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USA

Good Practice Case Study

IPRO

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GENERAL INFORMATION

Title of the case	IPRO – The Interprofessional Projects Program at IIT		
Sales pitch	The Interprofessional Project (IPRO) course prepares IIT undergraduate students for the practical challenges they will face in a changing workplace by emulating a cross-functional team environment. IPRO is an experiential interdisciplinary learning format that is part of university core curriculum that all undergraduates complete in order to graduate.		
Organisations	IIT – Illinois Institute of Technology, Chicago A number of external collaborators (corporations, entrepreneurial ventures, non-profit organizations, government agencies)		
Country	United States		
Authors	• Sara Arko (IRI UL) • Gregor Cerinšek (IRI UL)		
Nature of interaction	University-business/external stakeholder cooperation in the teaching and learning process		
Level of mechanism	<input type="checkbox"/> Government policy (e.g. law, funding framework) <input checked="" type="checkbox"/> Organisational strategy (e.g. university/business/agency) <input type="checkbox"/> Structural element (e.g. centre, lab, office) <input checked="" type="checkbox"/> Operational level (e.g. activity or programme)		
Length of programme	Semester long	Formality	Informal
Curricula-bound, co or extra-curricular?	Curricula	Level of initiative	Cross-disciplinary

Summary

IPRO is part of a distinctive core curriculum requirement at IIT with all undergraduates required to complete two three-credit-hour semester-long team projects. In an IPRO course, multidisciplinary teams of students engage in semester-long projects based on contemporary open-ended problem-solving opportunities from stakeholders that reflect the diversity of the workplace. Stakeholders are corporations, entrepreneurial ventures, non-profit organizations, government agencies, and university researchers, as well as students with their own invention or new venture ideas. Current IPRO courses include Energy & Environmental Innovation, Frontiers of Technological Innovation, Public Safety Innovation, Dragon Slayer: Designing Your Future, Principles of Entrepreneurship, Exploring Urban Livability Challenges and Innovations, and Community Engagement & Social Innovation, as well as several other special topics.

IPRO teams may include students from all academic levels and professional programs, with typical IPRO teams having students from at least three different IIT colleges: engineering, business, architecture, applied technology, science, and liberal arts. Through two IPRO courses, students develop a unique portfolio of experiences that aligns their academic efforts with career directions to fit their aptitude and interest. The team activities and project outcomes/deliverables develop in students the type of project competencies, cross-functional collaboration experience, team processes, leadership skills, and peer evaluation methods that reflect professional practice. Students have the opportunity to showcase their work each semester at IPRO Day (attended by alumni, faculty, staff, potential employers, and university leadership).



CASE STUDY PROFILE

BACKGROUND

IIT - Founded in 1890, IIT is a private, Ph.D.-granting research university that awards degrees in engineering, the sciences, architecture, law, design, psychology, humanities, and business.

IPRO was established at IIT in 1995 with the Pilot program that ran until 1999, followed by IPRO 1.0 (1999-2010), IPRO 2.0 (2010-2013), IPRO 3.0 (2013-2019), and IPRO 4.0 (new for Fall 2019).

A strategic direction for IIT was established in 1994 following the work of the National Commission for IIT. The University at that point in time was in a weak competitive and financial condition, with its location viewed as a liability in attracting students to the campus. Decisions were made to reinvest in the IIT Main Campus location and reinvent the undergraduate curriculum to make it more distinctive in higher education. These initiatives were made possible through a \$250 million challenge fundraising campaign with major support from the families of Bob Galvin, CEO of Motorola, and Bob Pritzker, CEO of The Marmon Group. The distinctiveness and resulting enhanced competitiveness of IIT undergraduate programs were enhanced by introducing the IPRO course as a new university-business collaboration initiative. It began as a prototype/pilot program in 1995 and became a regular part of the undergraduate curriculum in 1999 (IPRO 1.0). With first-year students entering in the fall semester of 1999, it became a requirement that all undergraduates complete two IPRO courses. The six credit-hours were shifted from other required and elective courses within each academic unit. The IPRO concept was inspired by feedback from companies like Boeing and from accreditation agencies who felt that engineering graduates generally needed greater university experience in teamwork and communication in order to be attractive candidates for corporate positions. In addition to the emphasis on teamwork and communication, the introduction of user-centred design thinking helped advance the program to establish IPRO 2.0 in 2010.

External organizations first became involved in sponsoring IPRO project topics through the IIT Board of Trustees, academic department advisory boards, and IIT alumni. Over time, this IIT network referred other organizations to the IPRO Program, and, very importantly, IIT began to attract corporations and other organizations who participated in IIT Career Fairs and wanted to recruit IIT students. By sponsoring an IPRO course and visiting the IPRO teams at IPRO Day, organizations were able to identify students they wished to interview and hire for internships and career positions. Also, as IIT students graduated, who had IPRO course experience, they came back to IIT to help evaluate projects and to sponsor projects from within their employers. The IPRO Director holds responsibility for all of the marketing and outreach activity and establishing and maintaining external relationships. Since 1995, hundreds of organizations have participated in the IPRO Program as sponsors and collaborators, including corporations of all sizes, entrepreneurs, non-profit organizations (museums, community organizations, etc.), government agencies, industry associations, philanthropic foundations, and more.

CONTEXT

The Interprofessional Project (IPRO) was first prototyped in 1995 as an elective course. With 20-200 students from various disciplines involved in the program each semester in the pilot phase, IPROs grew and developed to become part of the core curriculum for all undergraduates. It is now an IIT general education requirement that involves 100 Teams and 600 students participating each semester and earning three credit-hours toward their degrees.

Within IPRO courses, multidisciplinary teams of students engage in semester-long projects based on contemporary open-ended problem-solving opportunities from stakeholders.

The purpose of the IPRO course is to provide students with experiences that emulate the workplace, and an important aspect of the IPRO Program is the involvement of workplace organizations that identify viable “real world” complex topics, as well as provide financial support and professional advice to IPRO teams throughout the semester. Approximately one-third of IPRO projects are currently financially-sponsored, with additional IPRO projects benefitting from informal collaboration with a range of business, non-profit, entrepreneurial, and public sector organizations.

The IPRO model has developed and evolved over the span of 25 years since the spring semester of 1995 through experimentation with new formats. The IPRO Program has always been characterized by the desire for continuous improvement each semester to improve stakeholder satisfaction and increase the potential for successful learning outcomes. New for the fall 2019 semester, there are three platforms that offer students the opportunity to satisfy the undergraduate IPRO requirement:

- The IPRO Workshop (IPRO 497-xxx) is the latest representation of the concept of a multi-team themed cluster with 50 to 100 students from various disciplines organized in teams of five students each. They learn and apply user-centred design methods and agile project management methods. The IPRO workshop platform employs a team of four-to-six faculty members from various fields who guide the student teams. The fall 2019 topic areas consist of: Energy & Environmental Innovation, Frontiers of Technological Innovation, Public Safety Innovation, Dragon Slayer: Designing Your Future, Principles of Entrepreneurship, Exploring Urban Livability Challenges & Innovations, and Community Engagement & Social Innovation. The IPRO workshop platform essentially represents the evolution of the IPRO 397-xxx model with multiple teams organized under a common theme to learn and apply user-centred design methods.
- The Traditional IPRO Project (IPRO 497-xxx) has a single problem/opportunity to explore through an integrated team approach, with students organized in task groups that work toward a common goal. The traditional IPRO project typically involves 7 to 15 students from various disciplines relevant to the topic guided by one or two instructors with expertise in the topic area.
- The Interdisciplinary Course (I-Course) is a prototype for fall 2019 and spring 2020, where academic units adapt an existing course to qualify it as an I-Course by integrating the open-ended interdisciplinary team problem solving that reflects the learning objectives of the IPRO course. It integrates students from the academic unit that offers it with students from other academic units that can contribute to the interdisciplinary problem-solving challenge it represents. The I-Course is intended to increase the involvement of tenured research faculty members as IPRO instructors within their existing teaching responsibilities.

To provide an example of the students’ projects, a collection of IPRO students’ posters is available on the [IPRO website](#), which demonstrates the topics addressed by IPRO teams. As water covers over 70% of the earth and is essential to life, water is a topic that continues to be of interest to many industries and disciplines – particularly in the realm of innovation and design. Over the years IPRO projects have focused on water through a variety of contemporary lenses: accessibility, quality, health, transport, farming, urban planning, disaster mitigation, and sustainability. Other examples of IPRO projects include, e.g. architecture, humanities, and

engineering students collaborating on low-cost shelter solutions; or chemistry, business, and law students working together to develop best practices in CO2-reducing technologies.

OBJECTIVES AND MOTIVATIONS

The motivations of the stakeholders in their involvement of the program are as follows:

IIT - Through programs such as IPRO, IIT creates a network and partnership with external stakeholder organisations and offers a hands-on experience to attract students.

IIT students and graduates are differentiated by their readiness and ability to manoeuvre in a complex work environment—skills that cannot be learned in a classroom alone. IPRO offers an environment to help students develop the discipline, leadership, and communication skills to succeed within a multidisciplinary group. The IPRO experience complements a student's deep and rigorous experience in her/his major, providing an additional set of methods, tools, experiences, and faculty references that make them distinctive in the market (compared to their peers from other universities).

External stakeholders (collaborating organisations including financial sponsors) - The goal of the external stakeholders is to become acquainted with students to identify recruiting prospects; build relationships with research faculty; challenge a multidisciplinary team with a real and complex problem; support the needs of non-profit community partners; support IIT's distinctive interprofessional team project program; typically via a \$20,000 donation per semester sponsorship of an IPRO Workshop class of 50 to 100 students (a new format and sponsor opportunity for fall 2019).

IPRO Requirements that Satisfy Accreditation and Develop Future Leaders

The interprofessional course has the following learning objectives that are addressed in the process of grappling with a complex, open-ended problem that requires the collaboration of students from multiple disciplines:

- Teamwork: How to be an effective member of an interdisciplinary team, adding the expertise of your discipline and working on topics broader than your major or field.
- Communication: How to effectively communicate the technical and non-technical aspects of a project to key stakeholders.
- Logically correct reasoning: The ability to generate a hypothesis using inductive logic (leveraging creativity and design methods), and then prove/disprove it using deductive logic (leveraging prototyping and scientific thinking).
- Project management: Deliver a desired, planned outcome with time and resource constraints.
- Ethics: How to act ethically when conducting research, working in teams, and creating solutions.

STAKEHOLDERS

IIT Administration and Faculty Members:

- **The IPRO Program Office** – under the Office of Provost and director of the Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship – is responsible for administering and coordinating all aspects of The IIT Interprofessional Projects (IPRO) Program.
- **IPRO Instructors:** faculty with industry and/or university research experiences serve as coaches and mentors, guiding multiple teams of students comprised of disciplines from across professional programs.

IIT Students: Approximately 1,250 students are engaged in IPRO project courses each year (producing approximately 3,750 credit-hours), with an average team size of six students who are primarily at the third and fourth year level (juniors and seniors) and represent any discipline and professional program at IIT.

External Stakeholders: (corporations, entrepreneurial ventures, non-profit organizations, government agencies) offer problem-solving opportunities that:

- address real needs that have an impact on people, the organization, the industry, and the economy
- have sufficient creative content and challenges
- benefit from a multidisciplinary team approach
- can grow and expand over time

PROCESS

INPUT

Human Resources: IIT faculty as IPRO team coaches and mentors; IPRO Program Office staff as coordinators; students as members of interdisciplinary project teams; sponsors and other collaborating organizations as external stakeholders, content experts, and mentors.

Financial Resources: Financial resources come from IIT tuition revenue and from IPRO sponsorships. IPRO project teams receive modest funding from the IPRO Program for prototyping, field work, and more. IPRO events are financed by the IPRO Program to showcase IPRO team exhibits.

Physical Resources: The new Ed Kaplan Family Institute for Innovation and Tech Entrepreneurship is the home of the IPRO Program and IPRO courses, as well as the graduate Institute of Design. The Kaplan Institute offers IPRO team meeting and collaboration spaces with whiteboards and displays, the Grainger Makerspace with prototyping equipment (3D printers, general purpose fabrication machinery and tools, etc.), the Duchossois Idea Shop with computer visualization and prototype assembly and storage areas, and other areas for guest speakers to give large-scale presentations. The Kaplan Institute is also open to students from all classes to develop their ideas and be supported in developing new ventures.

ACTIVITIES

The range of actual activities depends on specific IPRO project demands. However, they mainly consist of specific lectures and design workshops where all key stakeholders are involved.

IPRO Teamwork Activities typically progress through five phases:

- Project Definition (What problem are we trying to solve?)
- Research & Analysis (What is our unique insight into the problem?)
- Concept Development (What are all the ways we might solve the problem?)
- Prototyping & Testing (What is the optimal solution to the problem?)
- Conveying the Work (What are the ways in which we can communicate meaning?)

The teaching and learning process involves the following activities and deliverables:

- **Project Plan** - IPRO teams are strongly encouraged to create a basic project plan or other similar document that captures a team's collective view about the organization and goals of the team, tasks and assignments, schedule and deliverables for the project, and a forecast of budget needs.
- **Midterm Review Presentation** - IPRO teams are required to present a midterm presentation (a 10-15-minute project update) about their project with at least three external professionals who are knowledgeable about the project topic and will provide feedback to the students.
- **IPRO Day Exhibit Poster/Prototype** - IPRO teams are required to create an exhibit for the IPRO Day event. This generally involves creating and printing posters, as well as prototypes, videos, and other means of communicating the story of a project and its outcomes/results.
- **Final Review Presentation** - IPRO teams are required to give a final presentation (a 20-minute overview) about their project with at least three external professionals who are knowledgeable about the project topic and will provide feedback to the students. There may also be separate presentations given to professionals representing sponsoring organizations.
- **Final Report** - IPRO teams may create a final report or other document that captures a team's project work in a professional manner for distribution to sponsors, community partners, and other stakeholders. In some cases, students may collaborate with the IPRO instructor to create a publishable paper or give a talk at a conference.
- **Work Product** - IPRO teams compile all of the tangible work product associated with their project so that it can be available to a continuing team or otherwise repurposed. This may include prototypes, materials and supplies, data files, hard copies of surveys, software developed, etc.
- **Course Evaluation** - The IPRO Program Coordinator distributes two evaluation surveys to students enrolled in IPRO sections during the semester: one at the midpoint and one at the end of the semester. The focus of these surveys is to assess the achievement of the IPRO learning goals and provide feedback to the IPRO Program that can lead to improvements in the experience.
- **Peer Review** – At the midpoint and again at the end of the semester, students complete a peer review process to evaluate each other's effectiveness as members of the IPRO team. These reviews are confidential, offering the IPRO instructor insight concerning team functionality that can be used to guide students in improving their effectiveness during the second half of a semester. Peer reviews are also used to validate or further inform an IPRO instructor's grading decision related to how well a student participated as a member of the team and contributed to the outcomes of the project.
- **Grading** - Students are graded on the quality and level of effort each team member demonstrates, the participation and functioning of the students as members of a team,

and the overall performance of the team, which includes its effectiveness in collaboration, as well as achieving the project goals, deliverables, and outcomes in a quality fashion.

IPRO Special Events during the semester may include guest lecturers that support learning in the above activity areas, with experts on user research, product design, and prototyping, giving presentations, protecting intellectual property, evaluating ethical implications, and more. IPRO teams also give mid-term presentations to invited guests and sponsor stakeholders, and may also be invited to give presentations of their work to Chicago-area audiences, Board of Trustee members, alumni, and other groups.

IPRO Day: At the end of the semester, IPRO teams participate in the IPRO Day event by showcasing their semester-long project. An IPRO Day exhibit may include prototypes, posters, videos, and other multi-media elements, as well as other creative interaction methods deemed appropriate. Professionals from the Chicago area, including a consistently large percentage of IIT alumni, serve as judges or are invited as guests to visit exhibits and offer IPRO teams an opportunity to share their methods and project outcomes. IPRO teams are organized by themes, with the top-ranked teams recognized at the IPRO Day closing ceremony. The Deans of IIT colleges also visit IPRO Day exhibits and select an IPRO project that they feel merits recognition. All IPRO teams are expected to exhibit their project at IPRO Day.



OUTCOMES AND IMPACT

OUTPUTS

Approximately 1,250 students are engaged in IPRO project courses each year (producing on the order of 3,750 credit-hours), with an average team size of six students who are primarily at the third and fourth year level (juniors and seniors) and represent any discipline and professional program at IIT. There are currently approximately 200 IPRO project teams each year.

Since 1995, hundreds of organizations have participated in the IPRO Program as sponsors and collaborators, including corporations of all sizes, entrepreneurs, non-profit organizations (museums, community organizations, etc.), government agencies, industry associations, philanthropic foundations, and more.

IMPACTS

Student Recruitment - The establishment of the IPRO course and its evolution over nearly 25 years has significantly improved the ability of IIT to attract students because it has been a sustainable, distinctive approach to experiential education that prepares students for the way that they will work in teams and on projects.

Alumni Engagement - The IPRO course has had a significant impact on how IIT alumni engage with the university by offering topics for IPRO teams, sponsoring IPRO projects, and serving as

mentors and IPRO instructors. Engaging alumni in a sustainable fashion is a challenge all universities face, and the IPRO course offers a terrific way for alumni to remain involved and become inspired to support the university financially as well.

Faculty Research – The IPRO course has offered a significant platform for faculty to crystallize their ideas for research projects that can lead to external funding, as well as encourage students to participate in research in areas of faculty interest. IPRO project work has resulted in peer reviewed publications and presentations at national and international professional conferences in a variety of topic areas that include energy and transportation research, web design, engineering education, user-centred design, and more.

Faculty Development – The IPRO course has offered opportunities to faculty members to develop their coaching skills and to collaborate with faculty from other university departments. It has also encouraged professionals from industry, including IIT alumni, to serve as IPRO instructors and become involved in sharing their expertise and experience with new generations of students.

Student Employment & Workplace Validation – The IPRO course has strengthened the resumes of IIT students seeking internships and career positions, and provided strong “talking points” in interviews with recruiters that underscore the practical IPRO experience they have gained and the unique user-centred design methods they have learned, which sets them apart from the competition for positions in industry and government.

University Accreditation & Peer Institution Recognition – The IPRO course has been recognized by accreditation bodies as a highly effective and distinctive way to demonstrate that the promise made to students about the value of their education has been fulfilled. Peer institutions have recognized the distinctiveness of the IPRO experience because of its university-wide pervasiveness across all undergraduate degree programs.

SUPPORTING ENVIRONMENT & SYSTEM

SUPPORTING MECHANISMS

The IPRO Program Office has the responsibility to coordinate and integrate faculty, sponsors, and students in order to identify, organize, promote, implement, and assess around 200 IPRO project teams each year. They are organized through about 20 IIT IPRO course sections available for registration, so that the students can fulfil their interprofessional project requirement.

As the IPRO program has been continuously implemented for almost 25 years and is embedded as an obligatory requirement within the curriculum for all IIT students, it is subject to continuous monitoring and evaluation measures on the university level. During the years, the model of IPRO courses had been adapted and transformed to meet its aims and goals.

IPRO Assessment Loop:

- Student Feedback Surveys: online survey twice each semester
- IPRO Day Judging: to assess IPRO learning outcomes
- Sponsor Feedback: feedback from external stakeholders
- College Leadership Meetings: discussing the current state of the program and setting future plans and goals

Faculty Meetings: twice each semester.

BARRIERS AND DRIVERS

There are a range of barriers and drivers that have influenced the effectiveness of the IPRO Program and its ability to realize the full potential and impact of the IPRO course. This includes the following:

- The initial barrier of “carving out” six credit-hours from the academic departments and gaining consent of the faculty.
- The continuing challenge of matching the university’s commitment to the IPRO course vs the need to give faculty members the incentives and recognition they deserve to take a risk and commit the time to a new approach to teaching.
- The budget to support the faculty and the IPRO Program staff in order to deliver a high quality, sustainable experience.
- Building multiple, sustainable sponsorships that provide funding to the program while also providing sponsors with innovative concepts developed by students, which is a real challenge in managing expectations.
- Matching sponsor interests with IPRO instructor interests, expertise, and availability in any given semester is a challenge.
- Since IIT is a predominantly engineering university, there can be a challenge in creating strong balanced interdisciplinary teams that provide opportunity for rigorous technical achievement but also exploration of business and non-technical issues associated with solving a real problem.
- Scaling the IPRO Program while assuring consistency of experience across all IPRO instructors, students, and sponsors.



LESSONS LEARNED

CHALLENGES

Sponsors & External Collaborators: As noted above under barriers and drivers, there are several aspects of sponsor engagement that are challenging:

- Respecting the time of organization professionals to devote to an IPRO course while making sure that students are energized and motivated by the sponsor or collaborating organization.
- Fitting a sponsor topic into the timeframe of a semester, with the need to continue over more than one semester with a new team that has to overcome the learning curve again.
- Attracting funding commitment from sponsors while managing expectations that the IPRO teams are comprised of students who are learning their disciplines and also have

many distractions with other courses and activities, e.g., they are not full-time interns working for the sponsor.

Academic Departments & Faculty: As noted above under barriers and drivers, there are challenges associated with academic department and faculty engagement:

- Securing the right faculty to serve as IPRO instructors for a particular sponsor and topic requires planning and compromise.
- Faculty members need to be mindful of meeting sponsor expectations and not necessarily pursuing their own viewpoint.

KEY SUCCESS FACTORS

Factors associated with success of the IPRO course include the following:

- Establishing a flexible course format that integrates virtually any type of topic from the workplace into the general education requirements of the university that requires all undergraduates to complete two IPRO courses
- Establishing a set of rigorous activities and deliverables that guide IPRO teams and create tangible outcomes that can be measured and evaluated
- Creating an IPRO Day event to showcase IPRO team project work through exhibits and involve panels of professionals, including alumni, who come to the university at the end of each semester to help celebrate student accomplishments
- Having a prototyping lab, and resource and team meeting spaces to create a professional environment for teams to work and build prototypes
- Alignment with national accreditation requirements
- Connection with the needs of organizations seeking professional talent for internships and career positions
- Continually reimagining the IPRO experience based on feedback from all stakeholders to maintain a contemporary approach that continues to inspire all participants
- Involving both part-time and full-time faculty members with industrial experience and with university research experience

The costs for prototyping the original IPRO program were borne by the university through its operating budget from 1995 to 1998 and then augmented through the fulfilment of its business plan. IPRO has a record of receiving sustaining funding over several years in one-semester increments from corporations. Sustainability is a result of strong commitment from the university's upper administration and a clear funding model. The annual funding for the program comes from net tuition revenue, IPRO corporate sponsorships and foundation grants, the Provost's Office, workshops, rapid-prototyping services, Idea Shop Store, and partnerships with programs sharing space, such as the Exelon Summer Institute and Boeing Scholars Academy.



FURTHER INFORMATION

AWARDS AND RECOGNITION

IIT has received external recognition in the form of several peer-reviewed competitive grant awards from the National Science Foundation.

Individual IPRO teams have competed nationally and have been recognized for their accomplishments. This includes awards from the National Collegiate Inventors and Innovators Alliance (now VentureWell) and the Idea to Product Competition.

IPRO team members have also been recognized in the form of peer reviewed publications and professional conference presentations, as well as patent applications and venture funding.

TRANSFERABILITY

As IPRO is a successful model of integrating problem-based learning within the curriculum on a university level, it has high transferability potential.

IPRO teams have already worked on projects across university boundaries with teams from other universities, nationally and internationally.

IPRO has served as one of the best practice cases, on which IRI UL has built the PEOPLE project (Erasmus+, Knowledge Alliance project) and designed an extracurricular course offered at the University of Ljubljana.

PUBLICATIONS

Nippert-Eng, C. (2002): Two weddings and still no funeral. In Design and the social sciences: Making connections. Ed.: Jorge Frascara. San Francisco: Taylor & Francis.

Kruck, S.E. and F.P. Teer (2009): Interdisciplinary Student Teams Projects: A Case Study. Journal of Information Systems Education, 20(3).

LINKS

<https://ipro.iit.edu/>

<https://web.iit.edu/kaplan-institute>

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