PROJECT NAME   Active Learning eStudio

TEAM
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PROJECT DESCRIPTION

What instructional problem did your project address?

Faculty who want to include collaborative learning activities in their courses often find that traditional classroom architecture is a barrier. Rows of fixed seats inhibit group work and make it difficult for instructors to walk among the groups to observe and engage in discussions. Collaborative learning requires physical space in which students can work with their computers, brainstorm on writeable surfaces, and project the results of their work so that faculty (and fellow students) can observe each group’s progress at the room level. The eStudio was envisioned as a collaboration space that would foster experimentation in active learning instruction, and facilitate problem-based investigation, group research, and development of student presentations.

What strategies or approaches were identified to address this problem (i.e., what resources were developed or curricular changes were made)?

The team used GSI funding to design and construct an Active Learning eStudio for faculty teaching gateway science courses on the Homewood campus. The design was based upon findings shared by other universities at the National Forum on Improving Undergraduate Education Through Active Learning Spaces (http://blog.lib.umn.edu/learninglibraries/2011/08/national-forum-on-improving-undergraduate-education-through-active-learning-spaces.html) and through the North Carolina State University’s Student-Centered Active Learning Environment with Upside-down Pedagogies project (http://scaleup.ncsu.edu/). The eStudio includes 5 round tables, each with 7 seats and local projection capability. The classroom walls are covered with writeable whiteboards. Faculty can project to multiple locations from an instructor station or promote student table projections through the multi-routing projection system.
CHALLENGES ENCOUNTERED

What unanticipated challenges arose and how did you adapt the original proposed project (if at all)?

The biggest challenge was finding a classroom to convert to the eStudio format. Classroom space is in high demand on the Homewood campus as a significant percentage of teaching space is controlled by departments and unavailable for shared classroom use. The Registrar, which manages campus shared classrooms, required that if a traditional classroom was to be converted into an active learning environment, student capacity must be equal to or greater than the number of students that could be accommodated in that space before its conversion. The original plan proposed a 64-seat eStudio classroom. The only space available for conversion to an eStudio format within Registrar capacity requirements was 309 Krieger Hall, a small, under-used computer lab that could accommodate a maximum of 35 seats.
A second challenge emerged as the special housekeeping needs of an active learning environment became apparent. White boards, a key component of an active learning classroom, must be thoroughly and frequently cleaned to provide useful work surface for each class. Because of space constraints, we selected a matte finish white board material to perform double duty: writing surface or display surface without glare. While that decision maximized the capabilities of the room, standard felt erasures are not effective on these white board surfaces. We experimented with paper towels and microfiber cloths and spray bottles of water and special chemicals. We learned that microfiber cloths work best for cleaning the surface; but they require regular laundering. The Housekeeping staff was asked to accommodate these special requirements in their classroom support protocols. Housekeeping was also consulted about refreshing the markers required for the white boards.

In addition, the classroom technology support team assumed responsibility for ensuring a continuous supply of Mac laptop adapters for each table’s projection system. The design team did not anticipate the need for a room-wide sound system in such a small space; but in response to faculty requests for sound, speakers were added.

Our conclusions: collaborative teaching and learning spaces require partnerships with housekeeping and technical support staff to ensure seamless functionality for all users. They also require development of a sense of good citizenship within the user community to ensure the environment is consistently ready for all classes.

**IMPACT**

*Faculty comment:* “I really love teaching here. Students walk in and expect something different. They come in, get settled, and are ready to get to work.”

*Student comment:* “The classroom was extremely conducive to discussion between students. I definitely found myself meeting and collaborating with other students a lot more in this class than in any of my other classes.”

**What evaluation (data collection) methods did you use to measure the impact of the project (i.e., what was your assessment plan)?**

1) Faculty surveys – online survey asking questions about instructors’ use of and opinions about the key features of Krieger 309.
2) Faculty focus groups – group conversation about teaching experience in Krieger 309 facilitated by the CER staff.
3) Classroom observations - CER staff observed classroom activities for a sample of courses taught in Krieger 309.
4) Student surveys – students were asked multiple choice and open-ended questions about their experience taking a course in Krieger 309.
5) Student focus group - A focus group was conducted with a class held in Krieger 309 for a separate NSF-funded project. Relevant comments to the physical space are included below.

**Were you able to observe gains in student learning or student retention when the project was implemented?**

Because of space constraints, the physical size of the eStudio was half that originally proposed. Therefore comparison of student learning outcomes measured by comparing courses taught via traditional lectures versus active learning approaches in three of the four courses in the original proposal could be not done. One course, “Civil Analysis,” taught by Professor Judith Mitrani-Reiser, had been taught as a traditional lecture course and as an active learning course. Dr. Mitraini-Reiser used Krieger 309 to teach Civil Analysis using active-learning strategies in Fall 2012. Scores were significantly different (p < 0.05) for students in the 2012 course (mean = 88.4; sd = 4.8) compared to those who took the course in 2010, before active-learning strategies were employed (mean 82.9; sd = 10.1).
Another course taught in Krieger 309 was part of a multi-year NSF-funded educational research project. Prof. Todd Hufnagel used the same concept inventory to evaluate student learning gains in his “Structures of Material” course taught in Fall 2011 and Fall 2012. When the course was taught with a lecture format (Fall 2011), the average score on the concept inventory improved from 32 (out of 100) at the beginning of the semester to 53 at the end of the semester, a gain of 63%. Under the active learning format (Fall 2012), the corresponding change was from 30 to 68, a gain of 127%. In other words the learning gains using active learning were more than twice as large as those using a traditional lecture approach.¹

In two cases faculty commented on the benefits of student groups extending outside of class that could have positive impacts on retention.

- “My course is an entry point to the [departmental] curriculum. I believe students are forming bonds with other students that they will carry beyond this class.”
- “When advising students in my department’s major, however, I’m finding that those who sit at tables together are planning to take classes together in the coming semester. It’s created little communities that extend beyond the classroom. I believe developing these relationships early in the program is important to help students succeed and persist through the engineering curriculum.”

What were the faculty/student perceptions of the project?

Through surveys and focus groups, faculty who taught in the eStudio cited the advantages listed below. One instructor remarked that a student in his class brought friends from another college to “show off” Krieger 309.

- **Annotating Images** – Students and faculty could annotate images projected on the whiteboard. Students could photograph the images and retain them as digital files.
- **Whiteboards** - In general, the whiteboards were cited as the most important feature in the classroom. In two courses, students were encouraged to work on whiteboards instead of paper. Both instructors commented that this is a good working habit – solving problems/proofs on a large, vertical writing surface so the problem can be viewed holistically (see figure 4). Faculty work on research problems using this approach.
- **Round tables** – facilitate student work and interaction.
- **Modeling active-learning** – One professor encouraged groups presenting in class to employ active-learning strategies. Faculty commented that students’ presentations improved remarkably over the semester and the room facilitated it. Another faculty commented that he planned to have TAs teach in Krieger 309 in future semesters. “Teaching experience is important (to show) in a math job search. Recitations should be interactive environments and experiment with its effectiveness. If my TAs can put an extra bullet on their CV about teaching, especially using active learning, they will jump on it.”
- **Faculty provide feedback on student work during active-learning exercises.** “I tell them, ‘Don’t use paper, use your whiteboard.’ I can monitor the whole class working this way and move around the room providing feedback.” Class observations and student comments also highlighted this benefit.
- **Web research** – Students worked in groups to research topics assigned by the instructor and then present findings to the class.

¹ Prof. Hufnagel presented these results at the 2013 Gateway Science Initiative Symposium and the 2013 American Society of Engineering Education conference (http://www.asee.org/public/conferences/20/author_index/24668).
• Faculty walking among groups – An instructor said the room facilitated her practice of visiting groups while they worked on in-class assignments.

A sense of community led to a safe, supportive environment that facilitated peer teaching. One instructor commented, “On days in which students were struggling, I could rely on bright students working in groups to help those struggling. I break up problems into parts that they can work through together.” This was also the case for a course that was computing-intensive. “It’s much more conducive [for peer instruction] than a computer lab where they work more independently and try to shout down the row for help. I can see the teaching going on [between the students], too. Students further ahead help students who are struggling. Students who teach, learn more, and students being helped learn, too.” Another faculty shared that he also noticed that tables of students were interacting more than in previous semesters that he attributed to the layout of the classroom. Student comments echoed the instructors’ perspectives. “It was more interactive. There is more of a closeness [between faculty and students] this semester.” (This student had audited the course the previous year when it was taught using a traditional lecture format.)

When asked if they spent more or less time preparing for class in Krieger 309, all but one instructor said they spent the same amount of time (the outlier spent more time). No open comments expanded on this issue.

Students liked learning in Krieger 309. A typical student observation: “I enjoyed the interactive nature of the classroom set up. Our professor used a variety of teaching methods and the space made student discussions easy.” Other student comments included the following.

• “It felt much more personal.”
• “Whiteboard walls and small group table setting were great. Got to know people in my group, and the whiteboard walls were great for in-class practice problems.”
• “Small size, more interactive, really get to know classmates and professor.”
• “The smaller and more intimate learning environment was more conducive to collaborative learning, and helped me pay attention better.”
• “Going in to the class I knew one other student, and ended up knowing and collaborating with every student who sat at my table outside of the class room.”
• “It was much more personal than other large classes at Hopkins. It helped me get to know the professor better and was a much more chill atmosphere.”
• “I liked the small size of the classroom, which allowed me to better understand what the professor was teaching because I didn't snooze as much and because it was easier to see everything he was writing on the boards.”
• “My table really helped me when I was struggling.”
• A student said he has trouble staying awake in most classes, but that “I was never tired in this class.” (Another student laughed saying “you slept everyday in [another] course.”)

Student comments on the survey question, “What did you like most about taking a course in Krieger 309,” were tagged for common themes. Engaging in group work and participating in collaborative activities were the most commonly cited advantages. Other features that students appreciated included student-faculty/student-student interactions; writeable walls; furniture/layout; computer projection capabilities; and small class size.
Faculty have requested additional active learning classrooms on campus. Several faculty who taught in Krieger 309 made a presentation at the Divisional Business Officers meeting in July 2013 communicating the increasing need for these classrooms. The Department of Physics and Astronomy consulted with the GSI project team on building an active learning classroom for courses with up to 90 students in Bloomberg 478. Classes began meeting in the new room in Fall 2013. The Whiting School Senior Associate Dean for Finance and Administration has also tentatively offered to reserve a space in Shaffer Hall for an active learning classroom after the current occupants move to the new Malone building.

**Will there be changes in faculty or departmental use/adoptions, etc., resulting from your project?**

No changes are planned for the physical space in 309 Krieger. As noted, however, it has served as a pilot for a larger collaborative space in Bloomberg Center for Physics and Astronomy, and faculty from a number of departments and divisions have explored its potential for re-designing spaces elsewhere in the University.

**What changes will be made in the future instruction based on the evaluation that you performed (how did the evaluation act as formative assessment)?**

**How many students used the new resource(s) developed through your project?**
350 students in 2012-13 academic year. See Appendix 1 for list of courses and instructors.

**Were they required to use the resource(s) or participate in new learning activities? If not, why?**

Students taught in 309 Krieger were exposed to active learning instructional approaches. There were no options for non-participation.

**SUSTAINABILITY**

*Faculty comment:* “I love the classroom and will teach here every chance I get. I also recommend it to other faculty to facilitate group activities.”

**How will the project be sustained and who will be responsible for it?**

Krieger 309 is now a general pool classroom that faculty can request through the Registrar. The classroom support unit of the Krieger IT department, which oversees classroom technology at Homewood, has assumed responsibility for maintaining the technology in Krieger 309. Krieger Hall housekeeping staff clean the whiteboards and room regularly.

**How often will this course be taught/resource be used in the future?**

The expectation is that as an addition to the campus pooled classroom resources, the eStudio will be used with increasing frequency each year until capacity is reached.

**Have other faculty or departments adopted the project resources, teaching strategies, or curricular changes?**

The Department of Physics and Astronomy designed an active learning classroom for courses up to 90 students in the Bloomberg 478.

**What lessons learned would you share with faculty who pursue similar projects in the future?**

In the physics class held in Krieger 309, instructors tried to engineer small student groups so there were never two men and one woman because experience showed the female would be left out of conversations. The instructors also tried to create groups that reflected the diversity of academic performance in class. Another faculty noticed that in his course, males and females tended to interact more than in traditional classrooms.

While faculty’s experience teaching in Krieger 309 was overwhelmingly positive, they did have suggestions for improvement.

- *Projection adaptors* – Need to have Mac adapters for students using Apple laptops to project.
- *Whiteboards* – The most frequently cited concern was the difficulty in erasing the whiteboards. While a high-gloss whiteboard is easier to erase, there is significant glare when the surface is used for projection. The design team made a conscious choice to use matte finish whiteboards to accommodate white board exercises while offering a reduced-glare surface for projection. CER worked with housekeeping to ensure boards were fully cleaned on a regular basis.
- *Projection to all tables* – Faculty want projection from any computer to all monitors. One instructor said she would not teach in the classroom again because she needed better projection for student presentations. Note: The classroom was originally designed to provide this capability, but the cost to support it became prohibitive.
- *Clearly demarked faculty area* – Faculty requested a clearly designated teaching podium for mini-lectures they present to class.
• *Projection support* – one instructor asked that instructions for using the projectors in the room (from student tables and from the teaching podium) be made available. Such instructions were posted in the classroom, but this request suggested that they were not obvious enough.

• *Keep room open* – The room could be an excellent study space. Lock up equipment so students can work in this room when it’s not being used to teach courses.

• *Table layout* – Because of the campus classroom squeeze, a small number of courses were assigned to Krieger 309 that were not designed as active learning courses and lectures were the dominant instructional mode. A number of students in Organic Chemistry commented that it was difficult to see the whiteboards from certain locations. This was an issue when the professor used the entire room to lecture. Several students in this course commented that traditional lecture courses should not be assigned to Krieger 309 for this reason. “Don't put classes that don’t need it in this room...it was really uncomfortable and annoying to be at a strange angle to the whiteboards.”

**DISSEMINATION**

**Are you planning to present or publish the results of your project?**

• The final report on the Active Learning eStudio was included along with other Round One GSI Project Reports in the GSI Round One Final Report published on the Provost’s web site in spring 2014.

• The GSI Round One projects, including the eStudio, are highlighted in the upcoming Middle States Self Study.

• A short presentation on the Active Learning eStudio was featured in the 2014 GSI Symposium on Excellence in Teaching and Learning.

• The GSI project reports were highlighted in press releases distributed by the University News and Information staff.

• A report on faculty demand for active learning classroom space was made to the divisional business officers in July 2013.

• CER staff have hosted numerous faculty from JHU departments to demonstrate the classroom’s features (one immediate result: construction of an active learning space to accommodate 84 students in the Bloomberg Center for Physics and Astronomy) and visiting teams from the University of Pennsylvania and from the Montgomery County Center.

**Please describe how others can access the resources you have developed?**

Contact the Center for Educational Resources (cerweb@jhu.edu) or Krieger IT for a tour of Krieger 309. The room is scheduled for courses through the Office of the Registrar.

**Do you give permission for your report to be posted on the GSI website?**

Yes
## Appendix 1 – Courses taught in Krieger 309

<table>
<thead>
<tr>
<th>Fall 2012</th>
<th>Spring 2013</th>
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<tbody>
<tr>
<td><strong>Faculty Member</strong></td>
<td><strong>Course</strong></td>
</tr>
<tr>
<td>Todd Hufnagel (WSE)</td>
<td>Intro to Orgo Chem II</td>
</tr>
<tr>
<td>Judi Mitrani-Reiser (WSE)</td>
<td>Brain Injury &amp; Recovery</td>
</tr>
<tr>
<td>John Lind (KSAS)</td>
<td>Intermediate French II</td>
</tr>
<tr>
<td>John Lind (KSAS)</td>
<td>Multi-Hazard Risk Mitigation</td>
</tr>
<tr>
<td>Judi Mitrani-Reiser (WSE)</td>
<td>Electro Chemistry</td>
</tr>
<tr>
<td>Becky Pearlman (KSAS)</td>
<td>Biology Workshop II</td>
</tr>
<tr>
<td>Lori Graham-Brady / Ben Schafer (WSE)</td>
<td>Structural Reliability</td>
</tr>
<tr>
<td>Bob Allen (WSE)</td>
<td>Biostatistics</td>
</tr>
<tr>
<td>Bob Lessick (KSAS AAP)</td>
<td></td>
</tr>
</tbody>
</table>

- **Fall 2012 Courses:**
  - Todd Hufnagel (WSE): Structure of Materials
  - Judi Mitrani-Reiser (WSE): Civil Engr. Analysis
  - John Lind (KSAS): Honors I Variable Calculus
  - Judi Mitrani-Reiser (WSE): Structural Dynamics
  - Becky Pearlman (KSAS): Biology Workshop
  - Lori Graham-Brady / Ben Schafer (WSE): Structural Reliability
  - Bob Allen (WSE): BME Design Group
  - Bob Lessick (KSAS AAP): Biostatistics

- **Spring 2013 Courses:**
  - Chris Falzone (KSAS): Intro to Orgo Chem II
  - Linda Gorman (KSAS): Brain Injury & Recovery
  - Suzanne Roos (KSAS): Intermediate French II
  - Judi Mitrani-Reiser (WSE): Multi-Hazard Risk Mitigation
  - Peter Searson (WSE): Electro Chemistry
  - Becky Pearlman (KSAS): Biology Workshop II
  - David Neufeld (KSAS): Gen Physics: Sci Maj I
  - Richard Brown (KSAS): Dynamical Systems
  - Bob Lessick (KSAS-AAP): Intro to Bioinformatics