

## WWC Review of the Report “Interactive Learning Online at Public Universities: Evidence from a Six-Campus Randomized Trial”<sup>1</sup>

The findings from this review do not reflect the full body of research evidence on interactive learning online.

### What is this study about?

The study investigated the effect of interactive learning online (ILO), a form of online course instruction in which computer-guided instruction substitutes for some, though not all, traditional face-to-face instruction. ILO-based courses are characterized by the use of student data to provide customized instruction to each student. Course instructors are also able to track students’ progress in detail in order to provide each student with individualized guidance relative to the goals of the course. The study was conducted at six public university campuses—two each from the State University of New York (SUNY); the City University of New York (CUNY) system; and the University of Maryland system.

The study used data from 605 students enrolled in an introductory statistics courses at these institutions. Fifty-two percent of the students were first-generation college students, 50% came from families earning less than \$50,000 a year, and 31% were racial/ethnic minorities. Of the 605 students in the study, 313 were randomly assigned to hybrid ILO course sections, in which computer-based instruction was supplemented by weekly 1-hour face-to-face sessions where students could ask questions or be given targeted assistance by the instructor. The other 292 students were randomly assigned to sections taught via traditional face-to-face instruction.

Based on data provided by the participating universities, the study authors examined the impact of ILO on the course pass rate (i.e., course completion with a passing grade).<sup>2</sup>

### What did the study find?

Pass rates in both the intervention and comparison course sections were similar (80% vs. 76%, respectively). The study authors reported, and the WWC confirmed, that there was no statistically significant difference between these rates.

#### WWC Rating

### *The research described in this report meets WWC group design standards without reservations*

This study is a well-executed randomized controlled trial.

Although random assignment was utilized to form intervention and comparison groups at each of the six study sites, the specific recruitment protocol and incentive structure varied across sites.

#### Features of Interactive Learning Online

Interactive learning online uses computer-based instruction to allow students to learn course material independently. The main features are:

- Interactive lessons, allowing students to track their own learning,
- Embedded assessments in each instructional activity, and
- Progress monitoring and targeted supplementary support by course instructor.

### Appendix A: Study details

Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2013). Interactive learning online at public universities: Evidence from a six-campus randomized trial. *Journal of Policy Analysis and Management*, 33(1), 94–111.

<b>Setting</b>	The study took place at six public universities in New York and Maryland.
<b>Study sample</b>	The sample included 605 students. Most of the students were first-generation college students (52%), 50% were from families earning less than \$50,000 a year, and a majority were female (58%). Approximately one-third (31%) were racial/ethnic minorities. Full-time students comprised 90% of the sample.
<b>Intervention group</b>	The intervention group in the study was comprised of students who were randomly assigned to sections of an introductory statistics course taught using interactive learning online (ILO). These sections were delivered in a “hybrid” mode, in which most of the instruction was delivered through interactive online materials, but the online instruction was supplemented by a weekly 1-hour face-to-face session, so that students could ask questions or be given targeted assistance by the instructor.
<b>Comparison group</b>	The comparison group in the study was comprised of students who were randomly assigned to sections of the same introductory statistics course as the intervention group, but taught only using traditional face-to-face instruction.
<b>Outcomes and measurement</b>	The study reported findings for one eligible outcome—course pass rate. The outcome measure was based on student academic records obtained from the six universities participating in the study.
<b>Support for implementation</b>	The authors did not provide information on training received by ILO instructors or other support the institutions received for implementation.
<b>Reason for review</b>	This study was reviewed by the WWC in response to a request by the Institute of Education Sciences.

### Appendix B: Outcome measure for the academic achievement domain

#### Academic achievement

##### *Course pass rate*

This outcome is measured via a binary indicator of whether or not the student completed the course and received a passing grade. It is based on academic record data obtained from the institutions participating in the study.

**Study note:** This study also assessed the impact of interactive learning online on three other outcomes—course completion, scores on a standardized test of statistics knowledge, and course final exam scores. None of these three outcomes were eligible for review under the Postsecondary Education review protocol, and therefore, are not included in this single study review.

Appendix C: Study findings for the academic achievement domain

Domain and outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Academic achievement</b>								
<i>Course pass rate</i>	Full sample	605 students	80%	76%	4%	0.10	+4	> 0.05
<b>Domain average for academic achievement</b>						<b>0.10</b>	<b>+4</b>	<b>Not statistically significant</b>

**Table Notes:** For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of the study’s domain average was determined by the WWC; for example, the study is characterized as having a statistically significant positive effect because univariate statistical tests are reported for each outcome measure, the effect for at least one measure within the domain is positive and statistically significant, and no effects are negative and statistically significant, accounting for multiple comparisons.

**Study Notes:** No corrections for clustering or multiple comparisons and no difference-in-differences adjustment were needed. The p-value presented here was reported in the original study. Adjusted regression and standard error estimates were obtained from the study authors. These statistics form the basis of the effect size calculations.

Appendix D: Supplemental findings for the academic achievement domain

Domain and outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Academic achievement</b>								
<i>Course pass rate</i>	Males	256 students	79%	75%	4%	0.09	+4	> 0.05
<i>Course pass rate</i>	Females	349 students	84%	78%	6%	0.18	+7	> 0.05
<i>Course pass rate</i>	First-generation college students	315 students	77%	75%	2%	0.05	+2	> 0.05
<i>Course pass rate</i>	Not first-generation college students	290 students	85%	78%	7%	0.20	+8	> 0.05

**Table Notes:** The supplemental findings presented in this table are additional findings that do not factor into the determination of the evidence rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention.

**Study Notes:** No corrections for clustering or multiple comparisons and no difference-in-differences adjustment were needed. The p-values presented here were reported in the original study. Using data obtained from the study authors, tests for subgroup interactions revealed no statistically significant differences in effects across subgroups.

### Endnotes

<sup>1</sup> Single study reviews examine evidence published in a study (supplemented, if necessary, by information obtained directly from the authors) to assess whether the study design meets WWC evidence standards. The review reports the WWC's assessment of whether the study meets WWC evidence standards and summarizes the study findings following WWC conventions for reporting evidence on effectiveness. This study was reviewed using the Postsecondary Education topic area review protocol, version 2.0. The WWC rating applies only to the results that were eligible under this topic area and met WWC standards, and not necessarily to all results presented in the study.

<sup>2</sup> There were three outcomes included in the study that are not described in this WWC report—course completion, scores on a standardized test of statistics, and course final exam scores. See the study note in Appendix B for more information.

### Recommended Citation

U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse. (2014, June). *WWC review of the report: Interactive learning online at public universities: Evidence from a six-campus randomized trial*. Retrieved from <http://whatworks.ed.gov>

### Glossary of Terms

<b>Attrition</b>	Attrition occurs when an outcome variable is not available for all participants initially assigned to the intervention and comparison groups. The WWC considers the total attrition rate and the difference in attrition rates across groups within a study.
<b>Clustering adjustment</b>	If intervention assignment is made at a cluster level and the analysis is conducted at the student level, the WWC will adjust the statistical significance to account for this mismatch, if necessary.
<b>Confounding factor</b>	A confounding factor is a component of a study that is completely aligned with one of the study conditions, making it impossible to separate how much of the observed effect was due to the intervention and how much was due to the factor.
<b>Design</b>	The design of a study is the method by which intervention and comparison groups were assigned.
<b>Domain</b>	A domain is a group of closely related outcomes.
<b>Effect size</b>	The effect size is a measure of the magnitude of an effect. The WWC uses a standardized measure to facilitate comparisons across studies and outcomes.
<b>Eligibility</b>	A study is eligible for review if it falls within the scope of the review protocol and uses either an experimental or matched comparison group design.
<b>Equivalence</b>	A demonstration that the analysis sample groups are similar on observed characteristics defined in the review area protocol.
<b>Improvement index</b>	Along a percentile distribution of students, the improvement index represents the gain or loss of the average student due to the intervention. As the average student starts at the 50th percentile, the measure ranges from -50 to +50.
<b>Multiple comparison adjustment</b>	When a study includes multiple outcomes or comparison groups, the WWC will adjust the statistical significance to account for the multiple comparisons, if necessary.
<b>Quasi-experimental design (QED)</b>	A quasi-experimental design (QED) is a research design in which subjects are assigned to intervention and comparison groups through a process that is not random.
<b>Randomized controlled trial (RCT)</b>	A randomized controlled trial (RCT) is an experiment in which investigators randomly assign eligible participants into intervention and comparison groups.
<b>Single-case design (SCD)</b>	A research approach in which an outcome variable is measured repeatedly within and across different conditions that are defined by the presence or absence of an intervention.
<b>Standard deviation</b>	The standard deviation of a measure shows how much variation exists across observations in the sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean; a high standard deviation indicates that the observations in the sample are spread out over a large range of values.
<b>Statistical significance</b>	Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups. The WWC labels a finding statistically significant if the likelihood that the difference is due to chance is less than 5% ( $p < 0.05$ ).
<b>Substantively important</b>	A substantively important finding is one that has an effect size of 0.25 or greater, regardless of statistical significance.

Please see the [WWC Procedures and Standards Handbook \(version 3.0\)](#) for additional details.