Evidence from the Final Frontier: The Impact of Innovative Technology-Enhanced Spaces on Student Learning

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OVERVIEW: Since 2007, the Office of Information Technology’s (OIT) Research & Evaluation Team at the University of Minnesota, in partnership with the Office of Classroom Management (OCM), has been investigating the impact of formal and informal learning environments on teaching and learning practices. Most recently, we have been evaluating the U of M’s Active Learning Classrooms (ALCs) which are:
- Modeled on NC State’s SCALE-UP and MIT’s TEAL projects;
- Designed with an emphasis on innovative and flexible construction;
- Designed to encourage new pedagogical approaches;
- Designed to accommodate new course designs; and
- Outfitted with large round tables, laptop connections, student display panels, multiple projection screens, and 360° glass marker-boards.

DATA & METHODS: Employing a range of research designs that included case study, single group pre- and posttest, and quasi-experimental approaches, the Research & Evaluation Team has collected a considerable amount of data, including:
- Individual level data on over 230 variables for 224 students; and
- Course level data on 38 variables for 52 class periods measured at 5 minute intervals from four courses representing three disciplines.

RESULTS: Our results demonstrate that – holding all other factors constant – learning environments have a significant impact on both teaching and learning practices – especially in the following ways:
- Technologically-enhanced spaces designed for flexible use and student collaboration are superior to traditional classrooms in terms of improving students’ learning (Table 1);
- ALCs promote enrichment and engagement at significantly higher levels and provide more opportunities for different types of learning than traditional classrooms (Figure 1);
- Perceptions of ALCs’ benefits vary by student characteristics responding favorably to the impact of ALCs on their engagement. Values derived from post-hoc analysis of a multivariate ordered logistic regression model.

Table 1. Difference of Means Tests of ACT Scores and Course Grades, by Biology Course Section

<table>
<thead>
<tr>
<th>ACT</th>
<th>Traditional Classroom</th>
<th>ALC</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>499.33 (9.13)</td>
<td>484.39 (9.59)</td>
<td>14.94</td>
</tr>
</tbody>
</table>

Table 2. Likelihood of Favorable Response to ALC Engagement, by Year and Metro (All ALCs)

<table>
<thead>
<tr>
<th>First-year Sophomore</th>
<th>Rural</th>
<th>Metro</th>
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<tbody>
<tr>
<td>Junior/Senior</td>
<td>37%</td>
<td>63%</td>
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</tbody>
</table>

NOTE: *p < .05; **p < .01; ***p < .001; ****p < .0001
Likert Scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Agree; and 4 = Strongly Agree with evaluation items.