

Teaching and Learning in the Digital Age

*A Final Report from the Committee on Near- and Long-Term
Impact of Instructional Technology*



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EXECUTIVE SUMMARY

We envision tomorrow's Rutgers to be one where students are immersed in a novel 21st century learning ecosystem that brings to bear rich infrastructure and innovative instructional technology to create a customized learning experience for each individual student. Learning spaces, from state-of-the-art active learning and immersive telepresence classrooms to new distributed online teaching and learning environments accessible from any mobile device, will be seamlessly linked, and powerful academic social networks informed by real-time data on student learning will enable new connections between learners and educators. By leveraging existing assets, creating new organizational and physical infrastructure, and launching bold new projects, we will cultivate a culture that embraces excellence in teaching and learning in the digital age, enhances modern education, and ultimately transforms the student experience at Rutgers and beyond.

This final report of the Committee on the Near- and Long-Term Impact of Instructional Technology has been informed by extensive research and consultation with Rutgers faculty, staff, students, and senior administrators across the University, as well as leadership representatives at peer and aspirational peer institutions.

The committee stands behind the goal to elevate Rutgers visibility and commitment to excellence in teaching and learning, driven by evidence-based approaches and enabled by cutting-edge technology and learning environments. Taking key steps toward this goal, the committee recommends action on the following critical imperatives which will be coordinated with university and existing campus level infrastructure:

- **RADII:** Create the Rutgers Academic Discovery & Innovation Institute (RADII) to spearhead and showcase instructional technology innovations.
- **Modern testing:** Build modern testing facilities to enable transformation of our academic assessments and provide a modern environment for large scale testing for core courses.
- **Intercampus connectivity:** Invest in mid-tier technology that provides low-cost distributed intercampus classroom connectivity.
- **Teach the Teachers:** Expand and highlight Rutgers' rich network to "teach the teachers", such as programs for peer-to-peer instruction and junior faculty training that offer opportunities for intensive professional development, mentorship, and support in teaching and learning.
- **NB Office of Teaching and Learning:** Create an Office of Teaching and Learning, led by a Vice-Chancellor, that brings together new and existing units including peer teaching, professional development, space management, instructional technology innovation, instructional design, assessment, and modern testing.
- **Rutgers Teaching & Learning Collaborative:** Form campus-level committees to coordinate teaching and learning resources and a university-wide collaborative, comprised of representatives from campus-level committees and key university level leaders, to set standards, review and advise on funding priorities, and share best practices.
- **Sustainable budget:** Develop a sustainable budget model for the full spectrum of online and hybrid courses that rely heavily on the use of instructional technology with the goal of having funds distributed locally to enable strategic investment to be made into teaching advancement based on local priorities.

OVERVIEW

This strategic plan¹ constitutes the final report of the Committee on the Near- and Long-Term Impact of Instructional Technology (ITC), which reports directly to President Barchi. It has been informed by extensive research and consultation with Rutgers faculty, staff, students, and senior administrators across the University, as well as leadership representatives at peer and aspirational peer institutions.

The committee strongly believes that key instructional technology innovations, leadership and resources should concentrate at the campus and school levels to support the core mission of individual campuses. The University's Academic Affairs leadership must oversee and coordinate the strategic planning and implementation of instructional technology at Rutgers, with key support provided by the Office of Information Technology and University Facilities and Capital Planning. This foundational principle highlights the centrality of instruction and positions technology as a facilitator for effective teaching and enhanced learning inside and outside the classroom.

The following report outlines a comprehensive instructional technology plan to support excellence in teaching and learning in the digital age by integrating three critical imperatives: *Instructional Advancement*, *Teaching and Learning Spaces*, and *Organization and Accountability*.

To drive new instructional technology innovations at Rutgers and engage instructors and students in the use of innovative instructional technology to support evidence-based teaching and learning, the committee proposes a framework for *Instructional Advancement* that leverages existing assets at Rutgers and introduces vital new infrastructure to:

- Create the Rutgers Academic Discovery and Innovation Institute (RADII), a vanguard institute to enable discovery and showcase transformative instructional technology innovations;
- Build prototypes for: 1) a state-of-the-art cyberlearning ecosystem that globally connects students with educators and instructional resources, 2) mid-tier technology that provides

low-cost distributed inter-campus classroom connectivity, and 3) modern testing facilities that enable large-scale testing to be performed and new modes of assessment to be explored.

- Construct a rich network to “teach the teachers” at Rutgers, including undergraduate peer-to-peer programs, graduate digital fellows programs, and faculty training and support;
- Highlight instructional innovation at Rutgers through public campaigns, academic publications and presentations designed to elevate our visibility and leadership;
- Focus institutional resources to: 1) coordinate University-wide Learning Management Systems; 2) deploy interoperable, synchronous conference/classroom communications across Rutgers; and 3) enhance teaching assessment and evaluation;
- Develop a sustainable budget model for hybrid to fully online courses, and instructional technology innovations;
- Explore creative ways to encourage and enable faculty to develop the full spectrum of hybrid to online courses, and instructional technology innovations.

To design and maintain state-of-the-art *Teaching and Learning Spaces* that reflect our shared commitment to instruction, the committee recommends that the University restructure its practices for the organization and management of instructional space to:

- Adopt a holistic approach to instructional space as a “common good”²;
- Form standing campus committees to maintain standards for instructional spaces;
- Develop a sustainable budget model that considers renovation and upkeep costs of instructional space, including the instructional technology;
- Create campus-level offices where needed to coordinate the units responsible for instructional space.

Finally, to ensure the University can maintain its commitment to 21st century education and provide sustainable support for the development, implementation, and assessment of innovative

instructional technology in support of excellence in teaching and learning, the committee proposes a *Leadership and Accountability* framework as follows:

- The Office of the Senior Vice President for Academic Affairs, in coordination with the Office of Information Technology and University Facilities and Capital Planning, will provide strategic direction on major academic issues.
- Leadership for instructional technology should reside at the campus level to ensure that investments and operations align with the distinct missions of the campuses. Camden, Newark, and RBHS have organizational structures in place and it is proposed that an Office of Teaching and Learning in New Brunswick is created, headed by a Vice Chancellor, to bring together the numerous separate offices that now exist.
- An Advisory Council for Teaching and Learning should be created at each campus that includes both faculty and administrators to enhance communication between the providers and users of educational services.
- A Rutgers University Teaching and Learning Collaborative should be formed, composed of representatives of the campus Advisory Councils and leaders from the Offices of the Senior Vice President of Academic Affairs, Information Technology, and University Finance and Capital Planning.

VISION FOR THE FUTURE

Instructional Technology refers to the technology and infrastructure required to support Teaching and Learning in the Digital Age.

We envision the Rutgers of tomorrow to be one that transforms the student experience through immersion in a modern learning ecosystem where educators and learners interact seamlessly in a blended digital and physical learning environment that is informed by rich networks, and equipped with tools and infrastructure to promote teaching and learning. The creation of the RADII as a premier institute for discovery and innovation in instructional technology will take great steps toward our goal of having Rutgers broadly recognized as among the nation's leading public universities, preeminent in research, excellent in teaching, and committed to the community.

Through strategic planning, collaboration, and assessment, Rutgers University will become a model for teaching innovation in higher education, establishing itself as a leader within the Big Ten Academic Alliance (formerly known as the CIC, or the Committee on Institutional Cooperation) and across the country. By leveraging the broad and diverse resources available within our institution, we will empower our faculty and staff to conduct and publish cutting-edge research that highlights best practices in innovative teaching methods and utilizes state-of-the-art technology. We will build the necessary infrastructure to enhance teaching and learning, ensuring individuals, organizations, and universities throughout the state, nation, and world will turn to Rutgers as a leader in the field.

Students will seek out Rutgers University for their education knowing that our institution is committed to pushing the forefront of instructional innovation and producing the highest quality learning environments. We will support our faculty, instructional staff, and students by giving them access to cutting-edge academic technologies, flexible learning spaces, and rich training resources, building the foundation for Rutgers graduates to become active, engaged, life-long learners.

Through decisive action and ongoing commitment, we are confident the vision outlined in the following strategic plan will be realized, enabling Rutgers to achieve its stated goal to be broadly recognized as among the nation's leading public universities.

BACKGROUND

The Committee on the Near- and Long-Term Impact of Instructional Technology (ITC) was formed by President Barchi in May 2014 as one of the two University-wide strategic planning committees. The committee was charged with developing a strategic and tactical institutional plan for the design, implementation, and assessment of innovative instructional technology at Rutgers. The President tasked the committee with developing a plan that provides the necessary infrastructure and organizational support, while being responsive to the rapidly changing landscape of instructional technology.

The ITC planning effort was executed in two phases:

- Phase I: data collection, analysis, and assessment used to identify strategic goals and inform the strategic planning effort. The Phase I endpoint is marked by the [ITC Interim Report](#), which was completed in April 2015 and is available online.
- Phase II: development of specific initiatives to advance our strategic goals and facilitate the tactical deployment of instructional technology to ensure that the University will continue to fulfill and enhance its mission in the 21st century. The Phase II endpoint is marked by the submission of this ITC Final Report, which describes critical imperatives that are supported by both long- and short-term initiatives.

Several overarching themes became apparent during the committee's work on the Phase I report:

- The term instructional technology needs to be updated to acknowledge that technology is implicit in teaching and learning in the digital age. This redefinition foregrounds instruction and views technology as facilitating effective teaching and enhanced learning inside and outside the classroom;
- Rutgers faculty and students are eager for leadership to drive effective institutional initiatives in a strategic, sustainable, and forward-thinking manner;
- Strong coordination between different units is

imperative to seamlessly integrate instructional technology into the University's educational mission;

- We are in a rapidly changing world of information technology, where new paradigms in education continuously emerge, providing the opportunity for Rutgers to become a pioneer and leader in instructional technology innovation.

These themes guided the discussions at a facilitated, day long ITC workshop in February 2015, from which the committee identified three strategic planning goals for Phase II:

1. Advance the development and application of effective teaching and learning methods and practices through the use of innovative instructional technology;
2. Standardize and enhance instructional spaces; develop technology-enabled alternative learning spaces; and build the infrastructure necessary to virtually connect learning spaces, students, and instructors;
3. Encourage and enable coordination, access, and effective exchange of information, content, and capabilities throughout the University community.

These goals gave clarity to the ITC's vision for the future and formed the foundation of the critical imperatives of this strategic plan.

The plan is also founded on the University's commitment to provide equitable access to learning opportunities for all students. Accessibility is the standard by which our teaching methods, learning environments, and course materials are measured for being as approachable as possible to as many students as possible, especially students with disabilities or differences. The Rutgers community is dedicated to eliminating barriers and helping our students succeed. The committee proposes that accessibility and usability be considered in all aspects of our institutional strategic plan for the design, implementation, and assessment of innovative teaching technology at Rutgers.

INSTRUCTIONAL ADVANCEMENT

The digital age offers exciting opportunities to transform teaching and learning at Rutgers. As both technology and research in education advance, it is inevitable that new instructional methods and practices will emerge in higher education. In fact, instruction and technology are inextricably linked in the modern teaching environment. We cannot simply apply digital technology to old practices; instead, the goal is to understand and engage with the ways digital technology transforms old practices. Rutgers must provide the infrastructure and resources necessary to help our faculty and students develop innovative instructional approaches informed by education research and enabled by transformative digital technology.

Along with Rutgers, our peer and aspirational peer institutions are mobilizing their faculty and students to thrive in this environment of rapid technological change by combining instructional technology and evidence-based teaching methods. While different universities are at different stages, our committee believes that Rutgers is in a strong position to lead in this area. Across our four campuses, we already have many resources in place for instructional advancement. Better coordination of these resources would maximize their impact, provide additional support for programs that demonstrate promise, and better communicate their value and importance, both within and beyond the University.

Instructional advancement begins with investing in those who are at the center of our educational enterprise—our students and faculty. To ensure that those who teach— including faculty, graduate student teaching assistants, and undergraduate peer leaders— have the resources and training they need to excel, the committee proposes the following recommendations:

- *Create transformative infrastructure* to facilitate discovery and innovation in instructional technology;
- *Develop a rich network* of faculty development opportunities available to faculty, instructional

staff, graduate students, and undergraduate students to teach the teachers building upon the existing University-wide network of faculty development and training that currently exists for faculty and instructors of all types, and graduate students;

- *Highlight instructional innovation* through ongoing campaigns and academic publications both inside and outside the university to emphasize Rutgers' leadership and commitment to instructional technology;
- *Focus our instructional resources*, including our learning management systems, communications systems linking learning spaces across Rutgers, and evaluation and assessment systems;
- *Create a sustainable funding model* to support courses from hybrid to online that has the flexibility to respond to emerging technology trends and provides incentives for schools, departments, and faculty to create online and hybrid courses and instructional technology innovations with the necessary support and training.

Infrastructure for Instructional Technology Innovation



RUTGERS ACADEMIC DISCOVERY AND INNOVATION INSTITUTE (RADII) STRUCTURE

Technology is reshaping education. The future of higher education will be greatly influenced by several important factors:

- *Diverse time and place* - eLearning and flipped/immersive synchronous/VR classrooms offer greater opportunities for remote, self-paced learning that enhance interactive, face-to-face instruction;
- *Student-focused learning* - active, inquiry- and project-based learning paradigms that are learner-centric, and establish context through “field experience”; learn by doing!
- *Personalized instruction* - adaptive learning tools that navigate individual strengths and weaknesses, inform learning networks, and customize the student experience.
- *Assessment* - measurement of skill competency and learning objective mastery provides valuable real-time data, enables educators to respond to learner needs, and empowers students to take ownership of their progress and learning goals.

- *Learning ecosystem* - the institution’s role is to create a vibrant learning ecosystem where educators and learners interact seamlessly in a blended digital and physical learning environment that is informed by rich networks, and equipped with tools and infrastructure to promote teaching and learning holistically.

A strategic priority of the University is to establish Rutgers as a pioneer and leader in instructional technology innovation. Toward this end, the committee recommends creation of a marquee institute to spearhead and highlight this effort. The *Rutgers Academic Discovery and Innovation Institute* (RADII) will house state-of-the-art laboratories engaged in pushing the boundaries of instructional technology to improve teaching and learning. The RADII will provide a collaborative environment to engage faculty, teaching staff, instructional designers, education researchers, and students in cutting edge projects that explore new technology-enabled teaching paradigms, and leverage new types of available data to create a new learning ecosystem at Rutgers that will transform the student experience.

The RADII will contain the following key components:

- Virtual and Augmented Reality lab
- Cyberlearning Technology lab
- Invention and Design Fabrication lab
- Incubator for Instructional Technology Innovations
- Research, Analytics, and Assessment group
- Innovation Showcase

The Virtual and Augmented Reality lab will explore the use of new and emerging immersive, synchronous environments (e.g., Computer Automated Virtual Environments, 3D cinematography, and user interface devices) to create innovative activities and experiences at the forefront of technology-aided instruction.

The Cyberlearning Technology lab will focus on the development of digital technology that enhances the student experience, facilitates collection of meaningful data on student learning, and enables synchronous, dynamic peer-to-peer interactions through academic social networks.

The Invention and Design Fabrication lab will establish a workshop where faculty, staff and students go to learn about, experiment with, and create prototypes of new technologies for education, and facilitate integration into courses and programs.

The Incubator for Instructional Technology Innovations will provide infrastructure and support to harden new technologies and serve as a springboard to move beyond consumption to creation.

The Research Analytics and Assessment group will perform data analytics and assessments, and conduct research into the effectiveness of instructional innovations being used in Rutgers classes.

The Innovation Showcase will serve as a stage to showcase, demonstrate and test drive instructional technologies being developed and applied at the RADII, and provide a gateway for media exposure, and public and private outreach.

The RADII will be a faculty-aligned academic unit that will develop and deploy pioneering innovative instructional technology. The RADII will have faculty governance, transparency of operation, and coordination with the Offices of the Senior Vice President for Academic Affairs, Information Technology, and Institutional Planning and Operations.

The RADII's initial project portfolio will include the development of prototypes for: 1) a state-of-the-art cyberlearning ecosystem that globally connects students with educators and instructional resources, 2) new classrooms with mid-tier technology that provides low-cost distributed inter-campus connectivity, and 3) new modes of assessment. These are key areas for making next-generation instructional technology investments that promise to have broad impact on higher education, and are described in more detail below.

Cyberlearning ecosystem. The RADII will spearhead the creation of a vibrant learning ecosystem where educators and learners interact seamlessly in a blended digital and physical learning environment that is informed by rich networks of student data (including data generated from activities and performance tasks generated on the fly), and equipped with tools and infrastructure to promote teaching and learning holistically. Toward

this end, modular technology components will be developed that ultimately will come together to form the foundation of a flexible, extensible digital learning ecosystem. These integrated technologies will address advancements in the following areas:

- Student interaction with technology
- Adaptive eLearning tools
- Data networks to enhance student learning

Mid-tier technology for distributed connectivity. The infrastructure to support university-wide interoperable connectivity with high bandwidth will enable new paradigms to connect classrooms using “virtual teaching and learning environments.” Virtual teaching and learning environments are an emerging technology that offers a powerful set of tools that can be customized to meet the needs of different modes of instruction ranging from large synchronous physical or online classes to individual peer-to-peer interactions. They can also be used to enhance physical classroom activities, connect multiple classrooms, or be used to create a completely distributed classroom anywhere on campus at very low cost. The RADII will develop powerful integrated virtual teaching and learning environments that contain the following customizable modular components:

- Interactive virtual whiteboards
- Customized audio and video streaming
- Smart chat boxes
- Student engagement tools
- Class management tools
- Custom palettes
- Tracking capability

New modes of assessment. In support of the RADII's activities, infrastructure will be developed to pilot next-generation student assessments that leverage new technology being developed at Rutgers and elsewhere. Student assessment is a crucial element to the success of our University-wide academic initiatives, and a necessary component of any strategic approach to instructional technology. Recent developments in cognitive science and information technology have opened the door for new paradigms in student testing that promise to significantly improve teaching and learning.

The RADII will develop technologies that will move beyond generic bubble-filling, Scantron-graded common-hour exams, to create personalized assessments based on cognitively challenging performance tasks that can be taken asynchronously to allow flexible scheduling and/or multiple assessment attempts. Leveraging adaptive eLearning tools, cyberinfrastructure and multiple forms of media, assessments can be created that contain interactive, multistep problems designed to deeply probe each student's mastery of concepts and problem-solving skills. The data collected by such assessments will inform networks able to identify the origins of individual learning obstacles, and afford a mechanism for delivery of personalized instruction at scale. These RADII innovations will have clear synergy with the broader goals of the proposed Academic Assessment Initiative (described below under Teaching and Learning Spaces), and will be supported by its infrastructure, including new modern testing facilities and assessment specialists.

The RADII's focus is on research and instructional technology innovations that support the core teaching and learning goals of programs directed towards matriculated undergraduate and graduate students.

The Division of Continuing Studies (DoCS) provides centralized tactical support operations for online learning, University-wide, serving 95% of all online credit courses, graduate and undergraduate, providing both faculty and student support. In addition, DoCS is the primary agency within Rutgers which promotes lifelong learning to non-matriculating students from across New Jersey and the nation. Between the research and innovation work of RADII and the central tactical support of DoCS, there are great opportunities for synergy that would benefit both students and faculty. Specifically, the RADII's Virtual and Augmented Reality lab will collaborate closely with the Game Research and Immersive Design unit within DoCS, which has been engaged with virtual worlds, augmented reality, and game and app development for the past decade. Further, the activities of the RADII's Invention and Design Fabrication Lab will coordinate with those of the University Makerspace under DoCS, which works with multiple schools across Rutgers and provides guidance and specifications for the development of local makerspaces. As the RADII evolves, it is anticipated that additional touchpoints with DoCS will arise that will allow for shared ideation, development, and execution of educational innovations.

Teach the Teachers

During the survey and data collection phase, the committee identified exciting innovations in instruction at Rutgers that could be expanded and more widely applied across our many schools and campuses as well as promising programs at peer institutions. The following section outlines examples of select programs in place, providing concrete initiatives to focus our resources and advance our instructional mission. We recognize the importance of the key contributions from instructional staff including part-time lecturers and non-tenure track faculty, as well as peer-to-peer teaching and learning at the graduate and professional levels. In the following section, we highlight successfully established models of “teach the teacher” efforts among undergraduate peer learning assistants, graduate student teaching assistants, and faculty members, from new faculty to experienced senior faculty, and recommend focusing “teach the teacher” efforts on these three cohorts.

Undergraduate Peer-to-Peer Teaching and Learning

In an institution as large and diverse as Rutgers, the undergraduate student body itself is an invaluable instructional resource. The formalized, active engagement of students sharing knowledge with their peers improves learning outcomes for both peer “leaders” and peer “learners.”³ In New Brunswick, peer learning programs at the Learning Centers serve over 13,000 undergraduates (~39% of the undergraduate population in New Brunswick) per year.

A tremendously successful program housed in the Learning Centers is the Learning Assistant (LA) Program. Demand by students and faculty for LAs is rapidly accelerating, from serving 5 courses in the School of Arts and Sciences five years ago to serving over 30 courses in the School of Arts and Sciences, the School of Environmental and Biological Sciences, and the School of Engineering in 2015-16, and an anticipated 55 courses in 2016-17. Although it is already one of the top LA programs in the country, additional investments and resources are necessary to sustain the strategic expansion of the program. In addition, changes to department-based peer learning programs in Chemistry and Math have been inspired by the success of the LA Program in New Brunswick.

A leading edge program currently in development is the Academic Social Network pioneered by Rutgers’ Cyberlearning Innovation and Research Center. The Academic Social Network is a powerful example

of how students can be matched as peer mentors to students who require extra assistance using data generated by student activities (i.e. online homework, recitations, team learning activities, etc.). For example, students struggling with a particular concept in their homework can be connected to relevant content, instructors, and, especially, peers and peer mentors who have mastered that concept.

To build and coordinate peer learning programs in New Brunswick, the committee strongly recommends that the Learning Centers be positioned as a central hub for both administrative and instructional resources. In addition, the committee recommends that all Rutgers campuses with undergraduate programs investigate the value and effectiveness of peer-to-peer teaching and learning. And, of course, our investments in instructional technology will further facilitate peer learning by increasing modes of interaction, including online office hours, study sessions, and recitations.

Graduate Digital Fellows Program

To prepare our graduate students for careers in research and teaching, it is our responsibility to provide the training and tools they need. To address this need, Digital Classroom Services in New Brunswick has proposed a novel initiative: the Graduate Digital Fellows program where each graduate student fellow is paired with a faculty member in the same discipline. Together, they are provided with ongoing training

and support to explore innovative teaching methods and emerging instructional technology, enabling them to reimagine course design and delivery and take full advantage of the ever-growing digital tools and resources that are available. As a requirement for the program, each pair develops or redesigns a course to be offered within the next year, including assessment metrics to measure the effectiveness of new teaching methods. The proposed program would have a positive impact on the graduate digital fellows, faculty, and students. The fellows benefit from discipline-specific professional development they receive from the faculty member, and both fellows and faculty receive the training, experience and mutual support in learning instructional technology. And most of all, the students in the course realize the benefits.

Faculty Training and Support

Our most valued instructional resource is, of course, our faculty. To ensure that our faculty have the training and support they require, our “teach the teacher” efforts with instructional technology must therefore focus on training tools and support for both new and senior faculty members, and include broad access to instructional design and incentives for instructional innovations.

New Faculty Training

The committee recommends developing competitive fellowships for entering faculty. The goal is to assist and support a select group of new faculty to prepare for their initial teaching assignments. Campuses and schools would nominate applicants, with the winners making up the first cohort of 20 participants. The program will include introductory and follow-up workshops, and monthly (or more frequent) meetings of small peer groups—4-5 new faculty members in similar disciplines from the cohort, joined by an experienced senior faculty facilitator. If successful, this program could be extended to a larger number of new faculty.

Faculty Fellows

To provide instructional technology training and support for senior faculty, the committee recommends modeling programs on Rutgers University–Camden’s well-developed Digital Teaching Fellows program,

The rapid pace of advancements in instructional technology and innovative teaching methodologies creates challenges for faculty to implement such practices. Rutgers currently provides support to new and seasoned faculty across all campuses through a variety of venues (e.g., group, individual, presentations, online) to promote best educational practices. A small sampling of professional development exemplars offered across Rutgers University includes: The Center for Educational Research and Innovation (School of Nursing), Center for Teaching Advancement & Assessment Research (University level), Teaching Matters and Assessment Center (College of Arts & Sciences), and the Center for Teaching Excellence (Stuart D. Cook, M.D. Master Educators’ Guild).

The concept of the Digital Teaching Fellows originated when Camden received The NJ Equipment Leasing Fund Grant for updating campus Internet connection and acquiring new computing and digital equipment for classrooms including interactive screens to enable instructors to utilize “flipped classroom” techniques using iPads, tablets, and other mobile devices that enhance student engagement. The Digital Teaching Fellows receive training from the Office of Instructional Design & Technology in effective use of this instructional technology for face-to-face courses. The Fellows select a specific class, complete a full-day workshop, and later present their redesigned course to each other. Many fellows subsequently participate in ongoing sessions coordinated by Instructional Design & Technology and TMAC (Teaching Matters and Assessment Center).

which provides training in instructional technology and evidence-based teaching methods. There have been two cohorts of Digital Teaching Fellows (35 faculty in 2014 and 25 in 2016) in Camden from the schools of Arts and Sciences, Nursing, Law, and Business. This program has created a ripple effect throughout the Camden campus, with faculty fellows inspiring their colleagues with presentations at the annual E-Learning Conference—now in its third year—on their implementation of innovative pedagogies.

Access to Instructional Design

Instructional design is a systematic process used to develop or re-design a course based on evidence-based learning practices. The process begins with an analysis of learning goals and objectives and then develops a delivery system to meet them. It ends with the implementation of the design and an iterative evaluation process. Numerous organizations at Rutgers offer faculty support and expertise in instructional design. Most, but not all, focus on online courses.

The committee recommends that existing units pivot to support, equally, in-person courses as well as broaden the scope of access to teaching staff. An excellent model is the “Scholarship Circles” initiative developed within Rutgers Biomedical and Health Sciences where teams of 4-6 faculty work together to perform research in teaching and learning with technology. RBHS supports these circles by supplying expertise in instructional and research design.

Promote Instructional Innovation

To promote grassroots, faculty-driven instructional innovation, the committee recommends that the University develop additional programs modeled on the Instructional Computing Fund (ICF) Competition in the School of Environmental and Biological Sciences (SEBS) in New Brunswick. The program supports faculty projects that incorporate instructional technology into the curriculum and enhance teaching and learning. Examples of funded projects include Web applications to enhance classroom instruction and enhance student participation; innovative uses of networked laboratories; and applications for smart classrooms; and robust assessment of learning outcomes. The committee further recommends that the University develop mechanisms to evaluate these innovative projects and to support the broad implementation of those that demonstrate promise.

“Scholarship Circles” at the Rutgers School of Dental Medicine in Rutgers Biomedical and Health Sciences (RBHS) are small groups of faculty that engage collaboratively to advance the scholarship of teaching and learning with technology. Scholarship circles conduct empirical research on the current and future use of technology and share that research in peer-reviewed journals, expanding knowledge and advancing Rutgers’ reputation in this area. It is a new program that currently has three circles with approximately 14 faculty involved and is led and supported by Academic Affairs within RBHS.

The Instructional Computing Fund Competition at SEBS supports faculty projects to enhance instruction with technology across its diverse units, including Landscape Architecture (to better facilitate visualization and transmission of concept plans), Ecology and Evolution (to develop portable sensors to collect real-time environmental data), Microbiology and Biochemistry (to support efforts in molecular modeling and visualization) and Marine and Coastal Sciences (to enhance connectivity with Rutgers remote marine field stations via videoconferencing and enable faculty stationed at these locations to enter into the normal teaching rotation).

Highlight Innovative Teaching and Learning

Across Rutgers, there are stunning examples of innovation in teaching and learning. The committee recommends that the University enhance and coordinate its efforts to publicly highlight and promote the innovations in instruction practiced on our campuses. It serves Rutgers well to celebrate our accomplishments in teaching and learning with our students, alumni, donors, and community partners. In particular, supporting and encouraging Rutgers faculty to share innovations in academic research publications enhances our profile in this area among peer and aspirational peer universities.

Medical simulation is an exciting innovation in health care education that allows students and trainees to practice their knowledge and skills before treating patients. At Rutgers Biomedical and Health Sciences, the Clinical Skills Center (CSC) in the New Jersey Medical School incorporates advanced, simulation-based training to provide learner-centered, realistic simulations of routine and complex clinical encounters, enhancing healthcare education, quality care, and, ultimately, patient safety. To prepare for real clinical situations, students and trainees practice on “standardized” actors who have been carefully coached to simulate patients, and on sophisticated mannequins. Advanced medical simulation, using state-of-the-art equipment, high-fidelity patient simulators, and standardized patients, is utilized at the School of Nursing at the Center for Clinical Learning to provide undergraduate and graduate students with realistic, evidence-based patient care experiences that develop clinical reasoning, critical decision-making, team-building, and technical skills.

The School of Environmental and Biological Sciences is creating a “data-enabled marine science lab” designed to turn the Raritan River—which bisects Rutgers University – New Brunswick—into a living classroom by leveraging Rutgers’ Center for Ocean Observing Leadership (COOL) and a new research vessel and floating laboratory, enabling students to participate in hands-on research science in the Raritan River estuary.⁴ This interdisciplinary initiative uses environmental science to link oceanography, molecular ecology, genomics, computer science, bioinformatics, statistics, and modeling, introducing students to real world scientific research. The unique framework created by the Raritan Initiative integrates education and research across Rutgers’ internationally recognized departments, uniquely positioning the University to be a world leader in cutting edge environmental education. The initiative builds on significant financial commitments into cyberinfrastructure and environmental sensing platforms, including the NSF’s ~\$380 million investment in the Ocean Observation Initiative, which is aimed at outfitting diverse oceanic regions with sensors to produce real-time data streams.

One stream of innovative practice in instructional technology at Rutgers is focused on finding new formulations of one of the oldest educational tools - the classroom itself. Synchronous classroom instruction, when led by an excellent educator, has instructional power difficult to replicate. Beginning with “Holodeck” classroom spaces in the Law schools in Camden and Newark that permit two groups of students to effectively share on instructor through full-size video displays, more spaces are being developed along this model which allows faculty to teach local and remote students simultaneously. Immersive Synchronous Lecture Classrooms are now being piloted in multiple locations on the Rutgers New Brunswick campus using broadband digital video technologies to bring quality instruction to geographically diverse groups of students across campus.

The Cyberlearning Innovation and Research Center (CIRC) is spearheading targeted efforts to transform teaching and learning at the University, including creating innovative new digital tools designed and implemented at CIRC to deliver customized instruction at scale, tools that allow synchronous, on-demand interaction between students, peer mentors, and instructors, and that provide adaptive and cooperative online learning activities. These technologies have already demonstrated tremendous educational promise, and CIRC faculty and staff continue to work with departments and units to further develop web-based platforms and to introduce them into Rutgers classes to support evidence-based approaches to teaching and learning. These tools have already transformed the undergraduate general Chemistry program in New Brunswick by creating online Chemistry Interactive Problem-solving Sessions (ChIPS) and weekly thematic workshops designed to identify and assist struggling students. The activities are offered throughout the week, and they can be completed on a laptop, tablet, or mobile device from virtually anywhere, allowing for flexible scheduling and dramatically reducing the need for transportation. This model is now being used in the Department of Mathematics in New Brunswick.

Increasingly, universities are providing seemingly informal spaces designed to encourage students to “tinker”—to learn by doing. For example, the Rutgers Makerspace⁵ in the Division of Continuing Studies—a local instance of the larger “maker space” movement growing across the country—provides resources and training for students, faculty, and staff to create hands-on projects using the latest in 3D printing, fabrication tools, and new media technology. The Makerspace has: helped model medical devices, air sampling devices, robot parts; created 3D masks for research projects in psychology; and printed 3D models for virtual worlds. Similarly, the Collaborative Academic Versatile Environment (CAVE) in New Brunswick—part of the Computer Science Instructional Labs—was designed to provide a collaborative space for students to work on group projects in Computer Science. And, adjacent to the CAVE is the Hack R Space, a “hackerspace” that creates an environment for students to explore and build electronic devices, perform actual computer security testing on live machines, and demonstrate their work to potential entrepreneurial investors.

Focus Institutional Resources

The committee has identified three key areas that require immediate action to enable the University to move forward with our goals for teaching and learning in the digital age. These three areas—Learning Management Systems, Connectivity and Learning in the 21st Century, and Teaching Evaluation and Assessment—provide part of the critical infrastructure upon which our future ambitions are built. The committee strongly recommends that senior leadership immediately mobilize the relevant stakeholders and subject area experts and that they establish an aggressive timeline for actionable recommendations to focus these critical institutional resources.

Learning Management Systems

The use of Learning Management Systems (LMS) at Rutgers has evolved organically over the last fifteen years. Separate campuses, schools, units, and departments have adopted diverse strategies and different software platforms. Though the committee understands and appreciates the desire for both flexibility and customization that has led to this largely decentralized model, what is now our broad institutional reliance on these platforms requires that we review our overall strategy for this critical instructional investment. The committee has recommended that the University create a task force to determine whether a rationalization of Learning Management Systems at the University or campus levels would be more efficient and effective, and, ultimately, more beneficial to the long-term success of our students. This task force has been convened, and is moving forward with making recommendations, including policies for instructional design and LMS support. As this task force is exploring a new LMS strategy, the committee further recommends that the University investigate new ways to increase the effectiveness and faculty adoption of best practices in the use of Learning Management Systems through campus-level instructional design support. For example, the latest study by the Educause Center for Analysis and Research (ECAR) on undergraduates and information technology reports that more than 50% of the students surveyed want their faculty to use their LMS more.⁶

Connectivity and Learning in the 21st Century

In the age of connectivity and mobility, universities increasingly have the ability to extend the boundaries of the traditional classroom for both synchronous and asynchronous instruction. For example, at Rutgers,

the School of Law and the School of Business—each with locations on different campuses—have invested heavily in high connectivity classrooms that allow their faculty to teach synchronously on multiple campuses. In New Brunswick, immersive synchronous classrooms allow students to attend courses at their “home” location rather than traveling to another location by bus.

RBHS, due to its geographical position of straddling different cities, has great need for technology that would bring cities together, allowing students in one location to benefit from faculty in another. While certain key investments will have to be made at the RBHS level, others - such as the standardization of video conferencing and communication technology to ensure interoperability - would be beneficial if made at the university level.

Further, high connectivity classrooms (and conference rooms, etc.) also serve to connect the University to the larger global community, enabling guest lecturers, traveling faculty, or entire remote audiences to participate regardless of location. The committee recommends that the University pursue a comprehensive communication and collaboration strategy with a common enterprise infrastructure to facilitate connectivity.

Teaching Evaluation and Assessment

The Rutgers University Strategic Plan proposes rewarding “best practices in teaching and evaluation of learning” in faculty “performance evaluations and promotion decisions” as one of four core initiatives.⁷ Our current methods and structures for the evaluation of teaching and the assessment of learning outcomes, however, need to be rethought. The committee recommends that the University review our evaluation

processes—including investigating best practices at our peer and aspirational peer institutions—and overhaul them as needed. Moreover, the committee recommends that the University investigate mechanisms to ensure that teaching is weighted more heavily during the tenure and promotion process, so the commitment our faculty members demonstrate toward their teaching is recognized and rewarded. As an example, mechanisms to achieve this goal are already in place in Camden via the Committee on Review and various Appointments & Promotions Committees.

To support innovation in teaching and learning, faculty members often turn to grants and external funding agencies. The outside funding agencies require that proposals include plans for serious assessment of the results and institutions are expected to conduct their own assessments. To assist faculty in being more competitive for external funding for innovative teaching projects, the committee recommends that the University invest in assessment infrastructure and support to measure student learning outcomes.

Create a Sustainable Budget Model to Support the Entire Spectrum of Courses from Hybrid to Fully Online

To transform teaching and learning for Rutgers students, it is crucial to develop a sustainable budget model to ensure ongoing incentives and funding for the creation and implementation of hybrid to online courses and other digital innovations. Instructional design support, custom technology development, and technical support for faculty all require significant institutional investments.

Toward this end, the budget model to support online and hybrid courses needs to be comprehensive and well-defined. The University's current academic support policy gives only a vague funding structure for online courses, and has no mechanism to support hybrid courses at all. Clearly, this policy must be thoroughly re-developed so as to align with the university's strategic plan and budget model to create a sustainable dynamic that enables the development of effective online and hybrid courses as well as an integrated, online learning community. The budget model should include mechanisms that provide resources for the full spectrum of hybrid to online courses, and flipped classrooms that rely heavily on the use of innovative instructional technology to support evidence-based approaches to teaching, blended learning, and modern forms of assessment. Of primary importance is that resources generated by tuition, online course fees and other appropriate sources (such as a portion of the Student Computing

Fee) feed back to the supporting units and sending schools, with the goal of having these funds controlled locally to enable appropriate strategic investment to be made into teaching advancement based on local priorities. The committee recommends the creation of a task force charged with addressing these issues comprehensively and developing a sustainable budget model for online and hybrid courses that can promote teaching innovation and advancement to meet the needs of each campus.

Looking ahead, the committee believes that online and hybrid instruction will continue to grow in higher education, including in large, gateway courses. Though the committee is committed to maintaining the hallmarks of the residential university experience—namely, teaching and learning centered on in-person interaction between students and faculty—online and hybrid courses for our residential students will facilitate course scheduling and ease Rutgers' space and transportation constraints. Of course, student success in these courses will require students to have access to additional academic support, as well as to dedicated spaces for testing. The committee strongly recommends that the University develop a comprehensive strategy for online and hybrid education, including creating a sustainable funding model that accounts for the total infrastructure and instructional costs.

INSTRUCTIONAL ADVANCEMENT: KEY INITIATIVES AND AIMS

Infrastructure for Instructional Technology Innovation

- Create Rutgers Academic Discovery and Innovation Institute (RADII) to engage in innovation in teaching and learning.
- RADII will contain laboratories focusing on virtual and augmented reality, invention and design fabrication, commercial incubator, and innovation showcase.
- RADII's initial projects will include: 1) a state-of-the-art cyberlearning ecosystem, 2) mid-tier technology for distributed classroom connectivity, and 3) new modes of assessment.

Teach the Teachers

- Undergraduate peer-to-peer teaching and learning.
- Graduate Fellows program.
- New faculty training fellowships.
- Faculty training and support.

Highlight Teaching and Learning at Rutgers

- Highlight instructional innovation at Rutgers for the public, our students, alumni, and community partners.
- Develop a campaign in the public and academic arenas to establish Rutgers' leadership.
- Reach potential students and faculty, donors, corporations, alumni, the NJ public, the Big Ten Alliance (formerly known as the CIC), other peer institutions, and the academic community.

Focus Institutional Resources

- LMS coordination.
- Interoperable communications among auditoriums, classrooms, and conference rooms.
- Teaching evaluation and assessment.

Create Sustainable Funding Model to Support Hybrid to Online

- Support instructional design, technology innovations and technical support.
- Develop a budget model to ensure sustainable funding for courses from hybrid to online and other digital innovations.

TEACHING AND LEARNING SPACES

Both the University Strategic Plan and the Physical Master Plan highlight the pressing institutional need to reassess our practices for organizing and managing our instructional space. Though it accounts for a relatively low percentage of our total assigned square footage — 23% in Newark, 21% in Camden, and only 14% in New Brunswick⁸ — instructional space is one of the University’s most intensely used physical resources.⁹ As the primary site for our students’ academic experience, our instructional spaces should reflect the importance we place on teaching and learning. Yet, we have struggled to keep pace institutionally with the ever-growing importance that technology plays in modern instructional environments, both for what has become standard technology-enabled instruction and for distance and hybrid teaching applications. Moreover, current trends in higher education pedagogy—which focus increasingly on active learning models that promote team-based problem solving—necessitate a complete reevaluation of traditional instructional spaces.

To address these foundational changes in the nature and importance of instructional space, this committee strongly proposes five interrelated recommendations:

- 1) The University treat instructional space as a “common good”—which, at the campus level, means they are independent from the respective schools and departments—and adopt a holistic understanding of instructional space to include classrooms, instructional labs, learning centers, testing centers, and proposed common learning spaces, e.g. learning commons in repurposed library spaces;
- 2) Each campus create a standing committee comprised of faculty, staff and administrators to develop and maintain up-to-date standards for the respective instructional spaces and assess their use and effectiveness;
- 3) The administration develop a funding structure that accounts for the total cost of the ongoing renovation

and upkeep of all instructional space—including the ever-greening of instructional technology;

4) Chancellors create an office on their respective campuses—which might include coordinating and consolidating existing offices—to organize and manage this fundamental institutional resource.

5) The University launch an Academic Assessment Initiative to advance and modernize our assessment practices by building pilot testing facilities on each of the geographic campuses, hiring the first assessment specialists to assist in creating and administering modern assessments, and incentivizing a select group of initial departments to convert their assessment measures and practices.

A Common Good

As with our peer institutions,¹⁰ control and management of instructional space at Rutgers is distributed across departments, schools, and the central administration, creating operational inefficiencies that often lead to perceived shortages with different types of instructional space—despite having sufficient overall square footage, as defined by the Council of Education Facility Planners International (CEFPI) guidelines—and to an uneven distribution of high quality instructional spaces. These inefficiencies are particularly acute on the New Brunswick campus, where the legacy of the former college system continues to create challenges “to operating an efficient and connected campus.”¹¹ While there will always be a need for a percentage of school/department-specific space (i.e. “makerspaces,” music studios, chemistry labs, etc.), the committee strongly recommends creating an institutional structure that treats instructional space as a “common good,” enabling efficient assignment of these spaces to maximize use and distribution across all schools.¹² Moreover, the committee recommends expanding the understanding of the term instructional space beyond traditional classrooms to include instructional labs, learning centers, testing centers, and common learning spaces in student centers, instructional buildings and libraries.

The committee’s recommendation for central coordination of instructional space will enable:

- 1) Efficient *scheduling* of instructional space to optimize usage and, particularly in New Brunswick, reduce course-related student travel;
- 2) Effective *campus planning* to address the needs of the entire institution rather than simply individual departments or schools;
- 3) Smart space design that is responsive to *pedagogical shifts* that increasingly focus on student-centered, active learning;
- 4) Spaces that foster *interdisciplinary research and teaching*.¹³

As in higher education more broadly, rigid academic divisions are increasingly breaking down across our campuses and institutionally, we need to be responsive to this fundamental shift and imagine a university that is interconnected rather than a collection of siloed departments and schools. University instructional space that serves all of our students and faculty—from general purpose classrooms, which are the central sites for in-class instruction, to university-wide learning centers, which provide vital hubs for research, teaching, and learning that happens outside of regular classroom hours—must be treated as essential institutional resources, supported by strong, well-articulated leadership and the necessary funding to ensure they reflect the value we place on our educational enterprise.

Instructional Space Committee

The committee recommends that each campus create a standing Instructional Space Committee—reporting to the campus-level office responsible for teaching and learning—comprised of faculty, staff and administrators. This committee would be responsible for developing and maintaining up-to-date standards for the respective instructional spaces, including classroom technology, Wi-Fi and mobile device support, assessing their use and effectiveness. In

higher education, our understanding of instructional spaces has been transformed in recent years, primarily due to rapid and ongoing advances in instructional technology and to new approaches to pedagogy that move away from traditional lecture formats and increasingly toward student-centered active learning models. Of course, to a large degree, these shifts in pedagogy have been spurred and enabled by our increasingly ubiquitous instructional technology. For

example, so-called “flipped” teaching models—like those pioneered through MIT’s TEAL project—allow faculty and departments to post high-quality lectures online for students to view asynchronously before class, enabling in-class work and activities that focus on helping students engage with the material from the lectures. Locally, Rutgers faculty and departments have been introducing sophisticated, interactive online recitation sections in large, introductory courses, both in an effort to more efficiently deliver one-to-many recitation instruction and to enable more effective use of in-person, classroom activities.

An overarching theme that will be of paramount importance is to establish standards for classrooms that enable access and utilization of online technology within an ever-evolving digital learning ecosystem. This will require baselines for high-capacity Wi-Fi bandwidth and support for use of mobile devices in all classrooms, and is emphasized in the critical imperative to implement interoperable, communications supported by high-bandwidth networks. These capabilities will become increasingly important as teaching paradigms make increasing use of advanced virtual teaching and learning environments that allow global classroom connectivity, as well as a host of student engagement, active learning and class management tools.

These fundamental changes in teaching and learning necessitate an ongoing commitment to ensuring that our instructional spaces remain current. With continuing advances in instructional technology, this is, naturally, a daunting task. Nonetheless, our students and faculty expect and deserve reliable, high quality instructional technology across our campuses, and thus Rutgers must move beyond the traditional understanding of instructional space as chalkboards and seats to one that imagines ubiquitous technology and innovative classroom design that supports the academic enterprise.¹⁴ The Instructional Space Committee would develop standards for the different types of learning spaces—including high-tech seminar rooms, active learning classrooms, including new active learning lecture spaces, and learning centers and learning commons—and ensure these standards remain up-to-date. Moreover, this committee would be tasked with assessing the use of these spaces based on learning outcomes and recommending refinements and adjustments based on this ongoing assessment. The campus Instructional Space Committees would further coordinate closely with the Campus Teaching and Learning Advisory Councils described in more detail below.

Sustainable Funding

The committee strongly recommends that the University build sufficient, sustainable funding for all instructional space to account for the total cost of the ongoing upkeep of these spaces, which must include both “evergreen” funding for instructional technology and funding for the design, building and renovation, and maintenance of the physical spaces. Again, the committee recommends that the University adopt a broader understanding of instructional space that includes not only classrooms, but also instructional labs, learning centers, testing centers, and proposed learning commons in repurposed library spaces. Creating sufficient funding streams for our University-wide instructional spaces will be a complex and multifaceted endeavor. Nonetheless,

the committee views the transition to RCM as an invaluable opportunity to undertake a broad reassessment of all of our instructional space and to ensure the necessary, ongoing funding for this essential institutional resource.

The significant costs of high quality instructional technology in higher education necessitate that the University develop a robust funding model to adequately support our instructional spaces, which are fundamental to the institution. Moreover, the committee strongly supports the recommendation from *Rutgers 2030* that the University develop the infrastructure to broadly deploy synchronous instruction, where “broadcast technology can enable

professors to move virtually to students, rather than students moving to professors as they currently do. These changes have the potential to reduce travel to classes, thereby enhancing the educational experience and reducing strain on the physical infrastructure.”¹⁵ These technologies in the education space are still rapidly evolving, and it is an integral part of the

RADII’s initial project portfolio to advance their capabilities to meet the needs of Rutgers students and classes. Major investments in these types of foundational resources require University-wide coordination to ensure they are deployed efficiently and effectively.

Campus Leadership for Instructional Space

Over time, all Rutgers campuses have developed offices that are designed to address different aspects of instructional spaces: i.e., classroom scheduling, classroom technology support, instructional design, learning centers, etc. As the work of these individual offices has become increasingly interrelated and complex with advances in technology and crosscutting instructional practices, operational inefficiencies have developed, inhibiting our ability to best support and advance teaching and learning at Rutgers.

The committee strongly recommends that the Chancellor’s offices on the respective campuses develop thorough inventories of units responsible for instructional space and create a central leadership structure to best manage and coordinate these units through the offices responsible for teaching and learning. Creating this leadership structure at the Chancellor’s level will maintain the proper alignment with the Instructional Space Committees on each campus, ensuring that the standards that are generated by the committee are applied properly in practice. Moreover, this level of central leadership will be best positioned to manage and direct the funding streams created for instructional space.

Though this new leadership structure should include consolidating and realigning existing offices to coordinate resources more effectively, it will also involve formalizing some current implicit relationships between units that have developed organically over time but have never been articulated. For example, the instructional labs on campuses are still largely department based, which has led in some cases to unreliable funding for the upkeep of

these labs, and, in other cases, underutilization of this valuable institutional resource.¹⁶ The committee supports the recommendations from *Rutgers 2030* that calls for both strategic planning for instructional lab space and the use of better space data and ongoing collaboration with the schools and departments to ensure these spaces are both adequately used and adequately supported.¹⁷ Similarly, *Rutgers 2030* recommends the creation of learning commons in repurposed library spaces on the respective campuses.¹⁸ The office dedicated to teaching and learning at the Chancellor’s level would align the learning commons with the teaching and learning spaces connected to the broader campus community, which would inhibit them from becoming siloed.

Perhaps the most critical component of this coordinated approach to instructional space is the direct articulation between academic planning and our physical plant. The committee strongly recommends formalizing the relationship between the campus-level offices for teaching and learning under the Chancellors—which are responsible for ensuring our spaces are being informed by current academic needs—and University Facilities and Capital Planning. Moreover, the committee recommends designating a University architect to be solely responsible for working directly with these offices on instructional space design. The University architect would be a standing member of the Instructional Space Committee on each campus, helping inform the committee on architectural trends in instructional space design and ensuring that the University instructional space design standards developed by the committees remain current.

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Academic Assessment Initiative

Academic assessment—both the testing of disciplinary knowledge taught in courses and the evaluation of skill building and learning outcomes over time—are at the core of the educational enterprise. Yet, while higher education more broadly has embraced the fundamental transition from paper-based to digital media, with few exceptions, our assessment methods have remained virtually unchanged over the past 50 years. The failure to adapt these methods and to leverage digital media inhibit our ability to deliver assessments more flexibly and efficiently. Creating enhanced assessment environments at Rutgers will enable the University to address the logistical challenges associated with traditional assessment practices, allowing us to shorten exam periods, reduce student exam conflicts, and eliminate night and weekend exams. Most importantly, taking advantage of digital media to create customizable assessment measures that adjust to student responses, mine the data from those responses, and inform classroom instruction has the potential to transform the overall learning experience for our students.

The committee strongly recommends that the University commit to the long-term goal of fundamentally overhauling our assessment practices to incorporate digital media and customized assessments, which includes hiring assessment specialists who will support departments and faculty and assist them in creating and delivering state-of-the-art, disciplinary-specific assessment measures. To

begin realizing that goal immediately, the committee strongly recommends that the University: build pilot testing facilities on each of the geographic campuses; hire the first assessment specialists to assist in creating and administering modern assessments; and incentivize a select group of initial departments who currently rely heavily on testing and assessment to convert their assessment measures and practices. These testing facilities will not only preserve the academic integrity and support of academic success, but will develop next-generation student assessments that leverage new technology.

The proposed pilot testing centers would provide the first large-scale, computer-based testing facilities on any of the Rutgers campuses. Faculty will be able to have exams proctored throughout the day and throughout the week independently of their regular course meeting times, rather than being limited to times and spaces that only allow common hour exams to be held on evenings and weekends. In addition, the testing centers can be utilized for make-up exams, accommodated exams for students with disabilities, and exams for students who take online courses at Rutgers and elsewhere. Finally, when they are not in use solely for Rutgers University students, the testing centers could be utilized for standardized exams, such as SAT, GRE, MCAT, LSAT, and TOEFL, which will also generate additional funding streams for the testing centers.

TEACHING AND LEARNING SPACES: KEY INITIATIVES AND AIMS

- Treat instructional space as a “Common Good.”
- Form standing campus-level Instructional Space Committees reporting to the respective offices responsible for teaching and learning, to strategically plan and maintain standards for instructional space and classroom technology.
- Develop a sustainable budget model for learning spaces.
- Create campus-level leadership structure to best manage and coordinate units responsible for space.
- Launch Academic Assessment Initiative to advance and modernize our assessment practices.

LEADERSHIP AND ACCOUNTABILITY

To achieve, maintain and enhance excellence in teaching and learning, a first-class educational institution requires an organizational structure that supports teaching and learning with continual innovation. Because teaching and learning are inseparable from instructional technology in the modern higher education environment, any effective structure must consider them as a coordinated whole.

At the university level, strategic direction is needed on major academic issues at the forefront of higher education that have implications for the Rutgers residential educational model over the next decade and beyond. The Office of the Senior Vice President for Academic Affairs (SVPAA) should provide institutional leadership on these issues. However, the integral role of technology and physical resources in teaching and learning requires strong collaboration and coordination among the SVPAA, the Office of Information Technology (OIT), and Institutional Planning and Operations (IPO), which encompasses University Facilities and Capital Planning (UFCP).

On January 13, 2017 Barbara Lee (SVP, Academic Affairs) and Michele Norin (CIO & SVP, OIT) announced a realignment of instructional technology resources under their respective offices. Changes include:

- The migration of learning management systems to DoCS under Academic Affairs at the University level.
- The migration of instructional design support to DoCS.
- The migration of areas within OIT that are related to instructional technology, pedagogy, teaching with technology, training, helpdesk support and eLearning support to DoCS.
- The transfer of technology support and service level agreements for server and desktop computer support to OIT under IT at the University level.

The committee envisions this reorganization as an important first step towards the ultimate goal of

rationalizing these critical and very distinct resources. While an LMS is clearly an enterprise-wide system that should be coordinated centrally, the committee strongly believes that, more broadly, instructional technology support for online, hybrid, and flipped classroom instruction must be firmly grounded at the campus level in order to adequately serve faculty and student needs. While Academic Affairs at the University level will work in tandem with the Rutgers Teaching and Learning Collaborative to serve as a focal point for overall coordination of efforts, the majority of resources and support for instructional design and technology innovation must reside at the campus level in order to work closely with faculty to meet the needs of Rutgers' residential student population.

It is the committee's vision that the proposed new Office of Teaching and Learning in New Brunswick will serve as the epicenter for teaching and learning innovation and dissemination in New Brunswick, just as similar structures have been successfully deployed at the Newark and Camden campuses. Within the OTL-NB, the RADII will serve as the nucleation site for innovation originating from New Brunswick-based faculty. This campus-centric approach is based on the following factors:

- Instructional and technical innovation and support services at aspirant-peer institutions are based at the campus level, and not under continuing studies at the university level.
- Instructional technology resources and innovation should be driven by the needs of the campuses; as such, major decisions regarding instructional technology infrastructure at the University level should be made transparently and informed by the Rutgers Teaching and Learning Collaborative.
- Campus-level instructional design teams must cultivate ongoing relationships and build rapport with faculty to serve the specific needs of schools, departments, disciplines and programs.

Within University Facilities and Capital Planning, specific expertise in the design of learning environments, both formal and informal, is critical to ensure that Rutgers' development of physical resources is in step with the cutting-edge model of residential education we hope to achieve. A University architect working directly with the campus offices of teaching and learning, and instructional space design, and coordinating with Rutgers Teaching and Learning Collaborative, is a high priority need. Further, it is imperative that University-level administrators be kept apprised of decisions, policies and developments involving instructional spaces in order to properly plan, budget and coordinate IT infrastructure needed in new or renovated learning spaces.

The committee proposes that leadership for instructional technology should reside at the campus level to ensure that investments and operations align with the distinct missions of the campuses. Camden, Newark, and RBHS have organizational structures in place and it is proposed that an Office of Teaching and Learning in New Brunswick is created, headed by a Vice Chancellor, to bring together the numerous separate offices that now exist. The responsibilities of the New Brunswick Office of Teaching and Learning are described in detail below, and include technical support for teaching and learning and programs to advance excellence in teaching and learning including peer teaching and mentoring, management of learning spaces broadly defined to include meeting spaces as well as classrooms, conference rooms and auditoriums, virtual teaching and learning environments, instructional design services for course development, assessment programs, testing centers, instructional data analytics, and innovation in instructional technology.

An Advisory Council for Teaching and Learning should be created at each campus that includes both faculty and administrators to enhance communication between the providers and users of educational services and spaces. Each campus-level Advisory Council for Teaching and Learning would be informed by and coordinate with the corresponding campus-level Instructional Space Committee (if the make-up of these committees is distinct).

At the university level, strategic planning for instructional technologies at all campuses will be overseen by the Office of Academic Affairs with key support provided by the Office of Information Technology and University Facilities and Capital Planning. A Rutgers University Teaching and Learning Collaborative should be formed, composed of representatives of the campus Advisory Councils and leaders from the Offices of the Senior Vice President of Academic Affairs, Information Technology, and University Finance and Capital Planning. The purpose of the Collaborative is to facilitate exchange of ideas and best practices, identify strategic cross-cutting initiatives and enhance coordination and technology transfer between campuses.

Teaching and Learning Organizational Structure at Camden, Newark, and RBHS

Establishing and/or reinforcing a functional administrative structure for teaching and learning at the campus level is foundational for Rutgers. The unique scale and identity of each campus requires that its organization be addressed separately. Currently Camden, Newark, and RBHS have in place organization and coordination plans and structures which we review in this section. In the section that follows we propose a teaching and learning organizational structure for New Brunswick.

The Rutgers-Camden strategic plan emphasizes the critical importance of technology and research-informed teaching and learning in achieving the Camden mission. Organizationally, structurally, and functionally, Rutgers-Camden is well positioned to move into the future of instructional design and technology envisioned in this report. Currently, the offices of Instructional Design & Technology, the Registrar's Office, the Learning Center and Disability Services, and Institutional Research are all part of the Division of Undergraduate Education & Student Success which reports to the Provost. Further, classroom scheduling is contained within the Registrar's Office. However, the Teaching Matters and Assessment Center (TMAC) is an office within the College of Arts & Sciences.

This organizational structure provides a strong foundation for teaching and learning in Camden. We recommend that responsibility for leading and organizing instructional technology, teaching initiatives, and classroom construction in Camden be centralized in the Provost's Office and that the Provost's Office assume responsibility for faculty development in instructional technology in Camden, for example, including the Camden Faculty Fellows program as described in more detail in the "Instructional Advancement" section.

Rutgers – Newark is in the fortunate position to have already centralized all aspects of instructional technology, teaching initiatives, and classroom construction in the Chancellor's Office. The position of Assistant Provost for Technology and Learning Spaces was created in July 2014 to allow more oversight and leadership over the different functional areas that impact teaching and learning.

The effectiveness of this reorganization was demonstrated in 2015 when the university successfully completed a 2-million-dollar learning spaces renovation project. The project was a combined effort between Academic Technology Services, Academic Scheduling-Newark, Newark Computing Services and Facilities. Classrooms, lobbies and staircases were painted, ceilings were repaired, and signs were added. Innovative furniture and technology were added to support active learning. Three classrooms were renovated to support distance learning, webcasting and live streaming. All of the classrooms' wired and wireless networks were upgraded to support better classroom connectivity for both faculty and students. In total 45 classrooms, over one third of all classrooms at Newark, were renovated and the project plans to continue with renovations over the next two years.

RBHS aspires to be a national leader in healthcare delivery education but lags behind in the use of pedagogy and its supportive technology. In order to close this gap, RBHS plans to develop best practices through the innovation of teaching methods and the development of its supporting technology. These best practices will be developed from pockets of faculty that exist across RBHS and the findings disseminated throughout the campus.

In line with the RBHS strategic plan and its measurable objectives, a "Novel Approaches to Teaching" Committee was created by the RBHS Vice Chancellor for Inter-Professional Education. This office will work closely with the CIO who will: provide IT expertise and project management for large-scale projects, back-end management of enterprise systems, security level specifications, server and network support, initiate and manage contracts and, provide developmental resources for collaboration and invention.

Under this office RBHS will: achieve excellence in simulation education and establish an administrative structure for simulation labs; expand utilization of learning management systems and unify the LMS system; and, create a central repository for curricular resources and expand online learning. This office will seek to streamline the educational process through curriculum mapping and potential program shortening, as well as

stimulate faculty scholarship. The office will administer daily operational support of each of its initiatives listed above and new initiatives chosen by the advisory committee.

The Committee on Academic Unit Organization (AUOC) was formed, along with the ITC, as one of the two University-wide strategic planning committees created by President Barchi in 2014. The AUOC was charged with examining how best to organize Rutgers as we respond to the evolving demands of the future, and recently released its final report. The AUOC was tasked with reviewing the current structure of academic units, noting our strengths and areas of uniqueness; considering structures for units that span campuses; and making recommendations for restructuring existing units or creating new units that would further our mission to create rich new academic environments within “One Rutgers.”

Among the AUOC’s proposed changes is to create a new Virtual University that would serve as a comprehensive online clearinghouse to facilitate cross-unit collaborations in teaching, research, and service activities. Key to this endeavor would be a database of faculty interests and expertise, a robust communication infrastructure to support distant interactions in research and teaching, mechanisms to encourage cross-unit collaborations, and an administrative structure to oversee the program. The Virtual University would exist in parallel with current administrative structures with the goal of facilitating bottom-up, interest-driven interactions among faculty members. The ITC strategy and proposed infrastructure for instructional technology innovation, including mid-tier technology for cross-campus connectivity, will greatly enhance the efforts of the Virtual University.

Proposed Office of Teaching and Learning in New Brunswick

The need for coordination is acute in New Brunswick. There exist excellent pockets of expertise across campus, but the structure lacks clear lines of communication that would enable critical synergies to develop and flourish. The committee strongly recommends simplifying this structure by bringing together key functions into a single New Brunswick Office for Teaching and Learning (NB-OTL).

The NB-OTL will report to the Chancellor through a Vice Chancellor for Teaching and Learning. Its responsibilities will include:

- Learning Centers
- Learning Assistant program and other peer teaching and mentoring programs
- Professional development for faculty, instructional staff, graduate and postdoctoral students
- Learning space planning, design, management and scheduling
- Instructional design and course development
- Assessment of programs, courses, and new learning technologies
- Integration of undergraduate and graduate teaching and learning resources
- Testing centers

- Data analytics
- Infrastructure to facilitate innovation in instructional technology
- Showcase teaching and learning innovation for audiences inside and outside Rutgers

While the NB-OTL will consolidate and manage many teaching and learning resources across New Brunswick, the NB Schools will be given the latitude to determine how best to utilize these centralized resources, and to what degree investments should be made to support their core educational mission.

Two standing committees within the NB-OTL will review and propose standards and priorities: the Instructional Space Committee responsible for the wide range of formal and informal learning environments, and the New Brunswick Teaching & Learning Advisory Council, responsible for teaching and learning programs that provide strategic guidance and enhance communication between providers and users of instructional resources. These committees should be closely coordinated, and could have partial overlapping membership.

Campus Advisory Councils and the Rutgers Collaborative on Teaching and Learning

Campus Advisory Councils on Teaching and Learning, with both faculty and administrative representation, are recommended for all campuses, to provide strategic guidance and enhance communication between providers and users of instructional resources.

The composition of the Advisory Council should be at the discretion of the Chancellor, and in some cases may involve consolidating, expanding or modifying the scope of existing committees. However, as basic principles: 1) each council should include both faculty and administrators that comprehensively represent all academic units; 2) the councils should have responsibility for reviewing and advising on funding priorities for teaching and learning on their respective campuses, with significant weight attached to their recommendations; 3) each council should be charged with continuing the strategic planning process for teaching and learning on their campus; 4) to enable their participation at a productive level, faculty should be accommodated by release time or other similar consideration for their service; and 5) An annual report on progress, concerns, issues, and needed resource allocations will be provided to the campus leadership center on teaching and learning (in Camden, the Provost, for example.)

These councils are crucially important to ensure that investments are carefully considered and align with the teaching mission of the campuses. Moreover, as the University moves towards the adoption of new approaches and technologies, for example, learner analytics, these groups will help to ensure that the campus communities are appropriately engaged and prepared.

Faculty and administrative representatives from each campus Advisory Council should sit on the university-wide Rutgers Teaching and Learning Collaborative. Issues that will continue to demand attention from the Teaching and Learning Collaborative going forward include: maintaining a current perspective on the role of virtual learning in the residential experience, capitalizing on learner analytics to improve student success, addressing the question of competency based education, and incentivizing faculty to maintain state-of-the-art teaching approaches grounded in evidence-based strategies identified by education research. The RTLCC should be a strong voice in the strategic deployment and technology transfer of innovations developed by the RADII.

Campus Advisory Councils

The committee has found immense value in the work of the last 24 months: learning the landscape of instructional technology at Rutgers; sharing ideas across disciplines, schools, and campuses; engaging in conversations encompassing both academic and administrative perspectives. Continued communication, planning, and input of this type will be essential to the successful implementation of a strategic vision for technology-supported excellence in teaching and learning. To this end, we recommend a Teaching and Learning Advisory Council be created on each campus.

LEADERSHIP AND ACCOUNTABILITY: KEY INITIATIVES AND AIMS

- Create an Office of Teaching and Learning in New Brunswick led by a Vice Chancellor and reporting to the Chancellor. Counterparts already exist in Camden, and Newark.
- Create a Teaching & Learning Advisory Council for each campus that includes faculty and administrators.
- Create, at the university level, the Rutgers Teaching and Learning Collaborative, composed of representatives from each campus Advisory Council and the Offices of the SVP for Academic Affairs, Information Technology, and University Facilities and Capital Planning.

CONCLUSION

The Committee on Near- and Long-term Impact of Instructional Technology has developed a deep and meaningful strategic plan to bring Rutgers to the forefront of innovation and excellence in teaching and learning in the digital age. This plan involves three critical imperatives that are intricately interwoven, and together will create sustainable infrastructure and organization for the institutionalization of instructional technology that will elevate teaching and learning at Rutgers to aspirational levels. The execution of this strategic plan is essential to the realization of the overarching objective to transform the student experience in our vision of tomorrow's Rutgers.

The roadmap is set, our destination is clear, and the journey is before us. Whether we are able to attain our aspirations will depend on strong leadership, commitment and above all – decisive action.

ACTION ITEMS FROM THE COMMITTEE ON NEAR- AND LONG-TERM IMPACT OF INSTRUCTIONAL TECHNOLOGY:

Instructional Advancement

- Create Rutgers Academic Discovery and Innovation Institute (RADII) .
- Expand peer-to-peer instructional programs. Implement graduate digital fellows and new-faculty training programs.
- Highlight instructional innovations.
- Coordinate Learning Management Systems .
- Deploy interoperable communication systems across Rutgers' campuses.
- Develop a sustainable budget model for courses from hybrid to online and other digital innovations.

Teaching and Learning Spaces

- Treat instructional space as a “Common Good.”
- Form standing campus committees to strategically plan and maintain standards for instructional space.
- Develop a sustainable budget model for learning spaces.
- Create campus-level offices to coordinate units responsible for instructional space.
- Launch Academic Assessment Initiative to advance and modernize our assessment practices.

Leadership & Accountability

- Create an Office of Teaching and Learning in New Brunswick.
- Create campus-level Teaching & Learning Advisory Councils.
- Create a university-level Rutgers Collaborative on Teaching and Learning.

REFERENCES AND NOTES

¹ This report does not thoroughly address the myriad issues involved with Rutgers delivery of fully online degrees, where students never come to campus. These issues transcend instructional technology issues, even though they may be supported by technology. Examples include: state authorization, for Rutgers to be fully authorized in all states where it enrolls students; ADA compliance, such that all online courses use technology and strategies that are fully accessible, ADA compliant, and move toward Universal Design; and student coaches with back-end performance analytics that guide intervention strategies.

² As the master planning team notes, this practice is becoming increasingly common in higher education, where institutions “are treating all classrooms as a common good, placing all classrooms under the control of the organization that schedules classes” (*Rutgers University Space Utilization Study, Volume 1: New Brunswick*. August 2014. 45).

³ Boud, D., Cohen, R., & Sampson, J. (2001). *Peer Learning in Higher Education: Learning from & with Each Other*.

⁴ This project coordinates with the larger Sustainable Raritan River Initiative, a joint program between Rutgers’ Edward J. Bloustein School of Planning and Public Policy and the School of Environmental and Biological Science, which was created to bring together stakeholders around the Raritan Basin and Bay to balance the “social, economic, and environmental objectives towards the common goal of restoring the Raritan River, its tributaries and its estuary for current and future generations.”

⁵ The Makerspace was featured in a February 2016 *New York Times* article: John Schwartz, “Wood Shop Enters the Age of High-Tech,” *New York Times*, Feb. 5, 2016 (http://www.nytimes.com/2016/02/07/education/edlife/forward-tinkering-colleges-make-room-for-maker-spaces.html?_r=1).

⁶ *ECAR Study of Undergraduate Students and Information Technology, 2015*. <http://net.educause.edu/ir/library/pdf/ss15/ers1510ss.pdf25>.

⁷ *A Strategic Plan for the New Rutgers*. February 2014. 43.

⁸ To put the percentage of classroom space into starker relief, the Space Utilization Study points out that in New Brunswick/Piscataway “there is nearly five times as much office space as there is classroom space” (*Rutgers University Space Utilization Study, Volume 1: New Brunswick*. August 2014. 44).

⁹ *Rutgers 2030*, the University’s newly released physical master plan, and the extensive space utilization studies created by RAMSA/Sasaki that inform the physical master plan, did not capture data from the newly-integrated Rutgers Biomedical and Health Sciences (RBHS), so those figures are not included in this report. Though this report will focus on the data from *Rutgers 2030* as the basis for its findings—and, therefore, will not include data from RBHS—the committee contends that the same recommendations for New Brunswick, Newark, and Camden apply, in principle, to RBHS.

¹⁰ “Space in higher education is still often controlled at the level of the school or department, which owns offices, classrooms, and labs. Institutions that recognize the value—and the cost—of space are moving toward centralized systems that allocate resources based on the needs and priorities of the institution as a whole” (“Facilities & Technology: The Transformation of ‘Campus.’” 2015 APPA Thought Leaders Series. 13).

¹¹ Rutgers University Space Utilization Study, Volume 1: New Brunswick. August 2014. 5.

REFERENCES AND NOTES

¹² As the master planning team notes, this practice is becoming increasingly common in higher education, where institutions “are treating all classrooms as a common good, placing all classrooms under the control of the organization that schedules classes” (*Rutgers University Space Utilization Study, Volume 1: New Brunswick*. August 2014. 45).

¹³ “Academia is growing more multidisciplinary; cross- discipline research is increasingly important. This blurring of boundaries impacts campus space; instead of academic buildings with single owners, spaces now have multiple owners” (“Facilities & Technology: The Transformation of ‘Campus.’” 2015 APPA Thought Leaders Series. 5).

¹⁴ In the Rutgers University–Camden volume of *Rutgers 2030*, the master planners highlight the importance of renovating outdated facilities and remaining current with “next-generation” teaching and learning practices in order to attract students and maintain a “competitive edge among its peer institutions.” The same imperative, of course, holds for Rutgers University– Newark, Rutgers University–New Brunswick, and RBHS. Rutgers University Physical Master Plan: Rutgers 2030. Volume 3: Camden. June 18, 2015. 15.

¹⁵ *Rutgers University Physical Master Plan: Rutgers 2030. Volume 1: New Brunswick*. June 18, 2015. 67.

¹⁶ For example, during the planning phase, the master planning team noted that in New Brunswick a “large proportion of instructional labs do not appear in the Fall 2012 class schedule—only 55% were scheduled for classes” *Rutgers University Space Utilization Study, Volume 1: New Brunswick*. August 2014. 50.

¹⁷ Rutgers University Physical Master Plan: Rutgers 2030. Volume 1: New Brunswick. June 18, 2015. 67.

¹⁸ Rutgers University Physical Master Plan: Rutgers 2030. Volume 2: Newark. June 18, 2015. 21.