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Collaborative innovation program: A Creative conspiracy for cross-college collaboration at the Rochester Institute of Technology

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Collaborative Innovation Program: A Creative Conspiracy for Cross-College Collaboration at the Rochester Institute of Technology

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The lifelong learning skills and attributes [we need to promote] are leadership, teamwork, problem solving, adaptability, analytical thinking, global consciousness, and communications. "Building a Nation of Learners: The Need for Changes in Teaching and Learning to Meet Global Challenges." Business–Higher Education Forum's (BHEF) Learning and Technology Initiative Working Group (2003).

Abstract

The 2007 inaugural address of RIT's ninth president, William Destler, highlighted the breadth and diversity of curricular offerings at RIT from business, engineering, and computing to design, fine art, and craft. In his address, Dr. Destler included this challenge: "What if RIT students [in addition to their discipline-specific courses] had the experience of working on complex societal problems with students from different majors on teams in...a cross-disciplinary effort to find real solutions?" The authors of this paper took that challenge to heart. In the 2008-2009 academic year, we wrote and taught a collaboration curriculum that was hosted by the RIT Honors program but open to all RIT students. The outcome of this program is an integrated "innovation suite" comprised of the following components: 1. learning outcomes and curricular models for innovation, 2. innovation activities, 3. collaborative learning environments, 4. collaborative technologies (IT and other), and 5. community-university partnerships. This integrated suite of innovation components will continue to grow in the new Center for Student Innovation at RIT.

Overview

In this paper we describe a pilot Collaborative Innovation Program for RIT's academic year 2008-2009. Looking forward to the opening of a new Center for Student Innovation on campus, the goal of the program is to enhance RIT's culture of collaborative innovation and creativity. We hold that cross-disciplinary teams of collaborators have great potential for innovation and creativity. We define **innovation** as the discovery and implementation of a new product, service, or process that makes a positive impact, and we define **creativity** as the ability to understand problems and to design novel solutions from multiple perspectives.

The Collaborative Innovation Program was a year-long series of coordinated courses that set out to design and implement locally developed, globally informed, solutions to a "wicked problem" by fusing knowledge from multiple disciplines and campus initiatives. These courses were offered to honors freshmen as well as upperclassmen. Students were able register for one or several of these courses depending on interest and availability.

What is a Wicked Problem?

A report from Buckingham Shum (1997), entitled "Representing Hard-to-Formalize, Contextualized, Multidisciplinary, Organizational Knowledge," identifies the following properties of wicked problems:

- cannot be easily defined so that all stakeholders agree on the problem to solve;
- require complex judgments about the level of abstraction at which to define the problem;
- have better or worse solutions, not right and wrong ones;
- require iteration--every trial counts;
- have no given alternative solutions--these must be discovered;
- often have strong moral, political, or professional dimensions.

http://www.unidata.ucar.edu/staff/caron/collab/wicked.html

Our Wicked Problem & RITs Center for Student Innovation

The "wicked problem" we chose for the year was "As we look forward to the opening of a new Center for Student Innovation at RIT, how do we increase cross-college collaboration at a university renowned for its discipline-specific expertise?" Our method was to gather students and faculty from many disciplines and levels of knowledge around this question through a suite of coordinated courses held over three quarters: research-oriented courses in the fall; design-oriented courses in the winter; and implementation-oriented courses in the spring.

The Current State of Interdisciplinary Instruction in Higher Education

Students worldwide are rapidly mastering methods for successful test-taking and quantitative problem-solving within disciplines. Academics and professionals worldwide delve ever-deeper into increasingly potent and specialized disciplines. Yet many universities and funding agencies now recognize that 21st century economic and social challenges demand new ways of working. A 2004 report by the Committee on Science, Engineering, and Public Policy (COSEPUP) entitled "Facilitating Interdisciplinary Research" emphasizes the need for interdisciplinary ways of working. Following are some excerpts from that report:

Interdisciplinary thinking is rapidly becoming an integral feature of research as a result of four powerful "drivers": the inherent complexity of nature and society, the desire to explore problems and questions that are not confined to a single discipline, the need to solve societal problems, and the power of new technologies.

Successful interdisciplinary researchers have found ways to integrate and synthesize disciplinary depth with breadth of interests, visions, and skills.

RIT is justly renowned for its career-oriented discipline-specific strengths and technological prowess. To complement this condition, several RIT initiatives aim to promote creativity and collaboration *across* disciplines (Mayberry and Coon, 2008.), though these initiatives are not yet at the scale required to create a truly innovative culture of collaborative cross-disciplinary creativity.

RIT is not alone in facing the difficulties of transitioning to this culture of cross-disciplinary collaboration. These difficulties are identified in a 2004 report by the Association of American Colleges and Universities and The Carnegie Foundation for the Advancement of Teaching, in conjunction with the national project "Integrative Learning: Opportunities to Connect":

Many colleges and universities are creating opportunities for more integrative, connected learning... however, such initiatives involve only small numbers of students...[and are] disconnected from other parts of the curriculum and from other reform efforts. But a variety of opportunities to develop the capacity for integrative learning should be available to all students throughout their college years, and should be a cornerstone of a twenty-first century education.

One of RIT's initiatives to overcome these difficulties has been the construction of a new Center for Student Innovation, as a place where students from traditionally right-brained (fine arts, humanities, and design) and left-brained (science, computing, and engineering) disciplines can work together. This structure is a ten-thousand square foot circular glass building that stands in marked contrast to the 1960s brutalist architecture dominating the rest of the campus. The research from the students who participated in the Collaborative Innovation Program last year had a positive impact on what we find in the Innovation Center at present: flexible furniture, immersive computing capabilities, rolling white boards, and a "hacker" space filled with tools and materials.

RIT's Center for Student Innovation. Photo: Sue Weisler

Planned Curriculum

Listed below is the initial curriculum that we proposed. However, for reasons discussed below, what was actually taught in the 2008-09 academic year was significantly different from this initial plan. It is included here for comparison.

In this initial plan, courses in each quarter were to be focused on a stage in the design process: the fall was devoted to contextual research and creative ideation; the winter to solution design; and the spring to implementation. It should be noted that two of the three core-courses appear as three quarter sequences, such as Open Studio I, II, and III, not because they were to teach increasingly advanced knowledge, but because they were to correspond with sequential stages in the development of the project. Individual students may have benefited from and contributed to solving the problem at hand by electing to participate in any or all of these courses as they craft their own learning programs.

*Fall Courses - discover**

1) Social Networks in Action I. (online networks for project management)
2) Open Studio I. (creative methods for blue sky thinking)
3) Contextual Design-Research

Winter Courses - design

1) Social Networks in Action II. (web 2.o journals, public and participatory)
2) Open Studio II. (creative methods for project selection)
3) Solution Design (e.g., What will it take to make this and will the market accept this solution?)

Spring Courses - deliver

1) Social Networks in Action III. (face-to-face events, public and participatory)
2) Open Studio III. (creative methods for realization and assessment)
3) Implementation (deliver the goods)

* "Discover, Design, Deliver" is a schema borrowed from frog design (www.frogdesign.com)

Even though this initial plan was not implemented in the 2008-09 academic year, its structure is serving as an inspiration for a campus-wide innovation minor currently under development. We hope that the students who will eventually participate in the Innovation Minor will be able to take on other wicked problems such as "The Greening of College Campuses," "Increasing STEM Literacy," and "Sustainable Urban Economies." And we hope that each year faculty from different colleges on campus with expertise and interest in the topic at hand will be able to participate, and that the theme of the year would be featured in activities and projects organized by the director of the Student Innovation Center. We believe that an Innovation Minor sanctioned by the university, would draw together people from the wide range of talent and knowledge at RIT and thus serve as a model for an innovation minor at RIT, or a "Team PhD" program.

Courses Actually Taught: 2008-2009

During the planning stages of this initiative, we received a lot of enthusiastic willingness to participate from faculty in several colleges across RIT. However, several of these participants had to renege because the chairs of their respective departments did not support their teaching courses outside their college. To try to accommodate these faculty, we created a venue for them to participate in the program: town hall meetings called "Innovation Sessions", which we discuss below. Nonetheless we *were* able to offer a group of courses, albeit abbreviated from our originally planned curriculum. The authors of this paper

were able to participate in this program for different reasons. One is a tenured faculty member who was given permission by his dean to work on this project. The other was a faculty member hired on a one year contract by the honors program to test out this program that she had developed. The administrative impediment of how to engage faculty in these types of ventures continues to be a challenge. Following is a list of the course taught during the 2008-09 academic year. In all, about seventy-five students participated in the Collaborative Innovation Program and several of them have continued on enthusiastic participants in the Innovation Center that they helped to create.

Wicked Problem for the school year:

How to encourage cross-college collaboration through curriculum, activities, learning environments, and **information technology**

FALL | research

Goal: Understanding the need for, and the challenges that come with, multi-disciplinary collaboration

course 1. **Design research: collaborative environments** (4 credits)

instructors: Evan Selinger, Philosophy and Xanthe Matychak, Design

Students will research the strengths and weaknesses of collaborative environments at RIT, at other colleges and institutions, as well as at non-institutional collaborative environments toward the end of identifying features, and combinations of features, that support collaboration.

course 2. Innovation and Invention (4 credits)

instructors: Jon Schull, Information Technology and Xanthe Matychak, Design

Students in this class are guided through a series of collaborative experiences inventing, designing, implementing, and studying emerging technologies and their educational and artistic potential.

WINTER | design

Goal: Designing and practicing methods for collaborative brainstorming and problem solving

course 1. Innovation and Invention (4 credits)

instructor: Jon Schull, Information Technology (see description from FALL)

course 2. Social Networks and Action (4 credits)

instructor: Xanthe Matychak, Design

Students in this class will investigate the influence of social media on culture through readings, video, discussion, and experimentation

SPRING | delivery

Goal: Working collaboratively to build and evaluate tools for multi-disciplinary innovation.

course 1. Design A Social Business (4 credits)

instructor: Xanthe Matychak, Design

Students in this class will design a business that holds a social mission at its core through. Students will engage in primary (field) research with various stakeholders and will develop and test prototypes with end-users.

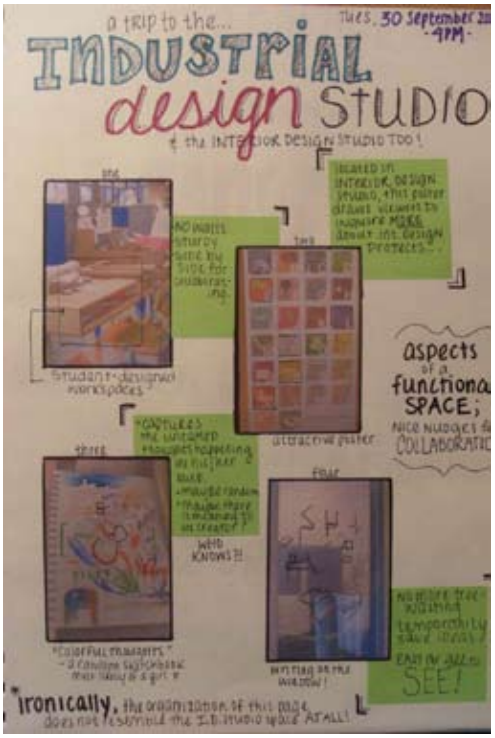
course 2. Innovation and Invention (4 credits)

instructor: Jon Schull, Information Technology (see description from FALL)

Review of the courses and "Innovation Sessions"

FALL

The Design-research: Collaborative Environments course, which was co-taught by a philosopher and a designer produced some interesting work from the students. However, the readings assigned for this course were very difficult and demanded most of the students time and attention. There was not enough time for the students to work on field research in any depth. Were the course to be taught again, we would limit the readings to one or two a week as opposed to three or four.



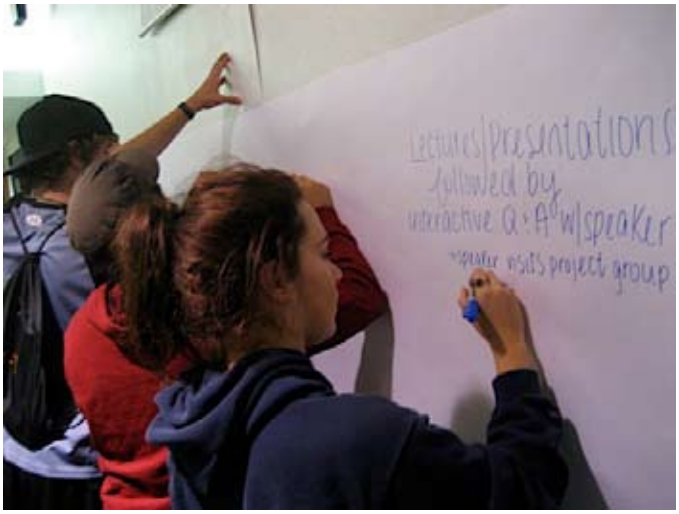
Notes from primary research in the Industrial Design studio

Due to the honors program advising process, the section of the Innovation and Invention course offered in the fall had more freshmen than had ever been in the course before. Students who have some discipline specific skill do well in this class because they have confidence in that they have something to contribute to this course even if, ultimately, their main contribution has little to do (directly) with their discipline. It was a challenge for the instructors to find skill-sets in these very young students (the difference between fall quarter and spring quarter freshmen turned out to be quite significant). Additionally, the course has a very loose structure. Some of the freshmen loved it and eventually thrived. But others got lost and felt frustrated.

In the fall quarter, the Innovation Sessions, weekly town hall meetings open to the entire RIT community, were a perfect opportunity for our students to experiment with how the arrangement of furniture and agenda of the session had an effect of collaborative behavior. We experimented with contests and blogging

as a way to engage students, staff, and faculty who were interested in the program but unable to sign up for the courses.

Innovation Session Activity: Build a Tall Tower with Straws



Innovation Session Activity: Draw on the Walls

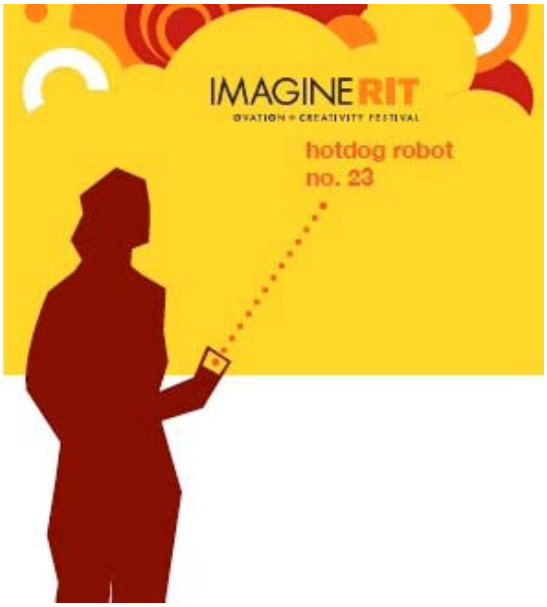
WINTER

The enrollment in the winter courses was smaller than in the fall and took on the form of group projects with faculty advisors. Because a low student/instructor ratio is not desirable or economically feasible for courses in this program, we will focus here, instead, on the success of the Innovation Sessions during the winter quarter. Again, the Innovation Session were weekly town hall meetings open to the entire RIT community.

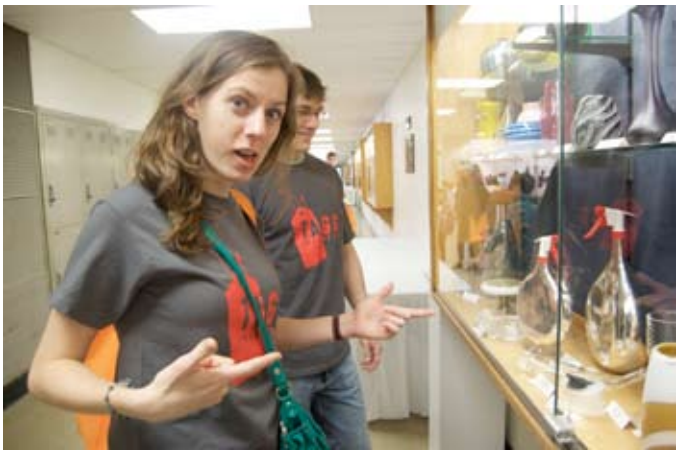
We continued experimenting with the format of the weekly Innovation Sessions. As mentioned above, the sessions were announced to the entire RIT community and held in the RIT library. Anywhere from twelve to fifty people would attend these sessions. We could not depict a pattern about what drew more people. And we aren't even sure that more people meant a better meeting.

The two successful activities that we tested in winter quarter were project demonstrations and student-led workshops. Because our courses were small, we sometimes used the Innovation Sessions as milestones for our student teams to demo prototypes of their work and gather feedback from strangers. This really helped our students, and the attendees of the sessions, to understand that it is desirable to gather feedback during the development of a project and not wait until it is "finished" to share it with the public. We had a few

"rules" for these product demonstrations. On the student-team side, we encouraged them to use language that could be understood across disciplines when presenting their work in the Innovation Sessions. If and when the teams used terminology that we, the instructors, felt might not be understood by all in attendance, we would light-heartedly interject with a question such as, "What's a GUI?"

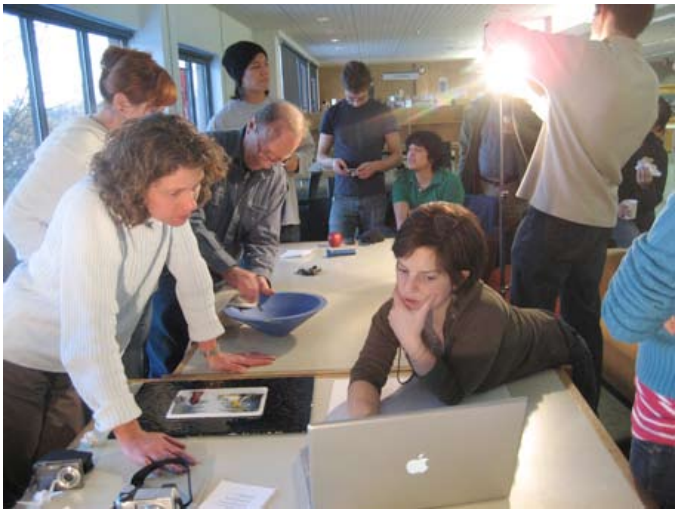


Early concept sketch of the TAGG Imagine RIT project.



Members of the TAGG Imagine RIT on festival day scouting out exhibits

Student-led workshops turned out to be a smashing success. The only criteria for the students workshop theme was that they choose something that they knew how to teach that they felt had cross-disciplinary appeal. When the time came for the workshops, we, the instructors, watched in awe as our students led the session attendees though workshops of their own design such as "How to write a Business Plan" or "Take Great Product Shots." It became clear to us that peer-to-peer knowledge sharing across academic disciplines is an untapped resource at RIT.



Innovation Session: Student-led workshop entitled "Take Great Product Shots"

SPRING

In the spring we continued to examine the role of furniture and the design of interior spaces on collaboration. The **Innovation and Invention** class did this through building furniture prototypes and testing them out in a new gaming lab in the Golisano College for Computing at RIT. Additionally, we shared out research with the graduate studio in Industrial Design who then built on our work through a series of drawings and some prototypes of furniture that they mocked up in Baltic Birch and presented in the Innovation Center at the yearly Imagine RIT festival.

The Industrial Design graduate students, even though not formally in the program, built on the design research from the CIP students to create drawings and models of the Innovation Center interior.

A dream come true. A group of 150 Residence Assistants (RIT undergrads from all eight colleges) participating in a creativity workshop in the Innovation Center.

After discovering some effective methods for cross-disciplinary collaboration throughout the year, students in the Design Research course decided to put our collaboration skills to work on a community-university project. Our students worked with a local credit union in Rochester that provides banking services to the poor called Progressive Federal Credit Union. After meeting with an array of stakeholders at the credit union from the tellers to the members to the donors, the students decided to focus on a new donor recruiting campaign. The students looked at artifacts that inspired giving, such as the pink ribbon for breast cancer research, and developed and tested a product called GROW—a laser-cut felt bracelet that was to be purchased and worn in support of the credit union. Students who had never had formal training in design mocked up felt prototypes, tested them out at point-of-purchase locations such as the museum store at the Memorial Art Gallery in Rochester, had a prototype "manufactured" using the online laser-cutting service Ponoko.com, and art directed a professional photo-shoot with models wearing the manufactured prototypes.

Laser cut prototype of the students' design manufactured by Ponoko.com

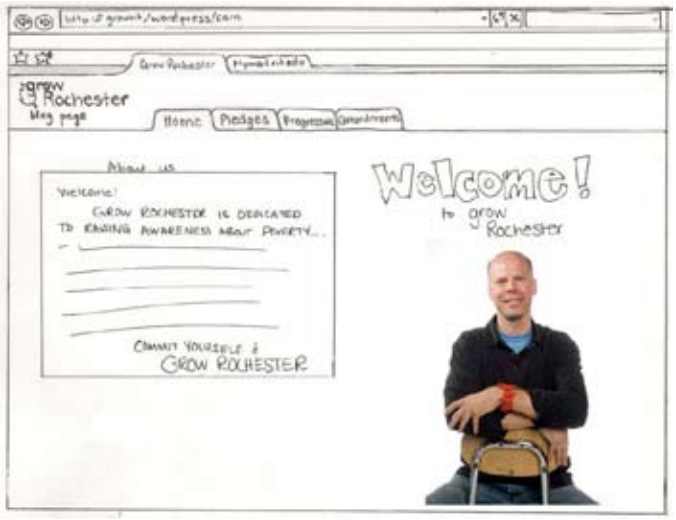


Photo of model wearing the GROW prototype incorporated into a wire-frame of an online market for the product.

Broader Impacts

Our work in collaborative innovation over the last few years has already been featured at academic conferences and entertainment venues in London, Portugal, Los Angeles, Indianapolis, and Boston. And our relationship with the Rochester Museum and Science Center has expanded from consultation on digital projection technologies and exhibit design, to development of exhibits that both bring our student-developed visualization technologies and science-learning content to the public, and support live interaction and collaboration links between RIT students and museum visitors (many of whom are potential RIT students). We are also exploring ways of productizing and commercializing several promising inventions and innovations developed in our classes as well as establishing collaborative relationships with other institutions through the development of an online project-sharing pool.

As stated earlier in this document, the majority of participating students this first year were freshmen. We were excited about working with incoming students as we feel that our pedagogical approach can inspire a culture change at RIT. As the program grows from year to year, we imagine these incoming students continuing as sophomores, juniors, and seniors to participate in an Innovation Minor, currently under development. In its steady state, there will be a mix of students from all year levels, and from many disciplines, working toward a common goal.

By running the curriculum, we confirmed that there is great enthusiasm from students, faculty, and the administration for cross-discipline collaboration and the discovery these courses inspire. However, we continue to bump up against the administrative constraints put on this type of work – the students don't have "permission" from their respective programs to take these courses for the credits they need to graduate, and the faculty don't yet have "permission" from their departments to teach them. These constraints have compelled us to focus on passing an Innovation Minor through the Institute Curriculum Committee this year. In the Innovation Minor document, we articulate student learning outcomes that are in line with general education goals with the hope that these courses may count as general education credit. However, there are outcomes of the collaborative innovation program that are beyond student learning. We are certain that the university will be asking questions such as "Does an investment in collaborative innovation increase the university's innovation portfolio?" and "Are there more projects coming out of RIT that are not only creative but are implemented in, and useful to, society?" It remains to be seen if the current collaborative innovation strategy will be successful in fulfilling these expectations, but we look forward to reporting on our progress no matter the outcome.

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