiving feedback?
- ❖ In the future, Formative could consider conducting an experimental or quasi-experimental study, with sample randomization or matching, to satisfy ESSA Level I (*Strong Evidence*) or ESSA Level II (*Moderate Evidence*) requirements. For ESSA Level II, Formative could consider using the data already collected from this study by comparing matched classrooms with usage versus those without usage.

Appendix A. Additional Information on the Participating District

The present study included 205 math and 160 reading classrooms from one district in California (see Table A1).

Table A1. Description of participating district

	District A
State	California
Locale	City: Small
Total students (district)	31,911
Families below the poverty level	2%
Students with a disability	3%
English spoken at home	74%
American Indian/Alaskan Native	0%
Asian	32%
Black	2%
Hispanic or Latino	7%
Native Hawaiian/Pacific Islander	0%
White	55%
Two or more races	4%

*Data retrieved from IES, NCES Common Core of Data <https://nces.ed.gov/ccd/>

Appendix B. Additional Information on Usage Findings

Researchers conducted independent two-samples *t*-tests to examine grade-level differences in usage. There were no statistically significant differences in the number of Formatives assigned for math classrooms between primary and secondary grades; however, there was a statistically significant difference for reading classrooms. Furthermore, there were statistically significant differences in the number graded students' answers to Formatives for both subjects between primary and secondary grades. Means and standard deviations by grade levels are presented below (Tables B1).

Table B1. Average usage by grade level

	Math Classrooms (n=205)		Reading Classrooms (n=160)	
	Grades 3-5 Mean (SD)	Grades 6-12 Mean (SD)	Grades 3-5 Mean (SD)	Grades 6-12 Mean (SD)
Formatives assigned	21.1 (2.3)	25.6 (3.0)	20.8 (2.3)	5.2 (0.8)
Answers graded	874.8 (143.2)	341.8 (95.2)	858.6 (144.4)	59.5 (24.1)