Illustrating Comparability of ACT Scale Scores from Paper and Online Testing

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Background

Institutions participating in ACT State and District testing have the option to administer the ACT® test on paper or online. Increasingly, online testing is preferred because it offers benefits such as longer testing windows, faster score reporting, embedded universal supports for accessibility, and test delivery without the need to ship testing materials. Yet, some stakeholders are hesitant about online testing due to concerns about the comparability of paper and online ACT administrations. Indeed, there are differences between testing on paper and testing online, and ACT research indicates that students testing online tend to answer more items correctly than students testing on paper, particularly on the English and reading tests (Li, Yi, & Harris, 2017; Steedle, Cho, Wang, Arthur, & Li, 2022). Despite such differences, 1–36 scale scores from paper and online testing are comparable because ACT tests administered online are linked to the same score scale as ACT tests administered on paper—using the same equating methods that account for slight differences in difficulty between ACT tests administered on paper (ACT, 2022). The goal of this Data Byte is to illustrate the comparability of ACT scale scores by showing that students with similar levels of high school academic achievement have the same expected scale scores regardless of whether they test on paper or online.

Data

The ACT score data for this analysis came from three mode comparability studies conducted in 2019 and 2020 (Steedle et al., 2022). Across studies, approximately 16,500 students were randomly assigned to take the ACT on paper or online. High school grade data came from MyACT, where students reported their overall high school grade point averages (HSGPAs) and grades for their courses taken. Analyses focused on two measures of high school academic achievement:

- Overall HSGPA on a 0.0–4.0 scale based on self-reported grades in core subject areas (English, math, science, and social studies)
- A rigor index that reflected students' self-reported high school grades and course selections, including honors and Advanced Placement courses (Allen & Mattern, 2019)

Not all students reported their grades and course selections, but the reporting rate was nearly the same for students who tested on paper and online (approximately 86%).

Results

Even though students who tested online correctly answered an average of one to two more items on the English and reading tests, the 1–36 scale score distributions for the two groups were practically identical (Table 1). The greatest mean ACT scale score difference was only 0.1 points (or 0.01 standard deviations), and none of the mean differences were statistically significant. This illustrates the overall effect of linking ACT tests administered online to the score scales for ACT tests administered on paper.

Figure 1 illustrates the expected positive relationship between HSGPA and ACT Composite score. Also, for each HSGPA range, the average ACT Composite scores were nearly the same regardless of whether students tested on paper or online. Likewise, Figure 2 shows how students with higher rigor indices had higher mean ACT Composite scores. Moreover, mean ACT scores differed little between paper and online testing in each rigor index range. An analysis of variance revealed no statistically significant differences between mean ACT scores in any HSGPA range or in any rigor index range. The same patterns in results (including non-significant mean differences) were also observed on the individual test sections (English, mathematics, reading, and science; see Appendix Tables A1 and A2).

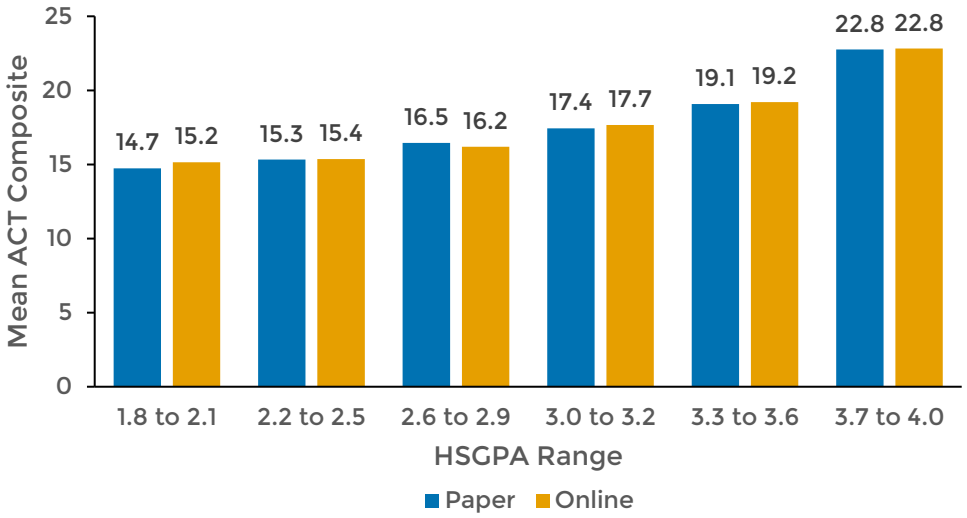
In summary, students with the same high school grades earned approximately the same average ACT scores regardless of testing mode. These results illustrate how the ACT—whether taken on paper or online—provides a consistent indicator of high school academic achievement. Thus, there are no expected benefits or disadvantages in terms of 1–36 scale scores when taking the ACT online.

Table 1. Mean 1–36 Scale Scores for ACT Tests Administered on Paper and Online

	Paper (n = 8,245)		Online (n = 8,328)				
Score	Mean	SD	Mean	SD	t	p	d
English	19.2	6.0	19.3	6.0	0.385	.700	0.006
Mathematics	19.7	4.9	19.8	4.9	0.777	.437	0.012
Reading	20.8	6.5	20.8	6.4	0.003	.997	0.000
Science	20.3	5.1	20.3	5.1	0.383	.702	0.006
Composite	20.1	5.1	20.2	5.1	0.463	.643	0.007

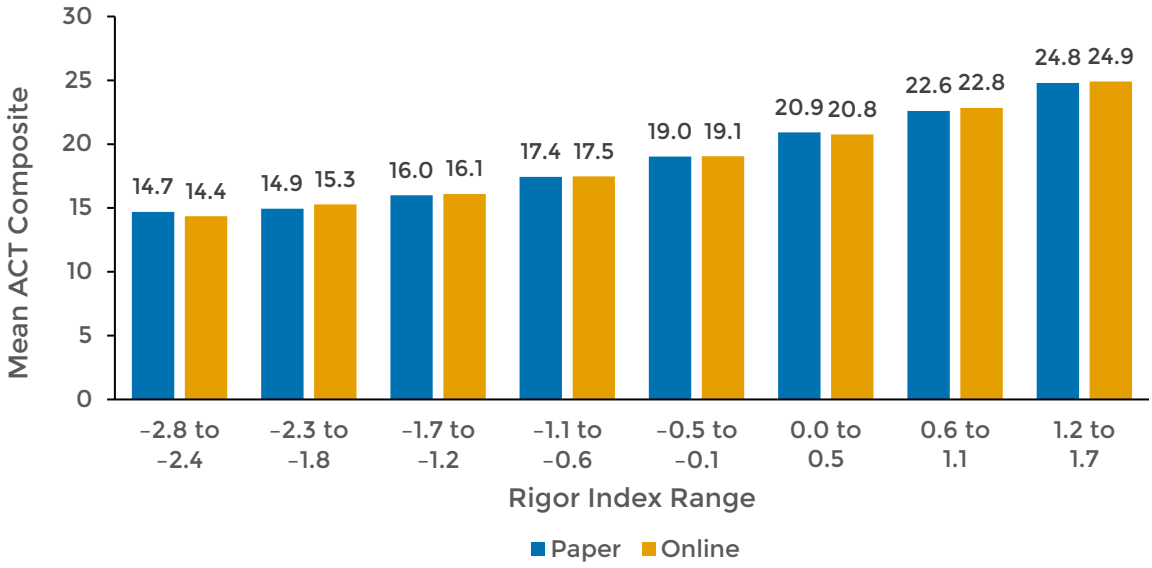
Note. t is the t-test statistic, p is the associated p-value, and d is the mean difference in standard deviation units (effect size).

Figure 1. Mean ACT Composite Scores by HSGPA Range



Note. The HSGPA ranges were selected to have equal widths based on the observed distribution, though it may not always appear so due to rounding. This analysis included 7,045 (paper) and 7,129 (online) students whose HSGPAs could be calculated from reported grades. Results are not shown for very low HSGPA ranges due to small sample sizes.

Figure 2. Mean ACT Composite Scores by Rigor Index Range



Note. The rigor index is reported on a scale with a mean of approximately 0 and a standard deviation of 1. The rigor index ranges were selected to have equal widths based on the observed distribution, though it may not always appear so due to rounding. This analysis included 7,045 (paper) and 7,129 (online) students who

reported data sufficient to calculate the rigor index. Results are not shown for very low rigor index ranges due to small sample sizes.

References

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Appendix

Table A1. Mean ACT Scores by HSGPA Range

HSGPA Range	*n*		English Mean		Mathematics Mean		Reading Mean		Science Mean		Composite Mean	
	Paper	Online	Paper	Online	Paper	Online	Paper	Online	Paper	Online	Paper	Online
0.0 to 0.5	2	0	11.5	–	13.5	–	12.5	–	14.5	–	13.0	–
0.6 to 0.9	2	1	18.0	12.0	15.0	14.0	17.0	12.0	15.5	13.0	16.5	13.0
1.0 to 1.3	13	6	12.2	12.3	14.4	15.2	13.9	13.5	14.5	14.0	13.8	13.8
1.4 to 1.7	23	32	12.5	11.8	14.3	14.7	14.0	14.0	14.3	13.5	14.0	13.6
1.8 to 2.1	92	118	13.3	13.7	15.3	15.8	15.1	15.2	14.8	15.4	14.7	15.2
2.2 to 2.5	210	208	14.0	13.8	15.6	15.8	15.5	15.5	15.7	15.9	15.3	15.4
2.6 to 2.9	479	490	15.4	14.9	16.4	16.3	16.8	16.5	16.7	16.6	16.5	16.2
3.0 to 3.2	994	1,052	16.3	16.4	17.2	17.5	17.8	18.2	17.9	18.0	17.4	17.7
3.3 to 3.6	1,410	1,467	18.0	18.2	18.7	18.9	19.7	19.7	19.4	19.5	19.1	19.2
3.7 to 4.0	3,820	3,755	22.1	22.2	22.1	22.2	23.7	23.7	22.6	22.7	22.8	22.8

Table A2. Mean ACT Scores by Rigor Index Range

Rigor Range	*n*		English Mean		Mathematics Mean		Reading Mean		Science Mean		Composite Mean	
	Paper	Online	Paper	Online	Paper	Online	Paper	Online	Paper	Online	Paper	Online
–4.1 to –3.5	6	2	13.0	12.0	14.2	14.5	12.8	11.0	14.5	12.5	13.8	12.5
–3.4 to –2.9	14	13	12.6	12.6	14.4	15.4	14.7	14.2	15.4	13.9	14.3	14.2
–2.8 to –2.4	87	112	13.2	12.8	15.1	15.2	14.9	14.4	14.9	14.6	14.7	14.4
–2.3 to –1.8	200	195	13.7	13.7	15.3	15.7	15.1	15.4	15.3	15.8	14.9	15.3
–1.7 to –1.2	513	551	14.9	14.8	16.1	16.3	16.2	16.4	16.3	16.5	16.0	16.1
–1.1 to –0.6	1,004	1,026	16.3	16.2	17.2	17.3	17.9	18.0	17.9	17.9	17.4	17.5
–0.5 to –0.1	1,281	1,330	17.9	18.1	18.6	18.7	19.7	19.6	19.4	19.3	19.0	19.1
0.0 to 0.5	1,369	1,297	20.1	19.9	20.2	20.1	21.9	21.5	21.0	21.0	20.9	20.8
0.6 to 1.1	1,307	1,352	22.0	22.2	22.0	22.2	23.5	23.6	22.5	22.7	22.6	22.8
1.2 to 1.7	1,264	1,251	24.3	24.4	24.3	24.3	25.6	25.8	24.4	24.6	24.8	24.9