IPRO 311 Final Report
Fall 2008

Campus Branding/ Sustainability Image

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1.0 Abstract

The overall aim of the project is to improve and enhance the image of Illinois Institute of Technology, both as an institution and a physical campus, in regards to sustainability and "green" practices. To that end, the current semester is focused on several design projects based on concepts generated in the previous semesters along with input from the current semesters to enhance a new "green" campus. We will also be spreading information how IIT is currently acting in a sustainable fashion and how students on campus can contribute to our image as a sustainable campus.

2.0 Background

Illinois Institute of Technology has been at the forefront of innovation from its architecture to providing a competitive education environment. Even with this innovation, IIT struggles with its image as a sustainable campus. An example of this is the recent letter D grade IIT received on its college sustainability report card, a comparative evaluation of sustainable activities in campuses across the United States and Canada. The goal of this IPRO is to come up with solutions to make IIT more sustainable and at the same time create a branding scheme to bring awareness to IITs sustainable efforts.

The spring 08' IPRO team created a design for a solar workstation, several greenstallations, energy gauges for buildings, and a plan for permeable pavements. This IPRO team also composed a design manual for making IIT "greener."

The summer 08' IPRO team went further with the ideas presented from spring 08' along with contributing new ideas. The permeable paving initiative looked at researched and identified areas of the campus that have draining issues. They redesigned a solar workstation which was ready for construction. They also created an online group on Facebook that attempts to gather attention and support from the student body in favor of new sustainability practices on campus. This group also created a survey that tried to retrieve useful information that would contribute to the process of moving towards a more sustainable campus. A green wall initiative was proposed to be put outside academic buildings in ideal locations. They briefly conducted research for possibly having nuclear power at IIT. The last project that this team worked on was to propose the use of Aerogel as an insulation material for campus buildings.

This semester's IPRO team will continue building upon the work that previous groups have started. The world is changing its stance on non-renewable sources of energy. Being a part of the Illinois Institute of Technology community, it is our mission to stay ahead of the norm and lead this movement to a more sustainable campus.

3.0 Objectives

The goal of the Fall 08' IPRO-311 team is to develop and implement projects that improve the image of IIT's Main Campus and define IIT's prominence in the realm of energy and sustainability. Another goal is to create awareness and pride in the renewable and sustainable community that will define IIT. This team will make our existing renewable resources known and prove that we are a sustainable campus. An even further step will be taken by the design and implementation of a Solar Workstation, Green Walls, double pane windows for academic buildings, censored sprinkler systems, "IIT" lighting on the main building and a revamped branding/marketing campaign to promote sustainability. Through the future accomplishments of this IPRO, we hope to create an environment that encourages visitors to learn about sustainability, its advantages, and influence them into incorporating sustainable measures into their environment.

Successful completion of the goals presented here will require each participant to gain useful experience and knowledge regarding teamwork, inter-professional skills and most importantly sustainable concepts.

There are several interrelated objectives based on the three teams we have organized ourselves into:

(1) Build IIT brand awareness and campus visibility in ways that are aesthetically pleasing, exciting and memorable.
- Have an exciting speaker(s) come to IIT to speak on Sustainability in an effort to educate and inspire the IIT community
- Administer a survey getting input from the community on what they want to see be made more "Green"
- Design a Lighting Scheme for the front of Main Building that is also renewable
- Publicize sustainability through Facebook
- Research ways on how to revamp the smokestack (possibly through vines)
- Promote a competition within the student body to design a new logo and a T-shirt for the sustainability project to get students interested in our IPRO
- Compile all materials for the deliverables and make sure the deadlines for all groups are being met.

(2) Create an eco-friendly, self-sustained project that enhances our facilities within the university

A. Window Replacement for campus buildings
- Replace poor insulating single pane windows with dual pane units
- Possibility for argon filled windows will be examined
- Use of translucent Aerogel windows will be examined for some applications

- Building analysis will be done to determine the positive effects of better insulating windows
- Conserve energy and make campus building systems more efficient

B. Green Walls
- Best location for green walls will be determined
- Possible model of a green wall structure made
- Keeps building wall cool
- Absorbs CO_2
- Beautify campus
- Possible implementation of a green wall on campus

C. Recycle Program
- Research implementation of a whole campus recycling program
- Research what can be done with recyclable material available on campus
- Promote recycling at IIT

D. Sprinkler System
- Install an integrated sensor system with current automated sprinkler system
- Operate sprinklers only during proper times of day
- Disable sprinkler system when rain is detected by sensors
- Disable sprinkler system when freezing temperatures are detected by sensors
- Disable sprinkler system for a certain period of time based on how much rainfall has been detected by sensors
- Wireless and wired models available
- Promote efficient use and conservation of water and campus resources

E. Permeable Pavement
- Install permeable pavement on campus
- Allow drainage of water back into ground
- Prevent puddles/ice from forming
- Use recycled materials in paving material
- Replace worn and broken pavement
- Possible completion of Phase One of previous pavement plan

F. Hiding Steam Pipes
- Artfully hide steam pipes coming from Farr and Gunsalus Halls
- Possibly use to warm pavement or bench
- Pipes will be 2-10 ft. tall
- Location will be determined
- Possible use as branding opportunity

(3) Promote “Green” Innovation by designing and building a Solar Powered Workstation

A. As part of the goal to strengthen IIT’s sustainability image, our intent is to design and build a solar workstation that expresses sustainability and alternative energy use in its design. The solar workstation will function as a place for students to

plug in their laptops, and other electronic devices, and use them in a comfortable setting. When the workstation is not in use by students, it will function as a light sculpture which will add to the beauty of the campus while attracting attention to the idea of sustainability and alternative energy technology. This will also be its primary function during the cold winter months.

To communicate sustainability in the workstation's design, we intend to construct it primarily out of salvaged, second-hand materials. It will also be modular, so that when more are produced, they can be put together to form a coherent unit and accommodate more users. The solar workstation is also meant to be attractive for students' use. When students use their computers in their rooms, they not only use the computer, but also air conditioning and lighting. Therefore, getting more students to go outside while using their computers also translates to energy savings for the university. We hope that this fact, its use as an educational tool, and the modular design, will make this a marketable product which other educational institutions might want on their campuses as well. This could make it a marketable product which other educational institutions might want to have, thus enhancing IIT's image as an institution committed to sustainability.

- Usable by IIT students in Spring, Summer, and Fall.
- Becomes a light sculpture during Winter months to brighten the campus and attract attention.
- Modular design, can be added together to form bigger unit which accommodates more users.

4.0 Methodology

Initially, the focus of the IPRO was the development of sustainable signage that could represent the 'Green' efforts undertaken by the university. After several class discussions, the vision of the IRPO broadened to develop an overall campus sustainable conceptual design, incorporating signage as one of the elements. The following subject matter explains in task orientated sequential terms how the team conducted the research activities of the project.

A. In the initial phase of the project itself, the team split up into sub-groups which were each responsible for developing and implementing some form of sustainability marketing. The three sub-groups formed were: Marketing, Facilities improvement, and Solar workstation.

B. Each sub-group worked twards ideas, concepts, and plans for their own particular sub-group. Marketing brainstormed ideas on spreading the word of sustainability, Facilities investigated possible projects to concentrate on for the semester, and solar workstation looked at previous IPRO work in order to move forward with a new design.

C. Each group contacted several different resources on and off campus to aid the development phase and gain input. Marketing remained in contact with Admissions and Marketing departments on campus, Facilities Improvements worked closely with the Facility department on campus as well as several product manufacturers, and the solar workstation group worked with the college of architecture shop, and well as additional manufacturers.

D. The final stages led way to a finalized lecture and competition, final design plans for projects throughout campus, and the construction of a solar workstation prototype.

5.0 Work Breakdown Structure & Team Structures and Assignments

In order to accomplish the objectives of the project for the current semester, the team has been divided into three groups.

The groups are as follows:

Marketing and Branding Group (and Team Leader Group):

Raise awareness of ways to make IIT more energy Raise and "green". Promote image of IIT as a sustainable university. Overseeing Administration and general group assignments.
Members: Melissa Toops (Leader), Catherine Budzinski, Vinu Mohan and Gabriel Fontes.

Solar Workstation Group:

Design and build a solar powered workstation to be placed on IIT's main campus.
Members: Milanko Milesic (Leader), Nor Tanapura, Sacha Roubeni and John Kapecki.

Facilities and Steam Pipes Group:

Work closely with campus Facilities Department to reduce wasted resources. Design and build art installations to embellish or conceal steam pipes on campus.
Members: Michael Chamales (Leader), Hyeran Um, Shawn Block and Justin Ma.

Name	Major	Year	Group	Individual Strengths	New Knowledge / Skills to Develop	Expectations about the Project
Shawn Block	CAE	4	Facilities	- green knowledge (LEED Program) - thinking outside the box	- permeable pavement - sprinkler systems	To design and have the project be seen on campus.
Catherine Budzinski	ARCH	5	Marketing	- good presentation skills and experience - marketing experience in other IPRO - woodworking,	- working with students of different majors - learning more about green technology and bringing those skills back to architecture.	I hope this project will be able to build a prototype for campus. I also hope we are able to work with art@iit.edu to come up with some artistic ways of hiding the exhaust pipes.

				designing		
Michael Chamales	MMAE	4	Facilities (sub-group leader)	- material selection - marketing - ideas	- thermal resistivity of windows - pavement installation - design sprinkler set up	- implement pavement plan - research window replacement - fix sprinkler issues and steam pipes
Gabriel Fontes de Faria	ARCH	5	Marketing	-design and construction skills - proficient in programs such as AutoCad, Photoshop, and Illustrator - presentation skills	- learn more about sustainability in both large scale and small scale projects.	I hope that with this project we are able to not only come up with ideas and designs for how to make IIT's Main Campus a more sustainable place, but also apply some of those ideas, and improve the image of the school and peoples awareness to environmental issues.
John Kapecki	ARCH	5	Solar Station	- architectural design - design build studio - sustainability research	- integration of hi-tech/ green systems - find out what will work for IIT Pavilion users	Optimistic that this can become something associated with the IIT community. I want it built and I hope this project can grow over time.
Justin Ma	MMAE	5	Facilities	- engineering background	- networking - team communication	Help IIT become green.
Milanko Milesic	ARCH	4	Solar Station (sub-group leader)	- design, woodworking, and construction skills - experience with project development - drafting, 3d modeling, and model-building skills - presentation experience	- working with large group to realize a project - sustainability and real solutions that work	- spreading the word about sustainability and green technologies while benefiting IIT students and the campus
Vinu Mohan	Biochem BUS	3	Marketing	-marketing - budget planning - unique thinking	- knowledge on sustainability - solar power - how to make a community more green	- to plan a realistic but optimistic project - execute by seeing real changes on the campus
Sacha Rouben	ARCH	5	Solar Station	- design - structure - presentation	- sustainable technologies/ ideas - improve communication skills	- get a solar workstation designed and built
Nor Tanapura	MMAE	4	Solar Station	- engineering aspects	- alternative energy - find out how solar cells work	- want to get solar workstation built.
Melissa Toops	ARCH	4	Marketing (sub-group leader)	- presentation skills - shop experience / woodworking - 3d models - Acad, Photoshop, Illustrator, 3dMax, Word	- project management skills - develop team working skills - learn more about sustainability	To better IIT and people's view of green IIT.
Hyeran Um	ARCH	4	Facilities	- green wall research - marketing - designing skills	- energy consumption - sustainability - greenstallation	To design realistic strategy and planning.

The work breakdown in this project was determined separately by each group. Additionally, analysis of the project by the entire group will be conducted during and immediately after the midterm review and the final presentation to further inform the future of the project.

I. FACILITIES GROUP

Task	Description	Deadline
Green Walls	Research location and implementation of greenwalls	10/03/08
Waste Recycling	Research a recycling program for IIT	10/10/08
Window Replacement	Research replacement of inefficient windows	10/17/08
Sprinkler Sensors	Research an installation of sprinkler sensors	10/31/08
Permeable Pavement	Installation of permeable pavement	11/14/08
Steam Pipes	Beautify or hide steam pipes	11/28/08

II. SOLAR WORKSTATION GROUP

Task	Description	Deadline
First Proposal	Present first proposal	09/23/08
Revised Proposal	Present revised proposal	09/25/08
Final Proposal	Present final proposal	09/30/08
Midterm Presentation	Make model and drawings for midterm	10/07/08
Acquisition	Buy material for workstation	10/14/08

Construction of Structure	Build workstation's structure	11/06/08
Construction of surface	Build workstation's surface	11/18/08
Final Presentation	Work on final presentation material	11/27/08

III. MARKETING AND BRANDING

Task	**Description**	**Deadline**
T-shirt/logo competition	Hold a t-shirt/logo design competition	9/25/08
Green Speaker	Book speaker for sustainability lecture	9/25/08
Facebook/Survey	Update Facebook group and finish survey	10/07/08
Green Speaker	Sustainability lecture	10/23/08
Smoke Stack Beautification	Complete research and design	10/23/08
Main Building Marketing	Design development for marketing on Main Bldg.	11/06/08
Design Manual	Update and print design manual	11/06/08
T-Shirts	Print/distribute T-shirts	11/06/08

6.0 Project Budget

	Items/Task	Budget Planned	Budget Actual
Marketing and Branding Group			
	Shirt Contest Advertising & awareness posters	$60	$0
	Shirt Contest Prize	$100	$100
	Shirts (144 @ $3.98 each)	$573	$0
	Sustainability Lecture Advertising	$30	$0
	Printing of final design manual	$100	
	Sub total	**$863**	**$100**
Solar Workstation Group			
	Sharp ND-130ujf, 130 Watt	**$**647	**See below**
	Enphase Micro-Inverter M175-24-240-S01, MC3	**$**199	
	Deka/MK Battery S6VGC SLD G Gel Cel, 6 volt 180 Ah	**$**275	
	TriStar Digital Meter TS-M (Charge Controller)	**$**193	
	Wood and Building material	**$**250	
	Misc. (screws, bolts, nails, etc.)	**$**50	
	Wires and cables	**$**50	
	Xantrex Link 10 Standard Meter (Emeter) (LED battery Monitor)	**$**216	
	Sub total	**$1,880**	**$400**
Facilities and Steam Pipes Group			
	Sprinkler Sensors example	$150	$0
	Permeable Pavement-sample material	$100	$0
	Other materials		$18.48
	Sub total	**$250**	$18.48
	TOTAL	**$2993**	**$518.48**

WORKSTATION
FINAL COST

	ITEM	QUANTITY	PRICE	TOTAL
MOLD	PLYWOOD	2	$14.49	$28.98
	LUMBER 2x4s	4	$2.19	$8.76
	DOWEL RODS	6	$2.65	$15.9
	THREADED RODS	10	$1.65	$16.5
	NUTS	1	$6.38	$6.38
	WASHERS	1	$6.38	$6.38
	STEAMER RENTAL	1	$76.	$76.
	MOLD TOTAL			**$158.9**
WORKSTATION	HARDWOOD ASH	56	$3.26	$182.56
	GLUE	1	DONATED	0
	CANVAS	1	DONATED	0
	DOWELS	1	$1.99	$1.99
	VARNISH	1	$15.	$15.
	SCREWS	1	$7.	$7.
	WORKSTATION TOTAL			**$206.55**
GRAND TOTAL				**$365.45**
	WITH TAX			**$400.**

7.0 Results

The solar workstation sub-group came up with their idea of this particular designed looking at a lot of chair designs. Also to see if it was possible to build the way we wanted to, we discussed it with John Kriegshauser of the architecture department. Our major accomplishment is that we finished building the solar workstation. Our main objective was to build the solar workstation and equip it with a thin flexible solar panel. We did manage to build our solar workstation but were not able to put up any of the equipment that we had planned. One ethical and moral issue is that every time we cut wood we are losing 1/8 inches of wood due to the thickness of the saw blade. But further thought in to that, if we were to fabricate the workstation out of materials such as Aluminum, it would have taken a lot more energy to do so.

The Marketing group looked to other universities and previous IPRO ideas and work as an resource. The major accomplishment of this sub-group was the lecture held in sustainability, as well as moving forward with current marketing projects. We

achieved most of our objectives set at the beginning of the semester, however stretch goals would have been a good idea, to achieve more than we expected. We did also plan on distributing merchandise with the new logo; however budget prevented this at the scale we would have liked. Ethically we needed to be sure what we were promoting as sustainable practices truly were sustainable.

The Facilities sub-group's Major Accomplishments: Planned the necessary paving of a walkway: obtained pricing and a sample of Filtercrete Analyzed the possibility of replacing single pane windows on campus and obtained samples. Created a plan to optimize sprinkler systems and recommended a product to use. Designed a functional and aesthetically pleasing green wall and made model of it. Objectives that were met: Analyzed possibility of replacing windows and came up with costs and cost savings. : Designed a green wall to be built and came up with costs. : Found a viable way to use permeable pavement and came up with costs. : Found what needs to be done to implement sprinkler sensors and found product to use along with the costs. Objectives not met: Implantation of sprinkler sensors in remaining 5 zones. : Actual paving of any of the 3 initial sites for permeable paving. : Plan to pave permeable paving sites in the spring. : Only initial ideas on how to hide steam pipes. Issues: How to calculate energy savings by replacing windows. : Lighting green wall inside at night in order to keep the same level of safety. Obstacles: A) Calculating energy savings from replacing windows. Getting renderings correct. B) Used heat and mass eqs. Rerendered. Recommendations: Possibly find a way to better insulate building roofs. : Implement sprinkler sensors. : Implement permeable paving in at least 1 of the three sites specified. Or at least create a plan for the campus facilities to do it in the near future. : Get plan together to implement green wall that was designed. : Obtain funding for these things.

Sprinkler sensors are an easy and economical way to save water and money. Window replacement would make the campus more sustainable but costs make it prohibitively expensive. Possibly replace windows as they break. Permeable pavement makes the campus more sustainable. A practical application would be to pave the dirt path outside E1 to begin implementation. The green wall canopy structure would be quite expensive. We feel it would be worth it however given its visibility on campus and practical use for cooling. There is a lot that can be improved or implemented on campus and IPRO 311 is a great way to begin this process. Research Findings: Location of sprinkler sensors in use now and where timers for all 7 zones are. --Facilities Crew Sensors needed: Rain-Clik rain sensors -- http://www.hunterindustries.com/Products/Sensors/rainclikintro.html Permeable concrete for walkway: Filtercrete: 1600sq. ft. : $15,000 including installation. --Ozinga : ozinga.com Windows: Aerogel windows : Edge w/ Nanogel by Super Sky: 18-$20 sq ft. : 73% light transmission: 25mm thick: polycarbonate laminate: R value, 7: 19780sq ft for Keating hall --supersky.com Dual pane argon filled windows: R value, 4.7: Pella commercial. --Pella commercial thermastar 20 series: low E coating. pellacommercial.com Green Wall: 11265 sq ft: structure, 40000: green wall screen material, $10 sq ft: LED lighting system, $6165: solar panels with batteries, $2500, from Sharp, PVC used for structure. -- mrsolar.com (solar panels, batteries) --GreenScreens

(green wall screen material) --http://www.theledlight.com/light_bars.html(LEDs, transformers, mounting stuff)

8.0 Obstacles

We encountered several obstacles throughout this semester, each sub-group with their own individual projects. The marketing group struggled with connecting with the students, faculty, and staff in getting out the word of sustainability. We struggled with advertising around campus. We utilized several means, through posters, facebook, iit today, and tech news to spread the word about our events. In the future advertising would need to be done earlier and in larger quantity so that allow for a further audience to be reached.

The solar workstation group One major problem was that as we were building the solar workstation, there was always a new obstacle to encounter everyday. Such as the saw table failed on us on the first try when we were cutting ash. Another incident was when we were trying to steam the 1/16-inch strips of wood in a PVC pipe but the PVC pipe melted and gave off toxic fumes. The failing saw table, we were able to re orientate the wood that we were cutting, so that the wood did not put pressure on the saw blade, which kept being stopped. The other problem with the steaming of the wood, instead of using a PVC pipe, we had decided to spot steam it. That meant we steamed the wood in the corner where it need to bend. We tried to anticipate all the problems that could happen during the process but since this is the first time for all of us building the solar workstation in this particular method; there probably couldn't have been anything that could have been done to prevent or reduce these obstacles. Maybe if we had more experience in woodworking or metal works it would be helpful. One thing that needs to be fixed is the canopy tarp. We wanted to make it waterproof but ran out of time. Also it sags a lot, if there is a lighter and water proof material that could be use it would be a great thing.

Obstacles for the Facilities sub-group include creating contacts with manufactures, and creating a discussion between the departments of facilities, researching new materials and conducting calculations for monies lost/gain. Perseverance in contacting companies, and several members would try and sometimes get different results, although in the short time span of a semester some material data and samples were not obtained. Perhaps if started earlier in the semester we would have had more time to obtain information. New technologies are always present, making this process ever changing, so looking out for new technologies would be a continuing barrier.

9.0 Recommendations

Next steps for future IPROs can be categorized into the three sub-groups, for the marketing team we would love to see a lecture series spin off of our sustainability lecture into a monthly or semesterly series, inviting different lecturers to each event. The lunch time 12:40-

1:50pm time slot seemed to work well however three lectures were too rushed; one or two might work best. Additionally continued work with admissions and marketing department to attempt a real-life concept into fruition. The solar workstation sub-group recommend that the next team takes the already built chair and finish putting in the equipments such as, solar panel, solar panel railing so it is adjustable, battery, inverter, charge controller, and if possible put it on a swivel base so that a table could be attached. We also recommend keeping contact with the company Konarka which is a company that is developing a thin film solar panel, which could possibly be used on the workstation. And the Facilities group recommends further contacting facilities on campus; try to obtain a real installation on campus such as the pervious paving which would require a lot of interdepartmental connections, and perseverance on the part of the group members. Possibly find a way to better insulate building roofs. : Implement sprinkler sensors. : Implement permeable paving in at least 1 of the three sites specified. Or at least create a plan for the campus facilities to do it in the near future. : Get plan together to implement green wall that was designed. : Obtain funding for these things.

10.0 References

Resources include the IIT community departments such as Marketing and Admissions as well as the Stuart school of business.

City of Chicago, particularly the center for green technology. (Susan Ask)

College of Architecture, particularly John Kriegshauser in the model shop

Konarka Technologies, Inc.

Nancy Hamill-Governalle, our advisor is a fountain of resources in the history of IIT

Rea Mindock, was one of our sustainability resources

Mindy Sherman was a resource of resources, directing us to the correct persons for our needs.

Konarka - which is a company that is developing a thin film solar panel, which could possibly be used on the workstation.

A wide variety of internet sources were utilized throughout this semester in a variety of applications.

11.0 Acknowledgements

Nancy Hamill-Governalle-she provided amazing guidance towards our goals, a source of knowledge and an amazing sustainability resource.
Rea Mindock- she provided us with guidance towards sustainability and past IPRO achievements, helping us to move forward.
Mindy Sherman – she served as an amazing network resource, allowing us to get in contact with several departments on campus, and was instrumental in advertising our IPRO.
John Kriegshauser- he provided assistance in the design and construction of the solar workstation, he was necessary in the successful construction of the workstation.
George Nassos- he gave us his time to lecture at our green lecture to better inform the student, faculty and staff community about sustainability.
Susan Ask(City of Chicago)- she gave us his time to lecture at our green lecture to better inform the student, faculty and staff community about sustainability.
Office of Admissions Department- aided in the implication of out logo design.
Konarka Technologies, Inc.- assisted in solar powered workstation material choices.