2013-14 MIU Report of Impact and Accountability
Wisconsin Collaboratory for Enhanced Learning (WisCEL)

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1. Project summary

Since its full-scale inception in Spring 2012, WisCEL has enabled UW-Madison undergraduate students to experience innovative types of active, high value-added residential learning, in contrast to purely online learning or the type of learning typically found in traditional lectures. During the past five semesters and two summer sessions, students have also benefitted from WisCEL’s dual-use capacity as both an active learning classroom and a learning commons, where extensive instructional technology access combines with open architecture and flexible furniture design to permit face-to-face instructor-student interaction in-class, and spontaneous peer-to-peer collaboration for studying in the evenings and on weekends. In academic year 2013–2014, WisCEL grew to support more than 4850 students in 236 course and/or discussion sections, taught by 26 different instructors and more than 30 TAs.

WisCEL has demonstrated that a proper combination of learning space design, instructional support infrastructure, and instructional technology integration has the potential to amplify the learning gains enabled by active learning pedagogies. Features of such pedagogies include maximum time-on-task; frequent, immediate and personalized feedback; emphasis on mastery learning; incentives for distributed-paced learning (instead of cramming); peer-to-peer collaboration; and instructor-as-personal-coach instead of impersonal orator. For example, a preliminary statistical analysis of Math 112 reveals that targeted minority students were about 2.2 times more likely to receive a grade of B or higher in the WisCEL classroom, compared to taking Math 112 in a traditional classroom setting. Targeted Minority students were 1.8 times more likely to receive D or F grades, or drop the course in the traditional Math 112 classroom setting than in the WisCEL Math 112 classroom (see Table 2, on page seven for detail). Meanwhile, several of the WisCEL courses have robust records of learning outcomes (semester grades) when comparing pre- and post-WisCEL instruction and have shown very significant improvements in content mastery enhancement from teaching in WisCEL. In a 2012-2013 comparison of the distributions of students’ final exam scores in ECE 431, 90% of the students in the WisCEL flipped instruction course had final exam scores exceeding 70/100, while only 55% exceeded 70/100 in the conventional course pre-WisCEL course. Similar results have been found in 10 courses held in WisCEL two or more semesters - all 10 courses had two or more semesters where the rates for the percentage of students receiving B or Better grades were 60% or higher. Four courses consistently had B or Better rates of greater than 80%.

Meanwhile, there are additional and important institutional benefits that have been observed. The multi-use design of WisCEL has achieved highly efficient instructional space usage (~ 90–100% compared to campus target utilization of 67% and in contrast to campus average classroom utilization of 43%). Heavy incorporation of instructional technology as part of blended instruction is providing a prime test bed to conduct internal program-improvement investigations (i.e., learning analytics or achievement gap vulnerability diagnostics) of the value and implementation of evidence-based program, instructional improvement and intervention strategies. In addition, WisCEL has continued to nurture and expand significant campus-wide and cross-disciplinary relationships that develop instructional leadership and professional learning for faculty. Core and new partners include the General Library System, College of Engineering, Division of Information Technology, College of Letters & Science, Institute for Biology Education, Sterling Hall Collaborative Learning Classrooms, DELTA, and the First Year Interest Groups Program.

2. Progress on WisCEL on project-specific goals

WisCEL MIU Goal 1 (Equal or better outcomes in WisCEL versions of courses).

Twenty-eight courses were held in WisCEL in fall and spring semesters, 2013–2014. Of those, 11 were new to WisCEL and 10 were held both fall and spring semesters. There were 17 Engineering courses, 6

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Math courses, and 1 course each from English, Statistics, Integrated Liberal Studies, Genetics, and Soil Science. A total of 4898 students enrolled in the courses – 293 dropped their course, and 4,605 completed their courses.

Using data provided by the Academic Planning and Institutional Research (APIR) office, an analysis was conducted comparing student outcomes in courses held WisCEL in 2013–2014. Two types of outcomes were considered to determine if WisCEL courses met the goal of producing equal or better outcomes: 1) the percentage of students who received a grade of B or better in the course; and 2) the percentage of students who received a grade of D or F, or who dropped the course. The analysis produced the following outcomes for 2013–2014:

**Increases in % of students with grades B or Better**
- Of the 10 courses held in WisCEL two or more semesters\(^2\), all 10 had two or more semesters where the rates for the percentage of students receiving B or Better grades were 60% or higher. Four courses consistently had B or Better rates of greater than 80%.
- 6 of 10 WisCEL courses offered both Fall and Spring (2013–2014) attained increases in the percentage of students who received a grade of B or better as compared to the previous semester.
- A continuing analysis of WisCEL course Math 112 student performance shows:
  - A 6% increase in the percentage of Non-targeted students achieving a “B or Better” grade fall semester 2013 as compared with fall 2012. B or Better rates were equal for Non-targeted students in both spring 2013 and spring 2014 (both at 60%).
  - Targeted Minorities’ “B or Better” rates fell in Fall 2013 to 39%, as compared to Fall 2012 (52%), but the fall semester rate was still higher than those in the pre-WisCEL semesters.
  - Targeted Minorities’ “B or Better” rates increased in spring 2014 (39%) as compared to Spring 2013 (36%). The Fall 2013 and Spring 2014 “B or Better” rates for Targeted Minorities were the same – 39%.

**Decreases in % of students with grades D, F or Drop**
- Of the 28 WisCEL courses in Fall 2013 and Spring 2014, 4 courses had no D, F or Drops, and 8 courses had no D or F grades.
- 5 of 10 WisCEL courses offered both Fall and Spring (2013–2014) saw decreases in the percentage of students who received a D or F or who dropped the course as compared to the previous semester.
- A continuing analysis of WisCEL course Math 112 student performance shows:
  - D/F/Drop rates decreased for Non-targeted students in fall semester 2013 (to 14%) as compared to both fall semesters 2012 (15%) and 2011 (16%). Spring semester comparison shows similar D/F/Drop rates of 16% (Spring 2013) and 17% (Spring 2014).
  - D/F/Drop rates for Targeted Minorities increased in Fall 2013 (33%) as compared to Fall 2012 (20%). However, Spring 2014 saw a significant decrease in the Targeted Minorities D/F/Drop rate from 42% in Spring 2013 to 26% in Spring 2014.

**WisCEL MIU Goal 2 (What does/does not work in WisCEL).**
Over the course of the first two years of instruction in WisCEL, ongoing program assessment activities have provided evidence that the following practices regarding learning environments, innovative instruction, and collaboration continue to work well:

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\(^2\) Includes only courses that held all class sessions in WisCEL classrooms for two or more semesters. Courses include: ECE 219, ECE 230, ECE 630, ECE 431, EP 271, ILS 275, Math 95, Math 101, Math 112, and NE 506.
Environment: What matters
- Multi-use space
- Flexible furniture
- 24/7 accessibility
- Campus location
- Informal and formal use
- Learning culture
- Library venue for open study
- Functional design
- Enhanced technology access
- Collaboration – onsite and campus-wide

Technology: What works
- Options for instructors (hardware and software)
- Individual computers for each student
- Dedicated large screen monitors for each table
- Software and UW network access (Infolabs, CAE)
- Use of course management systems (Moodle, Learn@UW)
- Computer scoring
- Onsite technical support

Instruction: Design, Support and Collaboration
- Program support that focuses on teaching and learning
- Instructor support for flipped, blended, active learning and hybrid course models
- Continuous course re-design and transformation
- Regular faculty and instructor learning community meetings
- Support and space for an “academic home” on campus for undergraduates
- Student/peer interaction, teamwork, relationships
- Instructor/student interaction, relationships

WisCEL MIU Goal 3 (Educational best practices).
An evaluation study of WisCEL in 2012–2013 showed that best practices at the course or classroom level fall into three interrelated areas: Instructional Design, Course Staging, and Classroom Pedagogy. Follow-up analysis in academic year 2013–2014 continues to endorse the following “educational best practices”:

- Minimal lecturing
- Short and focused video lectures
- Frequent and immediate feedback
- Emphasis on mastery learning
- Longer class periods (75 minutes +)
- Small group collaboration, problem-solving
- Increased instructor/student interaction
- Optimal instructor-to-student ratio of 1/25
- Strategic use of TAs
- Coaching and questioning strategies
- Individual and group incentives for task completion
- Use of “flipped” instructional models
- Use of course management software (especially Moodle)
Impact of the WisCEL project on the general MIU goals
WisCEL project-specific goals directly support MIU goal #3 which states: “Expand best practices and innovation in teaching and learning, curricular design, and student services in order to enhance undergraduate student learning and their educational experience”. The following highlights and summary statement address the impact of WisCEL on MIU goals.

3. Access for undergraduates

In summer 2013, fall 2013 and spring 2014, five bottleneck courses\(^3\) (36 sections) were held in WisCEL, taught by eight instructors, 19 TAs and served 1615 undergraduate students. These courses were: Computer Sciences 352, ECE 203, EMA 201, Math 101, Math 112, and Statistics 371. Four of the courses met all three criteria for bottleneck courses (access/demand, outcomes, or gateway/requirements). ECE 352 met the bottleneck definition as a gateway/requirement course and ECE 203 had a high D/F/Drop rate. All six courses have renewed as WisCEL courses for summer and fall 2014.

To respond to the increased enrollment in engineering programs and courses to be held in WisCEL, the College of Engineering (COE) funded the purchase of 36 additional laptops to use in Wendt Commons WisCEL classrooms, allowing WisCEL to schedule classes for up to 138 students in a section needing individual computers. The extra computers allowed WisCEL to accommodate larger than expected enrollments for BME 210 (112 students) and BME 310 (86), taking 17 students off the waiting lists in these two courses in spring semester 2014. The availability of these extra computers will support increased course enrollment of up to 138 for ECE 219, ECE 252 and ECE 352 in fall 2014.

WisCEL has agreed to collaborate with FP&M and L&S to put the scheduling of the new Sterling Hall Collaborative Learning Classrooms (CLC) under the WisCEL course scheduling and approval process. Collaboration ensures that assigned courses and enrollment are a “good fit” for the active learning classrooms at both WisCEL and Sterling Hall, and that instructors are taking full advantage of the technology, space and resources. For Spring 2014, eight courses were scheduled in the Sterling Hall CLCs: Chemistry 311, Math 113, Math 441, Math 473, Stats 327/692, PoliSci 566, ILS 275, Physics 241.

4. High demand opportunities

Academic year 2013–14 saw an increased interest and demand for teaching in WisCEL from instructors teaching large-size introductory courses. Among those deferred, due to inability to find openings in the schedule or sufficient seats per section include: Journalism 202, Forest and Wildlife Ecology 550, Chemistry 103, Physics 207 and Bio/Stats 151.

Several instructors in WisCEL courses have expressed the desire to give computerized final exams in WisCEL commuter labs. To date, WisCEL scheduling and coordination with the Registrar’s office and libraries have allowed two courses in Fall 2014, and three in Spring 2014, to hold their final exams, using WisCEL computers, in Wendt Commons. Each of these final exams were created and administered using Moodle CMS software.

2013–2014 saw an increase in the reservations for WisCEL classrooms for office hours, study groups, and math lab hours. In fall 2013, 7 courses scheduled a total of 37 hours per week for these extra course related activities. In spring 2014, 8 courses scheduled a total of 39 hours for these course-related activities.

\(^3\) Bottleneck courses are defined and identified in the report: Undergraduate Course Access and Courses with Bottleneck Features, Academic Planning and Institutional Research, Office of the Provost, UW-Madison.
WisCEL hosts a variety of workshops, TA training and one-time use meetings in collaboration with Wendt and College Libraries (i.e., Psychology and Computer Science student projects/presentations, DELTA courses, DoIT Blended Learning courses, COE faculty workshops, WisCEL Instructor Workshops, PEOPLE program, Summer College Experience (SCE) and library professional development).

5. High impact practices

According to the information about high impact practices provided on the UW-Madison Teaching and Learning website (see [https://tle.wisc.edu/node/1034](https://tle.wisc.edu/node/1034)), all WisCEL courses employ instructional practices that are considered to be high-impact and are designed to increase student engagement and benefit undergraduate students from different learning backgrounds. All WisCEL courses integrate and foster one or more of the following high impact practices: collaborative assignments and projects; first year, undergraduate, or introductory experiences that emphasize collaborative learning and critical inquiry; common intellectual experiences, and learning communities.

Of the 28 courses taught in WisCEL in the 2013–2014 academic year, all involved course redesign to include innovative active learning strategies, increase collaboration (peer-to-peer and instructor-to-student), integrate instructional technology, and develop conceptual understanding. Also, all WisCEL courses provide extended opportunities for students to continue course related learning outside of class (e.g., course-related office hours, lab hours, and study tables) and informally fostering learning communities and open study options in WisCEL spaces in the libraries.

An analysis of the instructional practices, course designs and technology integration employed by WisCEL instructors revealed more variation than consistency across courses, however four main types of WisCEL instructional models were identified:

- **Blended** – 8 courses featured pedagogical strategies which delivered course content both through technology and traditional demonstration or lecture, and in-class learning involved some active learning activities and collaboration.
- **Flipped** – 9 courses featured instructional designs that reconfigure student work in- versus out-of-class by emphasizing active learning strategies in-class (i.e., small group work, problem solving, critical thinking and discussion) and delivering content outside of class time (on-line, rather than through lecture). For example, flipped instructional models in WisCEL often use web-based content (e.g., instructor-produced video lectettes) and course management software such as Moodle to introduce basic concepts prior to class, and place the focus in class on the application of content and concepts to real world problems or questions.
- **Hybrid** – 6 courses were structured to alternate class meetings between WisCEL and other settings (e.g., a course with three class periods per week would hold one or two classes in a traditional lecture hall or lab setting, and the other class periods in WisCEL doing active learning). Three of these hybrid courses featured flipped instruction and the other three hybrid courses used a blended learning model in the WisCEL portion of their courses. *Note: This model affords larger classes (100+ students) the option to provide students with a regular active learning experience while allowing the instructor to maximize content delivery through lecturing to a large class size.*
- **Active** – 5 courses emphasized in-class strategies of collaboration, discussion, group work, instructor-student interaction, problem-solving and self-paced individual learning. In these classes, use of technology was present, but de-emphasized in relationship to the active learning activities.
6. Faculty involvement

In academic year 2013–2014, WisCEL had 27 faculty and academic instructors. Of those, 10 were full Professors or Emeritus status, three were Associate Professors, three were Assistant Professors, eight were academic staff Faculty Associates, and one was a Lecturer. Instructors also included two graduate assistants with RA status (ECE 203 and InterEGR 111) and 19 TA instructors for Math 95, 101 and 112.

7. Student learning and teaching excellence

WisCEL is currently engaging in an evaluation study to assess the impact of WisCEL on student engagement, student achievement, and perceptions about the efficacy of the WisCEL learning experience in Math 112, an introductory mathematics course. Specifically, this evaluation project aims to assess impact of WisCEL on student learning outcomes, as well as potential mechanisms that may contribute to the impact of the WisCEL experience on student perceptions, attitudes, and achievement in Math 112. The primary purpose of this evaluation is for internal program improvement at WisCEL. Secondary purposes include a demonstration and proof-of-concept of effectiveness and impact, as well as the development of a set of approaches and tools for evaluation that can be transferrable to other courses taught in the WisCEL space. As we develop consistent tools, methodologies, and databases to codify evaluation findings, we can then start to make comparisons of courses and programming over time thereby building a rich and robust set of best practices and evidence base of “what works” in the WisCEL space.

This evaluation study employs a mixed-methods approach. We are using a blend of quantitative analysis (i.e., statistical analysis of pre-and post-WisCEL end of course grades and survey results of students) with a complementary qualitative data set that include interviews with the course instructor, teaching assistants, and observation of classroom. The qualitative data set aims to begin to identify the various mechanism that may influence the student achievement and engagement.

Evaluation study questions:

1. How has WisCEL influenced student achievement in Math 112?
2. What are students’ perceptions about how WisCEL has influenced their learning?

8. Achievement Gap

As part of the evaluation study, WisCEL is investigating achievement gaps in the pre- and post-WisCEL Math 112 semesters and assessing the impact of WisCEL on minority student achievement.

Finding: Our preliminary statistical analysis reveals that targeted minority students are more likely to receive grades higher than B and less likely to receive a D or F or drop the course in the WisCEL classroom, compared to taking Math 112 in a traditional classroom setting (both of these grade groupings reveal statistical significance).

Please see Table 1 and 2 for summary of student grades in pre- and post-WisCEL Math 112 semesters, as well as a summary of Chi-Square tests for significance and odds ratio analyses. Further analyses forthcoming in the full evaluation report (July 2014).
Table 1. Summary of Comparison Grade Outcomes and Student Enrollment for Non-Minority versus Minority Students within Pre-WisCEL Years versus WisCEL Years for Math 112

<table>
<thead>
<tr>
<th>Status</th>
<th>Math 112 Eras</th>
<th>Grades</th>
<th>Totals</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td>&gt;=B</td>
<td>BC-C</td>
</tr>
<tr>
<td>Non-Minority</td>
<td>Pre-WisCEL</td>
<td>2824</td>
<td>1736</td>
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<td></td>
<td>WisCEL</td>
<td>733</td>
<td>291</td>
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<td><strong>Non-Minority Totals</strong></td>
<td></td>
<td>3557</td>
<td>2027</td>
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<tr>
<td>Minority</td>
<td>Pre-WisCEL</td>
<td>345</td>
<td>443</td>
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<tr>
<td></td>
<td>WisCEL</td>
<td>116</td>
<td>78</td>
</tr>
<tr>
<td><strong>Minority Totals</strong></td>
<td></td>
<td>461</td>
<td>521</td>
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<tr>
<td><strong>Grand Totals</strong></td>
<td></td>
<td><strong>4018</strong></td>
<td><strong>2548</strong></td>
</tr>
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</table>

Table 2. Chi-Square Tests for Significance and Odds Ratio Analysis for Non-Minority versus Minority Students Pre-WisCEL and WisCEL Years for Math 112

<table>
<thead>
<tr>
<th>Status</th>
<th>Grade Categories</th>
<th>p Values</th>
<th>Odds Ratio</th>
<th>Pre-WisCEL</th>
<th>WisCEL</th>
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<tr>
<td>Non-minority</td>
<td>&gt;=B</td>
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<td>0.635</td>
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<td></td>
<td>BC-C</td>
<td>.0000</td>
<td>1.375</td>
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<td></td>
<td>D-F-EI-I-NR-NW-W drop</td>
<td>.0001</td>
<td>1.396</td>
<td>0.716</td>
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<tr>
<td>Minority</td>
<td>&gt;=B</td>
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<td>2.249</td>
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</tr>
<tr>
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<td>BC-C</td>
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