INTERVENTION REPORT
Supporting Postsecondary Success
INSTITUTE OF EDUCATION SCIENCES

Open Learning Initiative (OLI)

Online instruction, including online instruction that is blended with traditional in-person instruction, offers students more flexibility in the timing of their coursework and may deepen students' understanding of the material. By leveraging online courseware, colleges have the potential to expand college access, reduce costs, recruit a more diverse student population, and accelerate instruction under some conditions.[1]

Carnegie Mellon University's (CMU's) *Open Learning Initiative (OLI)* provides online courses and learning materials to instructors and learners at low or no cost that can be presented in blended or purely online formats. *OLI* courses feature learning activities with immediate feedback for students and a dashboard for instructors to monitor student progress.

This What Works Clearinghouse (WWC) report, part of the WWC's Supporting Postsecondary Success topic area, explores the effects of *OLI* on course completion rates and academic achievement. The WWC identified 12 studies of *OLI*, three of which meet WWC standards.[2] The evidence presented in this report includes studies of the impacts of *OLI* on community college students, including students who were White, Black, Hispanic, and Asian or Pacific Islander.

What Happens When Students Participate in *OLI*?[3]

The evidence indicates that implementing *OLI*:

- **may increase credit accumulation and persistence**
- **has inconsistent effects on academic achievement**

Findings on *OLI* from three studies that meet WWC standards are shown in Table 1. For each student outcome reviewed by the WWC, an effectiveness rating, the improvement index, and the number of studies and students that contributed to the findings are presented. The improvement index is a measure of the intervention's effect on an outcome. It can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention. Findings on credit accumulation are based on one study with 605 students. Findings on academic achievement are based on three studies with 795 students. See Box 1 for a description of WWC effectiveness ratings.

Table 1. Summary of findings on *OLI* from studies that meet WWC standards

	Study findings		Evidence meeting WWC standards (version 3.0)	
Outcome	Effectiveness rating	Improvement index *(percentile points)*	Number of studies	Number of students
Credit accumulation and persistence	Potentially positive effects	+7	1	605
Academic achievement	Mixed effects	+8	3	795

Table Note: The improvement index is a measure of the effect of the intervention. The improvement index can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention. For example, an improvement index of +7 means that the expected percentile rank of the average comparison group student would increase by 7 points if they received *OLI*. The improvement index values are generated by averaging findings from the outcome analyses that meet WWC standards, as reported by Bowen et al. (2014); Lovett, Meyer, & Thille (2008); and Schunn & Patchan (2009). Outcomes include completing and passing a course (credit accumulation and persistence) and final exam and standardized test scores (academic achievement). The effects of *OLI* are not known for other outcomes within the Supporting Postsecondary Success topic area, including college access and enrollment; college attendance; college degree attainment; and labor market outcomes.

BOX 1. HOW THE WWC REVIEWS AND DESCRIBES EVIDENCE

The WWC evaluates evidence based on the quality and results of reviewed studies. The criteria that the WWC uses for evaluating evidence are defined in the **Procedures and Standards Handbooks** and the **Review Protocols**. The studies summarized in this report were reviewed under WWC Standards (version 3.0) and the Supporting Postsecondary Success topic area protocol (version 3.0).

To determine the effectiveness rating, the WWC considers what methods each study used, the direction of the effects, and how many studies tested the intervention. The higher the effectiveness rating, the more certain the WWC is about the reported results and about what will happen if the same intervention is implemented again. The following key provides a link between effectiveness ratings and the statements used in this report:

Effectiveness Rating	*Rating Interpretation*	Description of the Evidence
Positive (or Negative) Effects	The intervention is ***likely to change*** an outcome	Strong evidence of a positive effect, with no overriding contrary evidence
Potentially Positive (or Negative) Effects	The intervention ***may change*** an outcome	Evidence of a positive effect with no overriding contrary evidence
No Discernible Effects	The intervention ***may result in little to no change*** in an outcome	No affirmative evidence of effects
Mixed Effects	The intervention ***has inconsistent effects*** on an outcome	Evidence includes studies in at least two of these categories: studies with positive effects, studies with negative effects, or more studies with indeterminate effects than with positive or negative effects

How is *OLI* Implemented?

The following section provides details of how *OLI* was implemented. This information can help educators identify the requirements for implementing *OLI* and determine whether those implementation requirements would be feasible at their institutions. Information on *OLI* presented in this section comes from the three studies that meet WWC evidence standards (Bowen et al., 2014; Lovett, Meyer, & Thille, 2008; Schunn & Patchan, 2009), from *OLI*'s website, and from correspondence with the developer.

- **Goal:** *OLI* is designed to support learning and instruction via the high-quality online courses and learning materials available at low or no cost available on the *OLI* website.
- **Target Population:** Most *OLI* courses are open to both students who take credit-bearing, instructor-led classes and independent learners who do not receive credit or instructor monitoring. Over the past decade, more than four million students have enrolled in 40 *OLI* courses offered in both high schools and colleges.[4]
- **Method of Delivery:** Courses and learning materials are available on the *OLI* website. While *OLI* content is delivered online, instructors may choose to supplement the online material with face-to-face reinforcement (hybrid delivery). Two studies featured in this report (Bowen et al., 2014; Lovett, Meyer, & Thille, 2008) investigated the effects of *OLI* that used a blended approach, which supplemented online instruction provided through *OLI* with in-person instruction. One study (Schunn & Patchan, 2009) investigated the effects of *OLI* using online instruction only.
- **Frequency and Duration of Service:** *OLI* provides content that ranges in length from several-hour modules to full-semester courses. Independent learners may complete the material at their own pace, while students in instructor-led courses may be assigned to complete the material in a specified timeframe.
- **Intervention Components:** The *OLI* model includes several components, which are noted in Table 2.

Comparison Group: In the three studies that contribute to this Intervention Report, students in the comparison group completed coursework in traditional face-to-face settings.

Table 2. Components of *OLI*

Key component	*OLI*
Learning objectives	Every *OLI* course, section, and page lists learning objectives, allowing students to assess whether they have understood key concepts.
Expository materials	Materials include readings, examples, and multi-media components that support learning objectives. These expository materials can be downloaded from *OLI* to create a textbook.
Learning activities with immediate feedback	Two types of embedded learning activities provide opportunities for students to practice what they have learned and test their understanding: • *Learn by Doing* activities include multiple choice questions, simulations, matching, and other options to help students practice a new skill or understand a new concept. • *Did I Get This?* activities are self-assessments that pose questions to students to see if they understood a specific concept. These activities are presented after *Learn by Doing* activities. Students receive immediate feedback after each response addressing the misconception behind an incorrect answer or reinforcing the reasoning behind a correct answer. Checkpoint quizzes are also available within *OLI*, which provide detailed scores and information for instructors, and can be used to calculate course grades.
Learning Dashboard	The Learning Dashboard provides instructors with real-time student-level information about progress through *OLI* course activities, interaction patterns with course materials, and class-level accuracy in answering questions related to each learning objective.
Gradebook	Student performance on quizzes is reported in the learning dashboard as well as the gradebook. In the gradebook, instructors can view grades, adjust grades, change grading options, and grant exceptions to individual students.
Face-to-face reinforcement (optional)	Some instructors supplement the online *OLI* material with one to two hours of face-to-face instruction every week.

What Does OLI Cost?

The WWC identified a number of cost components from the *OLI* website. The cost breakdown below is not designed to be exhaustive; rather, it is designed to provide educators an overview of the kinds of resources needed to implement *OLI*.

- **Personnel Costs:** *OLI* can be delivered as part of an academic course at a college. *OLI* does not incur any personnel costs beyond those normally associated with teaching a course.
- **Facilities Costs:** *OLI* courses delivered in a hybrid format require physical space to accommodate periodic face-to-face instruction.
- **Equipment and Materials Costs:** All *OLI* courses require internet access and an up-to-date web browser. Some content cannot be accessed on mobile devices.
- **Costs Paid by Students or Parents:** *OLI* courses may be completed by independent learners or by students in credit-bearing, instructor-led classes. Most of the *OLI* courses are free to independent learners, but a few charge a $10 maintenance fee. Most *OLI* courses delivered for credit will charge students a maintenance fee of $25, with fees ranging from $10 to $80 per student. Course fees may be paid by individual students or by colleges. Students are also subject to any tuition fees assessed by their college.
- **In-Kind Supports:** *OLI* does not include any in-kind supports.
- **Sources of Funding:** The William and Flora Hewlett Foundation funded the development of the first four *OLI* courses at Carnegie Mellon University in 2002. Further development of *OLI* courses was supported by the Bill & Melinda Gates Foundation, the Kresge Foundation, the Lumina Foundation, the National Science Foundation, the Spencer Foundation, and the Walter S. Johnson Foundation. Ongoing funding and operational support are provided by Carnegie Mellon University.

For More Information:

About *OLI*

The Simon Initiative, Carnegie Mellon University
5000 Forbes Avenue, Pittsburgh, PA 15213
Web: **http://oli.cmu.edu/**. Phone: (412) 268-3294

About the cost of the intervention

For detailed cost information, please see: **http://oli.cmu.edu/olis-payment-options-and-cost/**.

Research Summary

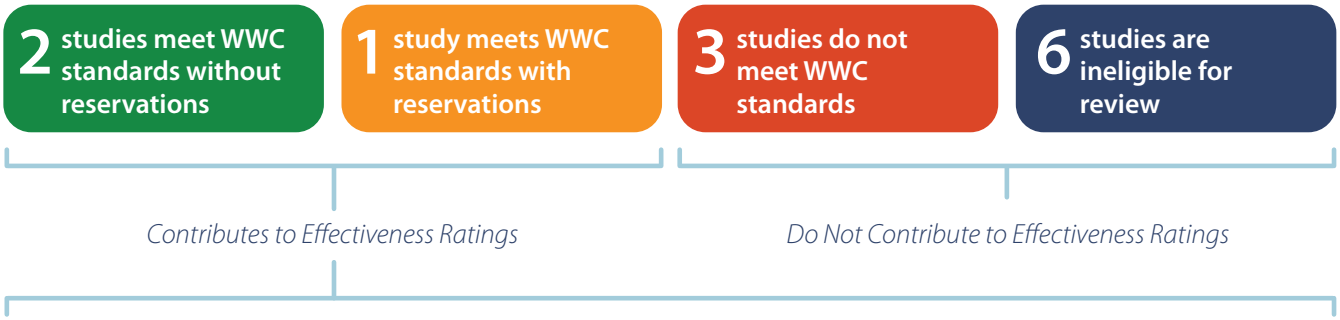
The WWC identified 12 studies that investigated the effectiveness of *OLI* (Figure 1):

- 2 studies meet WWC group design standards without reservations
- 1 study meets WWC group design standards with reservations
- 3 studies do not meet WWC group design standards
- 6 studies are ineligible for review

The WWC reviews findings on an intervention's effects on eligible outcome domains from studies that meet WWC group design standards, either with or without reservations. Based on this review, the WWC generates an effectiveness rating which summarizes how the intervention impacts, or changes, a particular outcome domain. Findings from studies that either do not meet WWC standards or are ineligible for review do not contribute to the effectiveness ratings.

The three studies of *OLI* that meet WWC group design standards reported findings on credit accumulation and persistence and academic achievement. The studies did not report findings on the following four outcome domains covered by the Supporting Postsecondary Success topic area: access and enrollment, college attendance, college degree attainment, and labor market outcomes. Citations for all 12 studies reviewed for this report are listed in the References section, which begins on page 10.

Figure 1. Effectiveness ratings for *OLI*



OLI has **potentially positive effects** on credit accumulation and persistence

The WWC determined that one study that meets WWC group design standards without reservations showed evidence of a positive and statistically significant effect of *OLI* on credit accumulation and persistence (Bowen et al., 2014).

OLI has **mixed effects** on academic achievement

The WWC determined that one study that meets WWC group design standards without reservations showed evidence of a positive effect of *OLI* on academic achievement (Lovett, Meyer, & Thille, 2008). The WWC determined that one study that meets WWC group design standards without reservations (Bowen et al., 2014) and one study that meets WWC group design standards with reservations (Schunn & Patchan, 2009) showed evidence of an indeterminate effect of *OLI* on academic achievement.

Main Findings

Table 3 shows the findings from three *OLI* studies that meet WWC evidence standards, and includes WWC calculations of the mean difference, effect size, and the improvement index. Based on those studies, the effectiveness rating for the credit accumulation and persistence outcome is *potentially positive effects*, indicating that there is evidence of a positive effect with no overriding contrary evidence. This finding is based on 605 students. The effectiveness rating for the academic achievement outcomes is *mixed effects*, indicating evidence of inconsistent effects in the three studies reviewed. This finding is based on 795 students.

Table 3. Findings from studies of *OLI* by outcome domain

			Mean (standard deviation)		WWC calculations			
Measure (study)	Study sample	Sample size	Intervention group	Comparison group	Mean difference	Effect size	Improvement index	*p*-value
Course completion rate (%) (Bowen et al., 2014)[a]	Postsecondary students	605 students	87	82	5.0	0.23	+9	.004
Course pass rate (%) (Bowen et al., 2014)[a]	Postsecondary students	605 students	80	76	4.0	0.14	+6	.083
Outcome average for credit accumulation and persistence across all studies						0.19	+7	
Comprehensive Assessment of Outcomes in Statistics (CAOS) (Bowen et al., 2014)[a]	Postsecondary students	458 students	0.48 (0.15)	0.47 (0.11)	0.01	0.08	+3	.420
Final exam score (Bowen et al., 2014)[a]	Postsecondary students	431 students	0.57 (0.13)	0.55 (0.22)	0.02	0.11	+4	.248
Comprehensive Assessment of Outcomes in Statistics (CAOS) (Lovett, Meyer, & Thille, 2008)[b]	Postsecondary students	61 students	68.00 (18.90)	53.00 (30.00)	15.00	0.55	+21	.044
Final exam score (Schunn & Patchan, 2009)[c]	Postsecondary students	276 students	62.35 (22.71)	64.13 (25.68)	-1.78	-0.07	-3	.547
Outcome average for academic achievement across all studies						0.19	+8	

Table Notes: For mean difference and effect size 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 outcomes, representing the average change expected for all individuals who are given the intervention (measured in standard deviations of the outcome measure). 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 improvement index can be interpreted as the expected change in percentile rank for an average comparison group student if that student had received the intervention. The statistical significance of the domain average was determined by the WWC. Some statistics may not sum as expected due to rounding.

[a] For Bowen et al. (2014), no corrections for clustering or difference-in-differences adjustments were needed. The *p*-values presented here were calculated by the WWC. The WWC applied the Benjamini-Hochberg correction for multiple comparisons within each domain, but this correction did not affect whether any of the contrasts were found to be statistically significant. This study is characterized as having a potentially positive effect on credit accumulation and persistence because the estimated effect is positive and statistically significant. This study is characterized as having an indeterminate effect on academic achievement because the mean effect is not statistically significant.

[b] For Lovett, Meyer, & Thille (2008), no corrections for clustering or multiple comparisons were needed. The WWC calculated the intervention group mean using a difference-in-differences adjustment by adding the impact of the program (i.e., difference in mean gains between the intervention and comparison group) to the unadjusted comparison group posttest mean. This study is characterized as having statistically significant positive effect on academic achievement because the estimated effect is positive and statistically significant.

[c] For Schunn & Patchan (2009), no corrections for clustering or multiple comparisons and no difference-in-differences adjustments were needed. The *p*-value presented here was calculated by the WWC. This study is characterized as having an indeterminate effect on academic achievement because the estimated effect is not statistically significant.

For more information, please refer to the WWC Procedures and Standards Handbook, version 3.0, page 26.

In What Context Was *OLI* Studied?

The following section provides information on the setting and participants involved in the three studies of *OLI* that meet WWC evidence standards. This information can help educators understand the context in which the studies of *OLI* were conducted so that they can better determine whether the program might be suitable for their setting.

WHERE THE STUDY WAS CONDUCTED

3 studies, **942** students in **8** colleges and universities in **Maryland**, **New York**, and **Pennsylvania**

1 private 4-year college, **7** public 4-year colleges

GRADES PK K 1 2 3 4 5 6 7 8 9 10 11 12 PS

Postsecondary (PS)

Details of Each Study that Met WWC Standards

This section presents details for each study of *OLI* that meets WWC standards. These details include the full study reference, findings summary, and description of study characteristics. A summary of findings for each outcome domain examined is presented in the first table for each study. The second table for each study provides a description of the study characteristics. These study-level details include contextual information on the study setting, methods, sample, intervention group, comparison group, outcomes, and implementation details. For additional information, the reader should refer to the original studies.

Research details for Bowen et al. (2014)

Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2014). Interactive learning online at public universities: Evidence from a six-campus randomized trial. *Journal of Policy Analysis and Management*, 33(1), 94-111. Retrieved from https://eric.ed.gov/?id=EJ1027704

Additional Source:

Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2012). Interactive learning online at public universities: Evidence from randomized trials. New York: Ithaka S+R. doi:10.18665/sr.22464

Findings from Bowen et al. (2014) show evidence of a positive effect of *OLI* on credit accumulation and persistence (Table 4). The improvement index is a measure of the effect of the intervention. For example, an improvement index of +7 means that the percentile rank of the average comparison group student would improve by 7 points on credit accumulation outcomes if they received *OLI*. This finding is based on two outcomes and 605 students each. Findings on academic achievement outcomes show evidence of indeterminate effects. These findings are based on two outcomes, with 458 and 431 students, respectively.

Table 4. Summary of findings from Bowen et al. (2014)

Meets WWC group design standards with reservations

		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Credit accumulation and persistence	7 colleges and universities/ 605 students	+0.19	+7	Yes
Academic achievement	7 colleges and universities/ 458 students	+0.09	+4	No

Table 5. Description of study characteristics for Bowen et al. (2014)

WWC evidence rating	**Meets WWC Group Design Standards Without Reservations.** This is a randomized controlled trial (RCT) with low attrition.
Setting	The study took place in seven public, 4-year colleges. Four colleges were located in New York (University of Albany, SUNY Institute of Technology, Baruch College, and City College), and three colleges were located in Maryland (University of Maryland, University of Maryland Baltimore County, and Towson University).
Methods	The study uses a randomized controlled trial (RCT) design. Students who were registered for introductory statistics courses in the seven participating colleges were asked to participate in the study at the beginning of the semester. Those that agreed were given a modest incentive, filled out a baseline survey, and were randomly assigned to either a hybrid classroom format with *OLI* or the traditional classroom format. Students completed the Comprehensive Assessment of Outcomes in Statistics (CAOS) at the beginning and end of the semester.
Study sample	The sample included 605 students who were randomly assigned, with 313 students in the intervention group and 292 students in the comparison group. There was no attrition in the study. In the intervention group, the study participants were 39 percent male, 46 percent White, had an average age of 22.0 years, and 50 percent had a family income of less than $50,000. In the comparison group, the study participants were 46 percent male, 41 percent White, had an average age of 21.9 years, and 49 percent had a family income of less than $50,000.
Intervention group	Students in the intervention group participated in *Interactive Learning Online (ILO)*, which was a rebranded *OLI* intervention that provided the same instruction as *OLI*. *ILO* 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 one-hour face-to-face session, so that students could ask questions or be given targeted assistance by the instructor. The *ILO* course for this study included textual explanations of concepts, worked examples, and practice problems. Students were also required to manipulate data using statistical software packages.
Comparison group	Students assigned to the comparison group were taught the introductory statistics course as it is usually offered at their college, with face-to-face instruction.
Outcomes and measurement	The study measures whether or not students completed the introductory statistics course and whether they passed the course. A student can complete a course without passing it if he/she is enrolled until the end of the semester but received a failing grade. These two outcomes fall under the credit accumulation and persistence domain. The study also measured academic achievement at the end of the semester using the Comprehensive Assessment of Outcomes in Statistics (CAOS), which is a 40-item multiple-choice, standardized measure of statistical literacy and reasoning skills.[5] The authors also report findings on the final exam from the course as well. Both of these outcomes fall under the academic achievement domain.
Additional implementation details	The study does not provide details on implementation support for *ILO*.

Research details for Lovett, Meyer, & Thille (2008)

Lovett, M., Meyer, O., & Thille, C. (2008). The Open Learning Initiative: Measuring the effectiveness of the *OLI* statistics course in accelerating student learning. *Journal of Interactive Media in Education, 1*. Retrieved from https://eric.ed.gov/?id=EJ840810

Findings from Lovett, Meyer, & Thille (2008) show evidence of a positive effect of *OLI* on academic achievement (Table 6). The improvement index is a measure of the effect of the intervention. For example, an improvement index of +21 means that the percentile rank of the average comparison group student would improve by 21 points on academic achievement outcomes if they received *OLI*. This finding is based on one outcome and 61 students.

Table 6. Summary of findings from Lovett, Meyer, & Thille (2008)		Meets WWC group design standards with reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Academic achievement	1 university/61 students	+0.55	+21	Yes

Table 7. Description of study characteristics for Lovett, Meyer, & Thille (2008)

WWC evidence rating	**Meets WWC Group Design Standards Without Reservations.** This is a randomized controlled trial (RCT) with low attrition. The authors also describe two quasi-experimental design (QED) studies that do not meet WWC Group Design Standards because they do not establish baseline equivalence of intervention and comparison groups.
Setting	The study took place in spring 2007 in an introductory statistics course at Carnegie Mellon University.
Methods	A month before the semester began, students were invited to participate in *OLI*. Of the 68 students who volunteered, 22 students were randomly selected for the intervention. The remaining 46 students formed the comparison group, with 4 students dropping out before the course began.
Study sample	The analytic sample included 61 students, with 21 students in the intervention group and 40 students in the comparison group. The study does not provide demographic or other characteristics of the students who participated in the study.
Intervention group	Students in the intervention group enrolled in a college-level, non-calculus-based introduction to statistics course. The *OLI* intervention condition involved (a) working in an online learning environment (*OLI*) to acquire most of the course content, (b) meeting with an instructor approximately two times a week for 50-minute sessions to ask questions and review more challenging material, and (c) completing the semester's material in approximately half the regularly scheduled time (8 weeks instead of 15 weeks).
Comparison group	Students in the comparison group attended a traditional, classroom-based introductory statistics course. The course's content was the same as that delivered in the intervention condition.
Outcomes and measurement	The Comprehensive Assessment of Outcomes in Statistics (CAOS) is a 40-item multiple-choice, standardized measure of statistical literacy and reasoning skills.[6] This outcome falls under the academic achievement domain. It was measured at the beginning and end of the semester. The authors also provided final exam scores; however, since different versions of the exam were administered to the intervention and comparison group, this outcome is ineligible for review.
Additional implementation details	The study does not provide details on implementation support for *OLI*.

Research details for Schunn & Patchan (2009)

Schunn, C. D., & Patchan, M. (2009). An evaluation of accelerated learning in the CMU Open Learning Initiative course "Logic & Proofs". Pittsburgh, PA: University of Pittsburgh, Learning Research and Development Center.

Findings from Schunn & Patchan (2009) show evidence of an indeterminate effect of *OLI* on academic achievement (Table 8). This finding is based on one outcome and 276 students.

Table 8. Summary of findings from Schunn & Patchan (2009)		Meets WWC group design standards with reservations		
		Study findings		
Outcome domain	Sample size	Average effect size	Improvement index	Statistically significant
Academic achievement	1 university/276 students	-0.07	-3	No

Table 9. Description of study characteristics for Schunn & Patchan (2009)

WWC evidence rating	**Meets WWC Group Design Standards With Reservations.** This is a quasi-experimental design (QED), with baseline equivalence established between the intervention and comparison groups.
Setting	The study took place at Carnegie Mellon University in four sections of a symbolic logic course during the fall 2007 and spring 2008 semesters.
Methods	The study is a quasi-experimental design (QED). Students opted to either participate in an online (*OLI*) section or in a traditional face-to-face section of a symbolic logic course. The same instructor taught both sections of the course each semester.
Study sample	The analytic sample for the fall 2007 semester included 88 students, with 45 students in the intervention group and 43 students in the comparison group. The analytic sample for the spring 2008 semester included 188 students, with 83 students in the intervention group and 105 students in the comparison group. Detailed demographic breakdowns are not reported, but the authors did indicate that there were no significant differences between the intervention and comparison group on gender, year, GPA, or prior experience with logic courses and online instruction in general.
Intervention group	Students in the intervention group received online instruction through *OLI* that generally mirrored the content of the course taught in the traditional (comparison) sections. The authors note that the *OLI* sections included several additional topics not covered in the comparison sections.
Comparison group	Students in the comparison group received instruction in the traditional face-to-face format.
Outcomes and measurement	The authors report findings on the final exam from the course. This outcome falls under the academic achievement domain. Baseline equivalence was established on cumulative GPA prior to the semester when the study took place.
Additional implementation details	The study does not provide details on implementation support for *OLI*.

References

Studies that meet WWC group design standards without reservations

Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2014). Interactive learning online at public universities: Evidence from a six-campus randomized trial. *Journal of Policy Analysis and Management, 33*(1), 94-111. Retrieved from **https://eric.ed.gov/?id=EJ1027704**

Additional Source:

Bowen, W. G., Chingos, M. M., Lack, K. A., & Nygren, T. I. (2012). Interactive learning online at public universities: Evidence from randomized trials. New York: Ithaka S+R. **doi:10.18665/sr.22464**

Lovett, M., Meyer, O., & Thille, C. (2008). The Open Learning Initiative: Measuring the effectiveness of the OLI statistics course in accelerating student learning. *Journal of Interactive Media in Education, 1*. Retrieved from **https://eric.ed.gov/?id=EJ840810**

Study that meets WWC group design standards with reservations

Schunn, C. D., & Patchan, M. (2009). An evaluation of accelerated learning in the CMU Open Learning Initiative course "Logic & Proofs". Pittsburgh, PA: University of Pittsburgh, Learning Research and Development Center.

Studies that do not meet WWC group design standards

Griffiths, R., Chingos, M., Mulhern, C., & Spies, R. (2014). *Interactive online learning on campus: Testing MOOCs and other platforms in hybrid formats in the University System of Maryland*. New York: Ithaka S+R. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Lovett, M., Meyer, O., & Thille, C. (2010). In search of the "perfect" blend between an instructor and an online course for teaching introductory statistics. In C. Reading (Ed.), *Data and context in statistics education: Towards an evidence-based society*. Proceedings of the Eighth International Conference on Teaching Statistics (ICOTS8, July, 2010), Ljubljana, Slovenia. Voorburg, The Netherlands: International Statistical Institute. Retrieved from **http://iase-web.org/documents/papers/icots8/ICOTS8_9G2_LOVETT.pdf**. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Ryan, S., Kaufman, J., Greenhouse, J., She, R., & Shi, J. (2015). The effectiveness of blended online learning courses at the community college level. *Community College Journal of Research and Practice, 49*(4), 285-298. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.

Additional Source:

Kaufman, J., Ryan, R., Thille, C., & Bier, N. (2013). Open Learning Initiative courses in community colleges: Evidence on use and effectiveness. Pittsburgh, PA: Carnegie Mellon University. Retrieved from **https://hewlett.org/wp-content/uploads/2013/12/CCOLI_Report_Final_1.pdf**

Studies that are ineligible for review using the Supporting Postsecondary Success Review Protocol

Bälter, O., Zimmaro, D., & Thille, C. (2018). Estimating the minimum number of opportunities needed for all students to achieve predicted mastery. *Smart Learning Environments, 5*(1), 15. Retrieved from **https://doi.org/10.1186/s40561-018-0064-z**. The study is ineligible for review because it does not use an eligible design.

Dollar, A., & Steif, P. (2008). An interactive, cognitively informed, web-based statics course. *International Journal of Engineering Education, 24*(6), 1229-1241. The study is ineligible for review because it is out of scope of the protocol.

Evans, K. L., Yaron, D., & Leinhardt, G. (2008). Learning stoichiometry: A comparison of text and multimedia formats. *Chemistry Education Research and Practice, 9*, 208-218. Retrieved from **https://eric.ed.gov/?id=EJ888338**. The study is ineligible for review because it is out of scope of the protocol.

Koedinger, K. R., Kim, J., Jia, J. Z., McLaughlin, E. A., & Bier, N. L. (2015, March). Learning is not a spectator sport: Doing is better than watching for learning from a MOOC. In *Proceedings of the Second (2015) ACM Conference on Learning@ Scale* (pp. 111-120). New York: ACM. The study is ineligible for review because it does not use an eligible design.

Koedinger, K. R., McLaughlin, E. A., Jia, J. Z., & Bier, N. L. (2016). Is the Doer Effect a Causal Relationship? How Can We Tell and Why It's Important. In *Proceedings of the Sixth International Conference on Learning, Analytics and Knowledge* (pp. 388-397). New York: ACM. The study is ineligible for review because it does not use an eligible design.

Scheines, R., Leinhardt, G., Smith, J., & Cho, K. (2005). Replacing lecture with Web-based course materials. *Journal of Educational Computing Research, 32*(1), 1-25. The study is ineligible for review because it is out of scope of the protocol.

Endnotes

[1] For more information, please see Recommendation 2 in the WWC Practice Guide, **Using Technology to Support Postsecondary Student Learning**.

[2] The descriptive information for this intervention comes from *OLI*'s website (**https://oli.cmu.edu/**) and from Bowen et al. (2014), Lovett, Meyer, & Thille (2008), and Schunn & Patchan (2009). The What Works Clearinghouse (WWC) requests developers review the intervention description sections for accuracy from their perspective. The WWC provided the developer with the intervention description in March 2019 and the WWC incorporated feedback from the developer. Further verification of the accuracy of the descriptive information for this intervention is beyond the scope of this review.

[3] The literature search reflects documents publicly available by March 2019. Reviews of the studies in this report used the standards from the WWC Procedures and Standards Handbook (version 3.0) and the Supporting Postsecondary Success review protocol (version 3.0). The evidence presented in this report is based on available research. Findings and conclusions could change as new research becomes available.

[4] Bier, N., Moore, S., & Van Velsen, M. (2019). Instrumenting courseware and leveraging data with the Open Learning Initiative (OLI). Companion Proceedings 9th International Learning Analytics & Knowledge Conference, Tempe, AZ.

[5] Delmas, G., Joan, G., Ooms, A., & Chance, B. (2007). Assessing Students' Conceptual Understanding after a First Course in Statistics. *Statistics Education Research Journal, 6*(2), 28-58.

[6] Delmas et al. (2007).

Recommended Citation

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