Immersive Synchronous Lecture Initiative

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Overview

During the planning process for the University’s newly released physical master plan, Rutgers 2030, Sasaki Associates submitted a memo—“Operational inefficiencies and their effect on travel demand”—identifying opportunities for Rutgers University–New Brunswick to reduce course-related student travel, and the initial findings from the memo informed central recommendations in the final plan. Volume 1 of Rutgers 2030 opens by succinctly highlighting a longstanding critical challenge, one that shapes the student experience on the New Brunswick campus: “too many students spend too much time getting to, from, and between their classes.”1 The burden on the University’s transportation network leads to clear systemic stresses: increases in traffic and congestion; overcrowding on busses and delays in travel; and increased environmental pollution. Moreover, these operational inefficiencies have a direct impact on our students’ academic experience, affecting their ability to register for the courses they want and to take courses in the required sequence, which, ultimately, influences their time to degree.

In the memo, the Sasaki team outlined four approaches for the University to consider in addressing course-related student travel, including investigating solutions that deploy “Technology-Aided Instruction,” in particular the potential of “synchronous classrooms,” where broadcast technology would enable faculty members to teach to both live and remote lecture audiences simultaneously. Synchronous classrooms would provide opportunities to reduce course-related student travel by keeping students on or close to their “home” districts and having their professors move virtually to them, which—in coordination with parallel efforts to introduce new scheduling and registration software platforms and to better coordinate the business processes between the offices responsible for scheduling, registration, housing, and transportation—will have a measurable impact on these operational inefficiencies and improve our students’ overall academic experience.2

The widely publicized “Holodeck” distance classroom project connecting Rutgers Law School classes in both Newark and Camden demonstrates the potential of synchronous learning environments, but inherent classroom size constraints with this solution limit the impact the model could have on substantial intercampus course-related travel reduction at Rutgers

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2 A student’s “home” district refers to: residence hall location for residential students; the district closest to a student’s residence for off-campus students; the designated parking location for commuter students.
University–New Brunswick. A pilot initiative to create lecture-sized classrooms, however, will enable the University to measure both the impact on student course-related travel and the pedagogical efficacy of large-scale synchronous instruction. The success of this initiative will require the project leadership to coordinate four interrelated imperatives:

1. **classroom design**;
2. internet protocol (IP) video and classroom **technology**;
3. **scheduling and registration optimization** to identify classes that would provide the greatest impact on course-related travel;
4. **faculty recruitment** to identify local instructors who would embrace redesigning their courses to take advantage of this instructional model.

Once the classrooms are operational, they will require ongoing **support**, both from instructional technology and IT staff, and from appropriately trained teaching assistants, who will help instructors lead the remote sites. Finally, the initiative will include robust **assessment** to measure both the impact on course-related student travel and the effectiveness of the synchronous lecture model on instruction and student learning outcomes.

Piloting synchronous lecture classrooms in two of the four districts at Rutgers University–New Brunswick (Busch and Cook/Douglass) and carefully assessing their use will enable Rutgers to evaluate further strategic investments in synchronous lecture classrooms to connect the remaining districts in New Brunswick, our campuses in Camden and Newark and our Rutgers Biomedical and Health Sciences (RBHS) locations, and, potentially, our Committee on Institutional Cooperation (CIC) peer institutions, which would facilitate genuine cross-institutional course sharing. Of course, synchronous lecture classrooms represent simply one of many promising avenues for technology-enabled instruction. Ultimately, Rutgers must continue to develop a coordinated institutional plan to keep pace with advances in instructional technology, which will include classroom environments like the “Holodeck,” online and hybrid instruction, and testing centers, which provide monitored testing locations for both online/hybrid and standard courses. Yet, the promise of synchronous lecture classrooms—and the central feature that distinguishes them from more fully online solutions—is that it will allow Rutgers to use what is now increasingly affordable high definition broadcast video technology to have a measurable impact on course-related student travel while maintaining the hallmarks of the **residential university experience**: hands-on learning; student-faculty interaction; and student-student interaction.

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3 The “Holodeck” solution only accommodates 24 students at each location.

*Immersive Synchronous Lecture Initiative*
Immersive Synchronous Lecture Classrooms

Classroom Design

Cost-effective audio/video solutions available today make streaming between locations a seemingly trivial task, and many classes at Rutgers are currently taking advantage of these options. Creating a successful synchronous lecture environment that produces the immersive experience necessary for effective instruction, however, requires the classroom design to address three central challenges:

• the remote audience must see the instructor life-size in high definition;
• the instructor must be able to see and hear the entire remote audience in order to interact with them effectively;
• the live audience must be able to see and hear the entire remote audience and the remote audience must be able to see and hear the entire live audience, so both sites imagine themselves as members of the same class.

Addressing these design challenges means that Rutgers cannot simply retrofit current lecture halls; a successful design must consider:

• maximum seating potential and the necessary seating arrangement;
• camera placements, viewing angles, projection angles, and screen placements;
• room dimensions, including ceiling heights and necessary tiering/sloping.

Rutgers has identified a design currently being employed by the Wharton School of Business at the University of Pennsylvania that has addressed these key design constraints (see Appendix A). A team from Rutgers made a site visit to Wharton and is currently working with an architectural firm to produce pilot site design concepts to modify the Wharton solution to accommodate a larger, lecture-seating design (see Appendix B). The Rutgers team will continue to work with the architects to produce design standards that will be used both for the pilot project and for potential future synchronous lecture classrooms.

IP Video and Classroom Technology

The immersive synchronous lecture initiative will require broadcasting sophisticated high definition audio and video between the two pilot sites. The long-term potential of this solution, however, requires that Rutgers consider the scalability and interoperability of the underlying technology from the beginning of the project. To the degree possible, the project team will determine which vendors and which protocols best support connecting multiple sites, including additional sites in New Brunswick, sites in Newark and Camden and at RBHS locations, and, potentially, sites at our CIC peer institutions. In addition, the Wharton solution includes a
separate broadcast room, where an instructor can present to remote audiences without being in front of a live classroom; for example, for Rutgers, that would enable an instructor to teach from a broadcast room in New Brunswick to remote lecture halls in Newark and/or Camden (see Appendix C). Of course, the broadcast room option does not need to be included in the pilot initiative. The Rutgers team will determine, however, whether this option is desirable in the future when determining the underlying technology chosen for this initiative. Finally, the classrooms will also be able to be utilized as standard classrooms—thereby extending their utility when they are not in use as synchronous classrooms—so the chosen solution will have to work seamlessly with Rutgers’ standard classroom technology designs.

**Scheduling and Registration Optimization**

Maximizing the impact of the proposed synchronous classrooms on course-related student travel requires first identifying which courses produce the most travel between the campuses chosen for the pilot sites and then creating mechanisms to intentionally register students into the appropriate sections on—or closest to—their “home” campuses (see Appendix D for an initial list of potential courses, which was compiled to identify large enrollment courses that produce high student travel). Of course, identifying the best candidates to be scheduled into the proposed classrooms will also help the project team determine the desired room capacity during the design phase—the classrooms do not need to accommodate a maximum of, for example, 400 students if the top candidates for assignment into these rooms have an average maximum enrollment of 300. Likewise, determining the desired classroom size from a design perspective might potentially spur discussions at the department level about adjusting section enrollment, if the resulting configuration would accommodate more—or, potentially, fewer—students. In any case, the success of the initiative will require extensive scheduling and registration optimization and the active participation of the schools and departments whose courses would most benefit from assignment into the immersive synchronous lecture classrooms.

**Faculty Recruitment**

Once the project team members identify courses that will yield the greatest impact on course-related student travel, they will recruit candidates from among the faculty who regularly teach these courses, faculty who appreciate the promise and importance of this initiative and who would embrace the necessary course redesign to ensure the classes taught in these rooms would be educationally effective. Naturally, these candidates would have both a comfort and facility with technology. More importantly, faculty who would be most successful in these classrooms would
appreciate the instructional paradigm created by this synchronous environment and would incorporate techniques to keep both the live and remote sites actively engaged in the course activities. In addition, to be most effective, the faculty member would have to alternate between the two sites, either on a class-by-class or weekly basis, so both sets of students would benefit equally from access to a “live” professor. The project leadership team will engage the academic leadership in the schools and potential faculty members from the beginning of the initiative to elicit ongoing feedback about design and implementation and to ensure that faculty have enough time to redesign courses so they are prepared to teach in the classrooms once they are ready for use.

Support and Assessment

Though the interface for the proposed solution will follow the same design principles of Rutgers’ current classroom instructional technology—namely, that it is intuitive and user-friendly—the sophisticated technology necessary for this initiative will require an enhanced level of classroom support to ensure they remain dependably online. In addition, the project team will consider additional support for the faculty teaching in these classrooms, including appropriately trained teaching assistants at the remote sites and additional instructional technology support to incorporate elements like electronic polling to help keep the live and remote audiences actively engaged. The project team will also work with the academic leadership at the participating schools to consider course release for faculty for course redesigns.

The stated objective of this initiative is to reduce course-related travel, so the project will build in mechanisms to measure the impact of the initiative on student travel and make recommendations for the best placement of future classrooms to reduce travel, if the University leadership determines after the pilot phase that additional strategic investments are warranted. Of course, the ultimate goal of this project—and of envisioning tomorrow’s university—is to enhance our students’ educational experience, so this initiative will also include assessment of the effectiveness of the synchronous lecture model on instruction and student learning outcomes. The project leadership team has engaged the Office of Institutional Research to develop the appropriate survey instruments and assessment metrics.
Appendix A: Wharton Telepresence

Wharton partnered with Cisco to create a “telepresence” solution to connect large classrooms in Philadelphia and San Francisco. An instructor on either coast can place a “call” to the other classroom and appear life-sized in high definition on a floor-to-ceiling screen in the front of the remote classroom. In the rear of both classrooms, two large screens show all of the students in the other classroom—the left and right screens for the left and right sides of the rooms. The audio and video are seamless with no delay, and the system enables content sharing between the two sites, including the ability for students to wirelessly share their own content.

Throw Mode

In “throw mode,” the live audience sees what one would typically expect to see in an in-person classroom: content is projected on two screens at the front of the room and/or on LCD screens on either side of the room. The instructor can also utilize vertical sliding blackboards at the front of the room.

The instructor sees both the live audience and, on large projection screens at the rear of the classroom, the remote audience. A smaller “confidence” monitor in the rear of the classroom can be used for a self-view or, alternately, it can project the instructor’s content, depending on the instructor’s preference. Audio/video allows audiences to interact with the instructor and peers.
In “catch mode,” the remote audience sees the instructor life-sized on a floor-to-ceiling screen at the front of the classroom. Instructor content can be shown on the side LCD’s and/or on an overlay on the front screen’s upper left area. The instructor controls if and where content is projected.

The remote audience sees the audience from the live site on large projection screens at the rear of the room. The center aisle room design allows each half of the room to be captured by individual video cameras. Directional room audio microphones allow students at both locations to interact with the instructor and with each other. Note the content being shared via the side display.
Appendix B: Pilot Sites

WRIGHT RIEMAN 128

LOREE 024

Immersive Synchronous Lecture Initiative
Throw Mode

The elevations shown depict Wright Rieman 128 in “throw mode,” where instructor is present.
The renderings below depict the front and back elevations of Wright Rieman 128 in “throw mode,” where instructor is present.
Catch Mode

The elevations shown depict Loree 024 in “catch mode,” where the instructor is projected onto a floor-to-ceiling screen.
The renderings below depict the front and back elevations of Loree 024 in “catch mode,” where the instructor is projected onto a floor-to-ceiling screen.
Appendix C: Broadcast Room

The Wharton “telepresence” solution includes an option for an instructor to teach to a remote site without being in front of a live classroom—or having to teach in any empty classroom, which, obviously, is inefficient for classroom utilization. A specially designed “broadcast” room enables the instructor to see and interact with the remote audience. A potential scenario for Rutgers might include an instructor in a broadcast room in New Brunswick teaching to classrooms in Newark and/or Camden.

The audience sees a life-sized, high definition projected image of the instructor at the front of the room. The instructor’s content is displayed on the side LCDs (pictured here) or as an overlay on the large front screen in the upper left corner.

The broadcast room offers the presenter a view of two large LCD’s, displaying the left and right sides of the remote classroom, and a smaller LCD confidence monitor. An option for Rutgers would include green-screen technology to enable instructors to project any image—including presentations—behind them.