Can Using ACT Online Prep Improve Score Gains?

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Introduction

Test preparation plays an important role in high-stakes standardized testing. While test preparation companies may claim large, at times unrealistic, gains associated with product use, much of which can be very costly, scientific research supports a more moderate impact of test preparation (Briggs, 2009; Montgomery & Lilly, 2012; Powers, 1993). These impacts should not, however, be understated as even small improvements in test scores can make a difference for college admissions and scholarship eligibility.

ACT offers a number of test preparation opportunities for students who are planning to take the ACT® test.[1] ACT's test preparation suite of solutions includes the Official ACT Prep Guide, ACT® Academy™, ACT Online Prep (AOP), ACT Rapid Review Live, ACT Rapid Review On Demand, and ACT Rapid Review All Access. Each of these solutions caters to different student learning styles and strategies.

In this study, we focus on student's usage of AOP. AOP provides two learning paths for students. The first is structured, comprehensive coverage of all subjects at all levels regardless of student's starting point. The second is an adaptive learning plan based on input from diagnostic tests to identify areas of weakness to target first. AOP presents official ACT test materials in a format that ensures students can cover all content areas tested. In particular, it affords access to over 200 hours of content including over 2,400 practice items.

The current study sought to examine the score gains students have attained between official ACT test administrations when using AOP between the tests.

Analytical Sample

For the present analysis, a sample was constructed which included ACT-tested students who had:

- enrolled in AOP during high school as a junior or senior,
- taken an ACT test within the six months prior to getting access to AOP, and
- taken a subsequent ACT test after gaining access to AOP that was closest to, but no more than three months after, the end of their access period.

These time bounds allowed for an examination of ACT score gains, with AOP usage occurring between tests. This analysis included all ACT retested AOP students since December 2015 and was limited to

students who had valid data for all student characteristics examined. This resulted in a sample of 46,394 students. The sample had a slightly greater number of female students than male students, most of the students were Caucasian, and most students came from a family with an income greater than $60,000. Descriptive statistics for the sample are provided in Table 1.

Table 1. Sample Characteristics

	%/Mean	N
Gender (%)		
Female	54.5	25,269
Male	45.5	21,125
Race/Ethnicity (%)		
African American	7.5	3,472
American Indian	0.5	217
White	71.4	33,134
Hispanic	8.4	3,876
Asian	4.3	1,986
Native Hawaiian	0.2	71
Two or More Races	4.3	2,003
Prefer Not to Respond	3.5	1,635
Family Income (%)		
<$24,000	4.6	2,113
$24,000-$36,000	5.0	2,305
$36,000-$50,000	6.4	2,954
$50,000-$60,000	6.3	2,908
$60,000-$80,000	11.2	5,180
$80,000-$100,000	14.1	6,549
$100,000-$120,000	14.6	6,780
$120,000-$150,000	12.5	5,818
$150,000-$200,000	25.4	11,787
Expected Educational Level (%)		
Voc-Tech Program	0.4	173
Associate's Degree	0.9	395
Bachelor's Degree	46.6	21,621
1-2 Years of Graduate Program	22.8	10,582
Doctorate or Professional Degree	28.9	13,410
Other	0.5	213
Highest Parental Education (%)		
Less than High School	1.0	446
High School Graduate/GED	5.3	2,454
Business/Technical School or Certificate Program	2.3	1,058
Some College, No Degree or Certificate	7.5	3,470
Associate's Degree	8.2	3,780
Bachelor's Degree	37.0	17,156
1-2 Years of Graduate Program	26.2	12,162
Doctorate or Professional Degree	12.7	5,868
Needs Help in Educational Skills or Occupational planning (%)		
Yes	60.1	27,877
No	39.9	18,517

Table 1. Continued

	% Mean	N
Testing with a Fee Waiver (%)		
Yes	3.9	1,814
No	96.1	44,580
Grade Level (%)		
11	27.1	12,566
12	72.9	33,828
Taken Mathematics Beyond Algebra II (%)		
Yes	64.5	29,936
No	35.5	16,458
Taken Biology, Chemistry, and Physics (%)		
Yes	36.9	17,104
No	63.1	29,290
Mean High School GPA	3.52	46,394
Mean Pre-ACT Composite Score	22.14	46,394
Mean Post-ACT Composite Score	23.39	46,394
Mean ACT Composite Score Gain	1.25	46,394
Mean Months Elapsed Between Pre- and Post-ACT Tests	5.83	46,394
Number of Times Taken the ACT	3.39	46,394

Statistical Analysis

The association between AOP usage and ACT Composite score gain was evaluated using Analysis of Covariance (ANCOVA) methods. This analytical methodology allows us to test the difference in group means associated with AOP usage while controlling for all control and usage variables simultaneously. This allows the exploration of the incremental contribution to ACT score for each of the included usage variables while controlling for student characteristics. While this methodology does not afford one to make causal conclusions, the ability to control for student characteristics provides a more accurate measure of the association between AOP usage and ACT Composite score gain.

The present analysis accounted for 13 student characteristics. These include gender, student's grade level, race/ethnicity, student's expected educational attainment, family income, highest parental education, whether a student tested with a fee waiver, having taken mathematics courses beyond Algebra II, having taken at least biology, chemistry, and physics, high school GPA, prior ACT Composite score, the number of months elapsed between their pre- and post-ACT tests, and the total number of times they had taken the ACT. Each of these 13 covariates were included because they have the potential to either directly or indirectly impact how a student may perform on the ACT.

To gain a better understanding of the gain in ACT Composite score associated with particular features of AOP, this study also looked at the activity of students in the platform (see Table 2). There were five AOP usage statistics that were investigated:

1. The number of days a student was active on AOP. This included any and all activity on the system.

2. The number of content lessons reviewed. These lessons focus on content reinforcement in English, mathematics, reading, and science.

3. The number of practice sessions a student took. These practice sessions provide students with practice items on each section of content covered by the ACT.

4. The number of full-length practice tests taken by a student. This timed practice test replicates the experience of taking the ACT by using retired ACT test forms.

5. The number of system resets performed by the student. Students can reset parts of the AOP system or the entire platform. This affords the students the opportunity to erase current work done on the system, such as practice test responses, and start as if new to the system.

For each of the AOP usage variables considered, the distribution was examined to establish levels of each variable. In some cases, quartile values were used to guide level creation. For other variables, it made more sense to decompose larger intervals that resulted from the quartiles. In these cases, judgments were made based on the distribution, interval size, and an understanding of each variable. The categorization of each AOP usage variable is provided in Table 2.

Table 2. AOP Usage Characteristics

	Statistic	N
Number of Days Using AOP (%)		
0	39.6	18,365
1	10.4	4,843
2-5	25.8	11,989
6-10	13.1	6,069
11-20	7.7	3,553
21+	3.4	1,575
Number of AOP Lessons Reviewed (%)		
0	45.1	20,912
1 - 14	12.6	5,843
15 - 27	14.4	6,695
28 - 54	14.0	6,510
55+	13.9	6,434
Number of AOP Practice Sessions (%)		
0	59.7	-
1	11.8	6,069
2-5	17.8	6,510
6-10	7.0	6,434
11-15	2.5	20,912
16+	1.2	6,695
Number of Full Length Practice Tests (%)		
0	95.6	44,342
1	3.3	1,537
2+	1.1	515
Number of AOP System Resets (%)		
0	85.5	39,662
1-5	12.4	5,761
6-10	1.3	621
11+	0.8	350

Results

Days Active in AOP

As seen in Figure 1, this analysis found that, in general, ACT Composite score gain increased as the number of days active in the AOP system increased. Students who had at least 21 active days had a score gain much larger than that for students who had an account but never used AOP (1.59 versus 1.16).

Figure 1. ACT Score Gain by the Number of Days Active in AOP

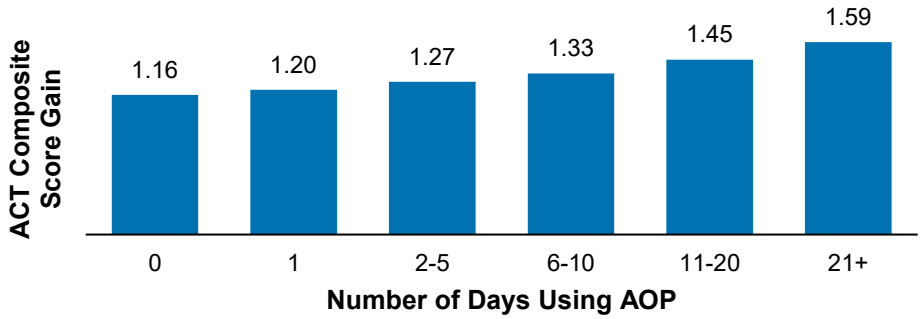


Table 3 displays the test of mean differences between different days of AOP usage. This table shows that most of the pairwise combinations of the six categories of days showed significant differences. Statistically, there was no difference between the average gain score for students who had zero active days in AOP and students who had a single active day in AOP. Additionally, most score gain means associated with more than one active day were statistically greater than that seen for students with zero or one active day in AOP.[2] Moreover, the group means for students who had 2-5, 6-10, 11-20, and 20 or more days were all statistically different from each other. The effect sizes for these difference are small (≤0.08).

Table 3. Pairwise Tests of Mean Differences Between Days Active in AOP

Days	Days	Mean Difference	Standard Error	Pr > |t|	Std Dev	Effect Size
1	0	0.04	0.05	0.36	5.80	0.01
1	2-5	-0.07	0.04	0.06	5.80	0.01
1	6-10	-0.13	0.05	0.00	5.80	0.02
1	11-20	-0.25	0.06	<.0001	5.80	0.04
1	21+	-0.40	0.08	<.0001	5.80	0.07
2-5	0	0.11	0.05	0.02	5.80	0.02
2-5	6-10	-0.07	0.03	0.05	5.80	0.01
2-5	21+	-0.33	0.07	<.0001	5.80	0.06
6-10	0	0.18	0.06	0.00	5.80	0.03
11-20	0	0.29	0.07	<.0001	5.80	0.05
11-20	2-5	0.18	0.05	0.00	5.80	0.03
11-20	6-10	0.12	0.04	0.01	5.80	0.02
11-20	21+	-0.15	0.06	0.02	5.80	0.03
21+	0	0.44	0.09	<.0001	5.80	0.08
21+	6-10	0.26	0.07	<.0001	5.80	0.05

Note: Effect size was calculated as the difference between means for greater number of active days and lesser number of active days, divided by the 2018 population ACT Composite score standard deviation. Differences in this table may not match differences conveyed in the histogram due to rounding.

Number of Lessons Reviewed

Average ACT Composite score gain appears to have a fairly flat relationship with the number of lessons reviewed (see Figure 2). In this analysis, students who reviewed 1-14 or 15-27 lessons had a slightly lower average score gain than students who reviewed no lessons or more than 27 lessons. Students who reviewed at least 55 lessons had a mean score gain range of 1.33 points.

Figure 2. ACT Score Gain by the Number of Lessons Reviewed

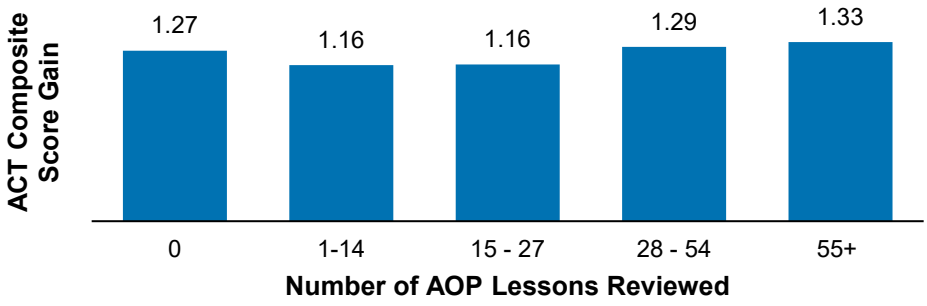


Table 4 shows the tests of significance for the different levels of number of lessons taken. We can see that students who took between 1 and 27 lessons had a lower gain score than students who reviewed no lessons or more that 27 lessons. The associated effect sizes were at most 0.03.

Table 4. Pairwise Tests of Mean Differences Between Numbers of Lessons Taken in AOP

Number of Lessons	Number of Lessons	Mean Difference	Standard Error	Pr > |t|	Std Dev	Effect Size
<=14	0	-0.11	0.05	0.02	5.80	-0.02
<=14	15 - 27	-0.01	0.03	0.86	5.80	0.00
<=14	28 - 54	-0.14	0.04	0.00	5.80	0.02
<=14	55+	-0.17	0.04	<.0001	5.80	0.03
15 - 27	0	-0.10	0.05	0.03	5.80	0.02
15 - 27	28 - 54	-0.13	0.04	0.00	5.80	0.02
15 - 27	55+	-0.17	0.04	<.0001	5.80	0.03
28 - 54	0	0.03	0.05	0.55	5.80	0.00
28 - 54	55+	-0.04	0.04	0.35	5.80	0.01
55+	0	0.06	0.05	0.21	5.80	0.01

Note: Effect size was calculated as the difference between means for greater number of lessons taken and lesser number of lessons taken, divided by the 2018 population ACT Composite score standard deviation. Differences in this table may not match differences conveyed in the histogram due to rounding.

Number of Practice Sessions

ACT Composite score gains appear larger as students take more practice sessions (see Figure 3). For example, students who took 0, 6 to 10, and at least 16 practice session had an average ACT Composite score gain of 1.22, 1.39 and 1.60. There appears to be a sharp increase in the gain score associated with completing more than one practice session. The average score gain estimate amongst the students most active in practice sessions, at least 16 sessions, was 1.60.

Figure 3. ACT Score Gain by the Number of Practice Sessions Taken

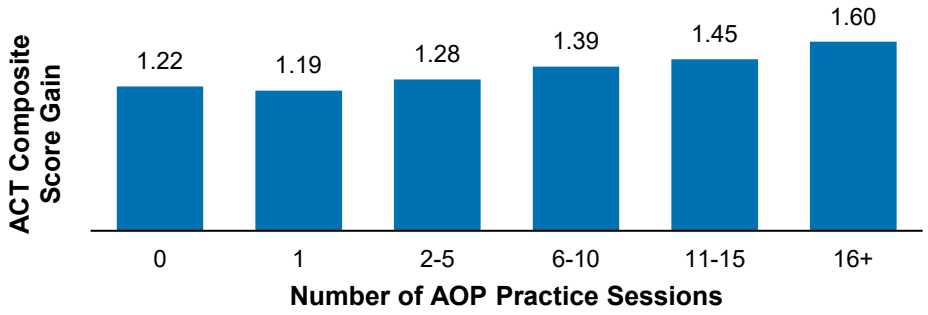


Table 5 shows that, generally speaking, the difference in gain scores observed as the number of lessons increases are statistically significant. These differences are less pronounced for students taking over six practice sessions. All effect sizes are at most 0.07.

Table 5. Pairwise Tests of Mean Differences Between Numbers of Practice Sessions Taken in AOP

Practice Sessions	Practice Sessions	Mean Difference	Standard Error	Pr > |t|	Std Dev	Effect Size
1	0	-0.04	0.03	0.31	5.80	-0.01
1	2-5	-0.09	0.04	0.01	5.80	0.02
1	6-10	-0.20	0.05	<.0001	5.80	0.04
1	11-15	-0.27	0.07	0.00	5.80	0.05
1	16+	-0.41	0.10	<.0001	5.80	0.07
2-5	0	0.06	0.03	0.08	5.80	0.01
2-5	6-10	-0.11	0.04	0.01	5.80	0.02
6-10	0	0.17	0.05	0.00	5.80	0.03
11-15	0	0.23	0.07	0.00	5.80	0.04
11-15	2-5	0.17	0.07	0.01	5.80	0.03
11-15	6-10	0.06	0.07	0.36	5.80	0.01
11-15	16+	-0.15	0.10	0.15	5.80	0.03
16+	0	0.38	0.10	0.00	5.80	0.07
16+	2-5	0.32	0.10	0.00	5.80	0.06
16+	6-10	0.21	0.10	0.03	5.80	0.04

Note: Effect size was calculated as the difference between means for greater number of practice sessions and lesser number of practice sessions, divided by the 2018 population ACT Composite score standard deviation. Differences in this table may not match differences conveyed in the histogram due to rounding.

Number of Practice Tests

AOP offers students the ability to practice taking the exam with two full length, retired ACT practice tests. Students have an unlimited number of times to practice using these tests. The score gain associated with taking practice tests increases as more practice tests are taken. In fact, for students who take at least two full-length practice tests, the associated mean gain is 1.69 points.

Figure 4. ACT Score Gain by the Number of Full-Length Practice Tests Taken

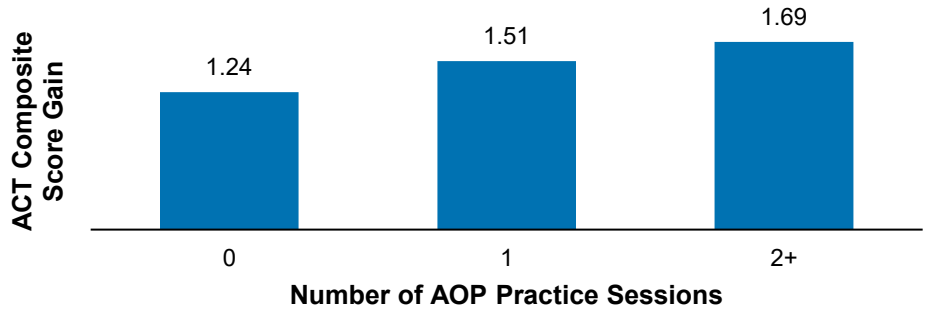


Table 6 shows that taking at least one full length practice test was associated with a significantly greater ACT score gain than taking none, while the difference between taking one and two or more practice tests was not significant. The estimated effect size for taking at least two practice tests is 0.08.

Table 6. Pairwise Tests of Mean Differences Between Numbers of Full-Length Practice Tests Taken

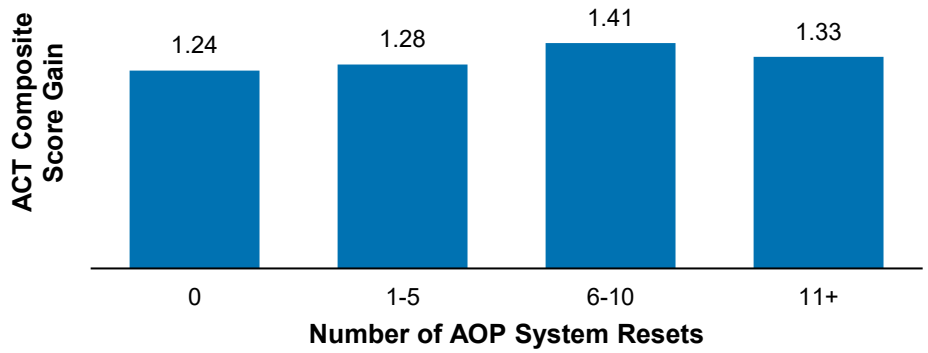
Number of Long Form Tests	Number of Long Form Tests	Mean Difference	Standard Error	Pr > |t|	Std Dev	Effect Size
1	0	0.28	0.05	<.0001	5.80	0.05
1	2+	-0.17	0.10	0.08	5.80	0.03
2+	0	0.45	0.09	<.0001	5.80	0.08

Note: Effect size was calculated as the difference between means for greater number of practice tests and lesser number of practice tests, divided by the 2018 population ACT Composite score standard deviation. Differences in this table may not match differences conveyed in histogram due to rounding.

Number of System Resets

When a student resets the entire AOP system, their prior work on the platform is erased, and they can retake all components of the system. Resetting the system allows students to revisit practice sessions and practice tests without prior scores or responses influencing their progress. There appears to be a positive association with resetting the system between 6 and 10 times and students' ACT gain scores. Students with 6 to 10 resets had the highest average gain score of 1.41 points.

Figure 5. ACT Score Gain by the Number of AOP System Resets



The pairwise tests of mean differences show that the gain score for students with 6-10 resets was higher than students who never reset AOP and similar to the gain score for students who reset AOP at least once or more than 10 times. Relevant effect sizes were at most 0.03.

Table 7. Pairwise Tests of Mean Differences Between Numbers of AOP Resets

Number of Resets	Number of Resets	Mean Difference	Standard Error	Pr > |t|	Std Dev	Effect Size
1-5	0	0.04	0.03	0.21	5.80	0.01
1-5	6-10	-0.13	0.08	0.10	5.80	0.02
1-5	11+	-0.05	0.11	0.66	5.80	0.01
6-10	0	0.17	0.08	0.03	5.80	0.03
11+	0	0.09	0.11	0.43	5.80	0.01
11+	6-10	-0.09	0.13	0.50	5.80	-0.02

Note: Effect size was calculated as the difference between means for greater number of resets and lesser number of resets, divided by the 2018 population ACT Composite score standard deviation. Differences in this table may not match differences conveyed in histogram due to rounding.

Conclusion

This study highlighted the positive association between using ACT Online Prep and ACT score gains over time. In particular, this study demonstrates the positive association with greater numbers of active days in AOP, the number of practice sessions done, the number of full-length practice tests completed, and the number of system resets. The association of each AOP usage variable with ACT score gain was estimated using a multiple linear regression model that controlled for several student characteristics as well as all other AOP usage variables. The results provide an estimate of the difference in ACT score gain between not using AOP and using it “optimally.” For example, we can estimate that if a students used AOP for over 21 days, reviewed over 55 lessons, took at least 16 practice sessions and at least two practice tests, and reset the system between 6-10 times they would have an average gain score that would be 1.51 points higher than if they did not use the AOP system.

Students who purchased AOP, yet did not use the product, also saw gains in their ACT retest score, as would be expected with the additional instruction that occurs between tests. The average gain for students

who did not use AOP was 1.13, while the average gain for students who use AOP optimally is 2.64 (i.e., 1.13 + 1.51).

There are certain limitations to this study that should be borne in mind. The most important is that this analytical method only allows us to speak of the association between gain scores and using features of AOP. Based on this study, however, causal claims cannot be made. Rather, this study helps us to understand the experience students are having with their AOP usage.

A second limitation is that information on additional test preparation activities students may have been involved with were not available. It is possible that AOP was the sole or primary activity performed between the two test dates, but it is also possible that it served as a complimentary activity to other test preparation activities. If students who did not use AOP were more likely to engage in other types of test preparation not captured by this study, the study likely underestimates the impact of AOP usage. An attempt to capture some of this variability in other test prep activities was made by including the number of months elapsed between the two tests in our model. It was thought that as the number of months between the two tests increased, the opportunity for other activities, including school learning, increased.

Another point to consider was that by using an ANCOVA approach that included all types of usage simultaneously, we see the incremental effects of each, but these estimates are likely smaller than if a model was estimated with only one type at a time. Notwithstanding these limitations, this study demonstrates the positive association between AOP usage and ACT Composite score gains over time.

Notes

1. In 2017, over two million high school seniors took the ACT.
2. The mean difference between students with 2-5 days of activity was significantly different than that of students with zero days of activity but was not significantly different than students with one day of activity.

References

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