Forward with Integrity Project Final Report

Opening the Box: Rethinking Classroom Flexibility from a User-Based Perspective

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Objective

To articulate a set of use cases and related classroom models for use in making decisions about classroom design and/or renewal.

Methodology

We conducted interviews with approximately 40 faculty members from all of the six teaching faculties. Each interview focused on a particular course recently taught by the interviewee and the classroom assigned for the course. Each interview was 45-60 minutes in length and elicited detailed responses on:

a. Learning activities in and out of the classroom;
b. Learning activities focus on interaction and active learning;
c. Features of the classroom space used;
d. Contribution of the classroom space in aiding or hindering active learning; and
e. Learning activities that would be of benefit if the classroom design allowed it.

The interview scripts were analyzed two different times by different members of the project team. Responses were mapped to themes or categories. In one pass, themes were extracted from the interviews without a prior schema. Recurrent themes were identified in similar comments and grouped together. The second pass was conducted independently without considering the results of the first pass. A schema was developed of the different categories of issues that might arise and comments were mapped onto these categories. The results from both passes were compared and were found to correspond closely with differences only in some of the labeling of the different categories and in the merging or splitting of some categories.

Based on the results we identified the major issues that impact active learning and developed guidelines for different suggested classroom models.

Issues that Impact Active Learning

1. First take care of the fundamentals

   There are some basic factors that are necessary for an adequate teaching/learning environment. Without these, it is superfluous to think about advanced technology, active learning, or innovative teaching strategies. The most important factors are:

   a. Adequate writing/display space for instructors to write or project notes
   b. Clear sightlines for students to be able to see boards/screens from anywhere in classroom
   c. Adequate acoustics
   d. Temperature control, ventilation, noise
   e. Adequate, well-maintained, comfortable furniture with writing space for students
2. **Instructors seek to promote active learning**

100% of instructors in our sample expressed the desire to be able to promote interaction within the classroom and to facilitate active learning by students. While the lecture is still the most common form of instruction, many instructors are interested in exploring other methods such as online learning or the flipped classroom. Instructors who continue to rely primarily on lectures still try to engage students in questions. The strongest barrier to incorporating more active learning in the classroom is neither instructor acceptance nor classroom technology. Rather, class size is the fundamental limit to increased interaction. For a class of more than approximately 40 students, interaction beyond simple Q&A is limited by the availability of additional trained instructional staff.

3. **Consistency**

To the extent possible, classroom facilities across campus should follow a uniform standard. Reducing the number of different access codes that instructors need to be aware of if they are using different classrooms, the different kinds of projectors, playback equipment, and other resources reduces problems related to instructor acceptance and/or technical setbacks.

Within a single classroom, care must be taken that different resources do not clash. For example, most instructors did not express a strong preference between whiteboards and blackboards but did express a strong rejection of the combination boards where instructors have to switch back and forth between chalk and markers. Another example of problematic design is where the screen used to project slides or audio covers most of the blackboard leaving a space that is not usable for supplementary instruction.

4. **Instructors require education & resources**

While the vast majority of instructors (100% in our sample) are interested in incorporating active learning techniques and strategies, few instructors have firsthand knowledge of pedagogical research or have the time to keep up with new studies and innovation. A communications strategy is needed to bring this knowledge to instructors with minimal impact on their already overloaded schedules. Success requires a combination of proactive “push” strategies such as email bulletins, visits to departmental meetings/retreats, and visits to individual instructors, together with “pull” strategies such as regularly scheduled workshops and conferences. In addition, there must be a regularly maintained, well publicized, easily accessible and navigable repository of resources related to pedagogical research and implementation strategies.

5. **Instructors require training & support**

In the same vein, instructors require easy and continuous access to information regarding access and use of classroom facilities. It would be helpful for example to have online manuals, guides, and/or instructional videos specific to each classroom on campus. Access codes should be available online rather than through live support. For example, if an adequate database of classroom resources is built, it should be possible to automatically populate an Avenue course shell with documents accessible only to the instructor detailing access and use instructions for classroom equipment.
6. **Active learning spaces**

Active learning is not limited to the traditional classroom. It is desirable to have spaces that promote student engagement and interaction. This can be as simple as writing walls or open spaces near classrooms.

7. **Ecosystem**

Classrooms are not isolated teaching environments. Classroom teaching is part of the university’s ecosystem and is impacted by myriad factors including course enrollment, scheduling (both time and space), traffic bottlenecks, interaction between the different communities of practice across campus, instructor workload and rewards, teaching culture, and student life. These factors must be considered in classroom design, layout, and scheduling.

**Suggested Classroom Models**

Our study clearly indicates that the most important factors in the design of a classroom strongly depend on the type of use that the room will see, which is strongly correlated with the size of the classroom. We identified four classroom prototypes.

1. **Seminar room**

This classroom style is suited for very small rooms (capacity ~20) for graduate or senior seminar style classes where one or more participants are expected to give formal or informal presentations and there is a strong emphasis on discussion and collaboration. It is also suited for class sizes up to ~75 students where different learning activities and group work are heavily utilized.

   *The most important requirement in such a room is the ease of moving furniture to reconfigure the room layout.* The actual room capacity can vary by up to 20% depending on the specific activities used.

   This room requires:
   - a. Movable furniture
   - b. Writing tables for individual or group use
   - c. Multiple writing surfaces (blackboards, whiteboards, or writeable wall space)
   - d. Easily accessible power supplies for student equipment
   - e. Stations for students to be able to present their work including multiple overhead projectors or remote access to a central projector
   - f. Room for students and instructors to move
   - g. Access to the room should be designed to ease traffic flow into and out of the classroom to facilitate transition between classes
   - h. Technical support for instructors to help them setup different activities throughout the term

2. **Medium lecture classroom**
This type of room is suitable for sizes up to ~200 students. It is primarily intended for lecture style classes but should allow for some interaction between students and instructor. At a minimum, discussion should be encouraged and facilitated. Ideally, some limited group work should be possible.

*The most important requirements in such a room are optics and acoustics involved in communication between students and instructor and between students and each other.*

This room requires:
  
a. Multiple presentation modes accessible to the instructor: LCD projector, laptop connectivity, document camera, playback equipment, blackboard/whiteboard: at a minimum, the instructor must be able to simultaneously use the projector and the blackboard/whiteboard
b. Zone lighting control to allow dimmed lighting needed for display while still allowing adequate light for students
c. For classrooms seating more than ~40 students, sloped seating and a horseshoe layout rather than theater style rows
d. For classrooms seating more than ~75 students, multiple microphones (ideally at the seats, alternatively cordless microphones that can be circulated among students)
e. Tables are preferred to tabbed chairs
f. Room between rows to allow instructor to reach students during discussions
g. At least some limited mobility for seats (e.g. swivel seats) to allow students to turn and form groups for short term activities

3. **Design studio**
   
   This type room is intended to permit group activities and/or projects for large classes. The desire for such a setup has been expressed by instructors teaching very large classes. In principle, this design is scalable given adequate instructional staff. Ideally, there would be two adjoining rooms with a capacity up to 300 students each that can occasionally be combined for one large class.

*The most important requirements in such a room are technology to allow student groups to present their work to the entire class and adequate space for students and instructional staff to move around.*

This room requires workstations, each of which is designed for 6-8 students. Each workstation should have roundtable seating, large shared workspace, and power outlets. Additionally, the room requires:
  
a. Space for instructor to setup notes, models, computer, etc.
b. Projector that can be connected to laptop, desktop computer, document camera, playback equipment, or writing tablet
c. Students access to be able to display their work – this can either be via electronic access from any workstation to a central projector or by having multiple overhead/LCD projectors each accessible to one or more workstation

d. Zone lighting control

e. Adequate sightlines to allow students at any workstation to clearly see material projected by instructor or other workgroups

f. Adequate acoustics and/or multiple microphones to allow students to present their work and/or ask questions and engage in discussions

g. Room to allow students and instructional staff to move between different workstations

4. Large lecture theater

The fourth type of classroom required on campus is the lecture theater for large classes.

The most important requirement in such a room is to provide the instructor with sufficient ability to control lighting and equipment to be able to effectively communicate with the entire class.

This room requires:

a. Zone lighting control with separate controls for lights near the screen and lights over the student work area

b. Well-designed acoustics and audio equipment

c. Enough microphones for students to be encouraged to engage: microphones at the seats or shared between 2-4 seats are ideal; if cordless or stationary microphones are used then they have to be easily accessible to the students so as not to create a barrier to student engagement

d. Aisle space for the instructor to move to be able to engage different segments of the class

e. Multiple screens such that the instructor can project multiple documents, slides, or pages of notes simultaneously

f. A curved layout rather than straight theater-style rows

An innovative room layout that has been suggested for this application is the arena style lecture theater. In this arrangement:

a. The control station stands at the center of the room, with chairs arranged in circular rows on a sloped floor

b. The control station allows the instructor to project from up to four different sources onto eight screens

c. Opposite screens are paired so that each display can be adequately seen by all the students in the room

d. The displays are controlled from a mobile tablet so that the instructor does not have to remain standing at the center of the room but is able to move around
Available sources include laptop computer, desktop computer, playback equipment, scanner/document camera, and the mobile tablet which can be used as a writing surface.

A wireless microphone is available for the instructor, and individual or shared microphones are available at the seats.

The mobile tablet allows control of lighting as well as volume control, brightness/contrast, and other basic functions.

Sufficient internet bandwidth and power outlets are available for students.

While the above description is ideal, it is possible to compromise on some of these features while still creating an effective instructional space. The most important features to observe are:

a. Lighting control, sightlines, and acoustics
b. Flexibility for the instructor to simultaneously present material from multiple sources
c. Curvature in seat layout to allow students to feel that they can enter in conversation with each other

Conclusion
This project examined the need for different learning spaces based on studying the way in which instructors currently use space and the ways in which they would like to be able to use space. Our main conclusions are:

1. Classroom design and upkeep must first and foremost ensure the basic requirements such as sightlines, acoustics, environment control, cleanliness, and maintenance.

2. Classroom design is only one component in promoting active learning – it can only operate within a teaching culture that promotes and enables active learning inside and outside the classroom and provides the spaces and administrative and technical support for it.

3. “Flexibility” in classroom design means different things in different contexts – for small classrooms or design studios the emphasis can be on movable furniture and space, but rooms are needed to enable effective lectures and still engage students. We have presented four different classroom “types” that meet the needs of different kinds of learning environments that were identified from our interviews.