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ABE Student Assessment Study

Advance Executive Summary

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Advance Executive Summary

A sample of high school ABE teachers in the U.S. during the 2016-2017 school year demonstrates that students exposed to ABE have significant and substantial (1) learning in biotechnology and (2) increased interest and confidence in doing science and biotechnology. These statistically significant increases in student learning and view of science are particularly remarkable since ABE is only a one- to three-week experience. The full study report to accompany this summary will be released Fall 2017.

Findings from student test items

Overall, students exposed to ABE lessons showed a statistically significant increase ($p < 0.001$) and with large effect size ($d = 1.03$) on the assessment. Students averaged an increase of 20% between the pre- and post-tests. Students averaged 36% correct items on the pre-test and 56% correct on the post-test. Figure 1 shows the distribution of pre- and post-test scores for all students and table 1 summarizes the data overall and by item topic.

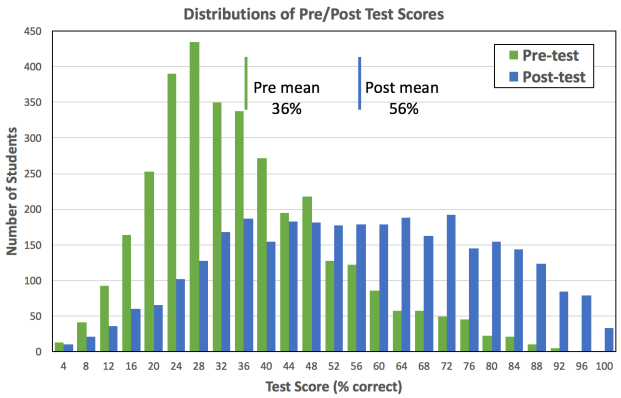

Figure 1. Distribution of student scores for items 1-25.

Students showed the largest gains and largest effect size for questions related to their ability to interpret experimental results (25% increase and 1.02 effect size) and knowledge of biotechnology skills (21% increase and 0.86 effect size). Students showed more moderate gains and medium effect size for questions related to their understanding of experimental processes in biotechnology (17% increase and 0.72 effect size) and general biotechnology knowledge (17% increase and 0.63 effect size).

Table 1. Student pre- and post-test results for test items 1-25, overall and by sub-topics.

Items	N	Pre-Test		Post-Test		Difference	Effect
		Mean	Std Err	Mean	Std Err	(post - pre)	Size
All	3007	36%	3%	56%	4%	20%	1.03
General	3001	41%	5%	57%	5%	17%	0.63
Process	3006	36%	4%	54%	5%	17%	0.72
Results	2962	29%	4%	54%	5%	25%	1.02
Skills	2932	42%	4%	63%	5%	21%	0.86

Girls and boys show almost identical scores and gains on the pre- and post-tests (36% pre and 56% post for both genders); any differences were not significant.

Findings from student survey questions

Students were asked a series of seven questions about what they got out of doing ABE (see Table 2). Results indicate that ABE was most impactful on students by giving them new ideas about what happens in science laboratories (82% agreed), followed closely by giving them new ideas about what science is (72% agreed). Slightly over half agreed that ABE made them more interested in learning about science research and made them want to know more about what science careers there are (53% for each). Slightly less than half (45%) agreed that they are better at doing science than they thought they were from doing ABE, while 43% were neutral in response to this question.

Table 2. Student responses to what they got out of doing ABE (n=2485 to 3150).

From doing ABE…	Mean response
I got some new ideas about what happens in science laboratories.	4.08
I got some new ideas about what science is.	3.81
I am more interested in learning about science research.	3.52
I want to know more about what science careers there are.	3.49
I am better at doing science than I thought I was.	3.41
I am thinking harder about taking more science courses in high school. *	3.34
I am thinking about taking different high school science courses than I had planned. *	2.90

Note: students responded on a five-point scale: strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5). *Seniors, 12th grade students, were omitted from the analysis of these two items.

Students were also asked eight questions about how ABE changed their interest in education, science, and jobs after high school (see Table 3). All questions showed a significant increase in students' agreement from before to after but of varying magnitudes.

Table 3. Retrospective survey responses to how ABE may have changed student interest.

	Before	After	Difference
I am interested in taking more biotechnology after high school.	3.74	4.11	0.37
I would be comfortable with a job/career that requires using science.	4.61	4.88	0.27
I am interested in becoming a laboratory technician.	2.99	3.21	0.22
I am interested in taking more science after high school.	4.62	4.83	0.21
I am interested in becoming a scientist.	3.73	3.91	0.18
I am interested in majoring in science at college.	4.41	4.55	0.14
I am interested in going to a community college.	3.07	3.09	0.02
I am interested in going to a four-year college or university.	6.07	6.08	0.01

Note: students responded on a seven-point scale: strongly disagree (1), disagree (2), slightly disagree (3), neutral (4), slightly agree (5), agree (6), strongly agree (7).

Students showed an increased interest in learning about biotechnology and science. Before doing ABE 28% of students agreed they were interested in taking more biotechnology after high school compared to 43% of students after doing ABE. Similarly, results show an eight percent gain in students' interest in taking more science after high school (52% before and 60% after) and a six percent gain in interest in majoring in science at college (46% before and 52% after).

Results indicate students' interest in science careers increased after doing ABE. Just over half (53%) said they would be comfortable with a job or career that requires using science before ABE, compared to 61% of students after. Likewise, 31% of students said they were interested in becoming a scientist before doing ABE, compared to 38% who said they were interested after.

About the study

Sixty (60) high school teachers from across U.S. ABE sites and their classrooms (n=3507 students) participated in the study during the 2016-17 academic year. The study created assessment shows high reliability (Coefficient Alpha = 0.9084) and good discrimination (mean discrimination = 0.5068) for all but one item.