

Composting Program

Methodology

Research

When we initially began the EnPRO our sponsor Joe Clair stated that one area the Student Business would be involved in running would be a campus composter. Therefore, the first thing we did was to began researching and looking over the information from a previous IPRO (IPRO 312) which was involved in getting the funding for the composting unit.

Legal Issues

One thing which the previous IPRO did not research was any legal issues associated with gathering materials, using the compost on campus, as well as the additional possibility of selling the compost.

Our team therefore began to dig into these realms of the project. Contacting the multiple organic waste sources on campus and speaking with them on the current contracts as well as options for changing the contracts. Similarly, we looked into the legislation and other legal issues associated with the university selling compost to outside companies and individuals

Blake Davis

Blake Davis was the professor for the previous IPRO. He was extremely helpful in helping us gather information and sift through the results from the previous IPRO.

IPRO 312

The previous IPRO gathered a lot of information and did a good job of comparing IIT to other universities. They also had good research on financial information associated with having a composting unit on campus. There were however additional aspects of implementing a composting unit on campus which they did not address, that we needed to look into.

Brickman

In addition to the results previously obtained by the past IPRO, we spoke to Brickman representative Will Haverkamp. Will provided us with current quantitative results of the amounts of materials we would be able to obtain from their company services on campus. Will also gave great insight on the amount of space and additional materials

Additional Material Sources

Our campus has numerous opportunities for gathering organic materials.

Global Grounds
 Center Court
 Commons
 Pritzker Club
 10 West
 Bog

- Einstein Bros - Greek Housing

Data Compilation

Once we gathered numbers and figures from all the different areas we began to do the calculations behind beginning a composting program.



Process

- 1. Locate your composter on bare soil. Somewhere in your garden that is easily accessible all year round.
- 2. You should mix your Green and Brown materials evenly when composting. Greens are soft, wet materials like grass cuttings, vegetables and fruit scraps. Browns are harder, dryer materials like hedge trimmings and strips of cardboard.
- 3. When composting you should put a lot of materials in all at once. Chop large items into smaller pieces to help with the process. Try to ensure that your compost is moist but not wet when squeezed in your hand, a few drops of water should be produced. Add water if it is too dry; cover and add dry material if too wet.
- 4. If you wish, add compost accelerator (young nettles are an excellent natural accelerator) to help speed up the composting process.
- 5. Keep adding materials, remembering to agitate the contents every couple of weeks throughout spring and summer to keep air flowing through.
- 6. Your compost is ready when it is dark in colour and smells like earth. This can take from 6 to 18 months depending on the materials used and the time of the year.





composting program



iit

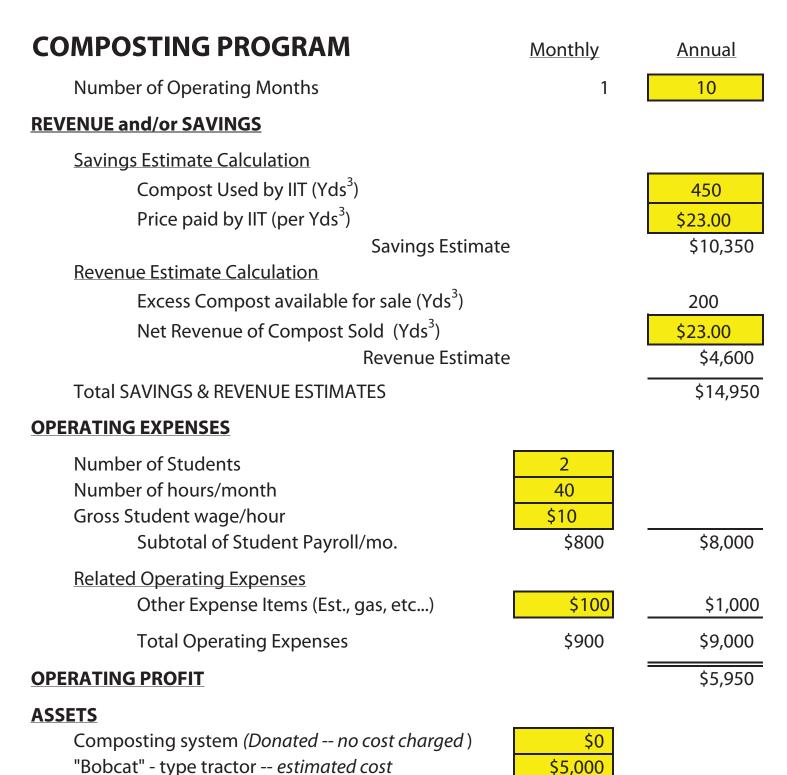
Revenue Model

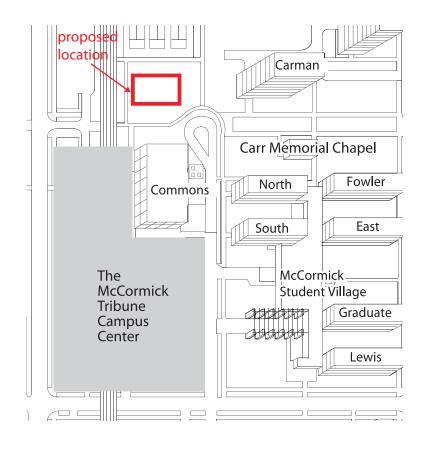
Total Assets Needed / Purchased

formula modified for context; no "net" caluculation available

ROA estimated using the formula of "= Operating Profit / Total Assets"

ANNUALIZED RETURN ON ASSETS (ROA)





Results

Benefits

- -increase organic waste recycling
- -self sufficient
- -university more sustainable

Marketing

-new labeling-students/ staff to becomemore involved with sustainability

Future Plans

- -implementation
- -purchase machinery -train staff
- -create on campus garden
 -look for outside sources
- -student organizations

ob Description: Composter Manager	
ob Category:	Facilities & Maintcoenance
osition Title:	Composter Manager
Pepartment:	Facilities, Campus Energy & Sustainability
ieneral Description:	The Composter Manager will direct and operate the IIT Composter, which may include budget development and management, sourcing and coordinating incoming materials, on-site materials handling and processing, and compost trade. Additionally, the Composter Manager oversees any additional staff or volunteers working on the site and will collaborate with other staff on tasks, such as marketing, workshops and research projects. The Composter Manager will be tasked with

the execution of operational aspects of education and research programs, and will participate in workshops and trainings. The Composter Manager will play a critical role in the expansion of IIT's composting operation and related research programs, providing both leadership and the capacity to execute tasks as needed. The Composter Manager reports directly to the Director of Campus Energy and Sustainability and is supported by the organization's resources and staff.

OFFICE: Assist with budget management, record keeping, and invoicing. Continue relations with IIT food services and landscape maintained contractors to secure and increase organic materials for composter and further the compost trade.

coordinating incoming materials, on-site materials handling and processing, and compost trade. Distribute or replace compost bins throughout campus.

MARKETING: Assist with marketing events and

COMPOSTER: Responsible for sourcing and

OUTREACH: Responsible for scheduling and overseeing a calendar of community education and outreach events and workshops, for IIT students, related to composting or other related sustainability issues.

workshops at IIT campus.

Other Duties: Participates in job-related training as deemed necessary by the University or department.

Additional Responsibilities as assigned. QUALIFICATIONS

Location:

Requisition Numbers

Required Applicant Documents:

Key Responsibilities

Education & Experience:

Currently enrolled IIT student in good standing.

Experience in material handling, inventory

Experience gardening, composting, or farming preferred.

control, and website maintenance preferred.

Preferred Skills:

Demonstrated Ability to:
-Access computer programs & use computer operations related to position requirements.

-Willingness to work with and further the

sustainability goals of the university.-Take direction and complete work independently with minimal supervision.

Physical Environment:

Other Physical Environment:

-May be exposed to wet or dry environments, harsh weather, extreme heat or cold, and long

hours during emergency situations.

-Must be able to climb ladders, lift, unload, and move loads of up to 50 pounds.

-Good attendance & punctuality are essential to the efficient operation of the entire sustainability team.

Resume & Cover Letter

IIT Main Campus (MC), 3300 S. Federal, Chicago 1234567

119%

\$5,000



Biodiesel and Liquid Soap Program

Methodology

Research

When initially searching IIT's waste stream for a potential revenue creating item, waste cooking oil emerged as a very plausible avenue. After some research, it was realized that waste cooking oil could be turned into biodiesel and hand soap after being put through certain processes. In order to learn more, a trip was taken to Loyola University's Center for Urban Environmental Research & Policy's Biodiesel Lab. After gaining some valuable insight, it was concluded that a similar program at IIT was very possible.

Microprocessor

Decided it would be in the best interest of IIT to purchase a Biodiesel Microprocessor from Loyola Univeristy. The cost of the microprocessor is \$5,000 and comes with construction, training, and on-going technical support. The microprocessor creates 15 gallon batches and is portable and small enough to fit inside an elevator. The logic behind purchasing a microprocessor is simple. IIT engineers will observe and analyze the process and then make changes to make it more efficient and cost effective. These same engineers can then design a system at a larger scale and eventually produce a one of a kind biodiesel processing lab.







This soap is made from recylced "waste" products from biodiesel production in IIT's Facilities Campus Energy and Sustainability (FCES).

Ingredients: water, filtered and purified waste vegetable oil (WVO), glycerin, potassium hydroxide, isopropyl alchohol, essential oil

Process

In order to grasp the overall process of converting waste cooking oil to biodiesel, we can break it down into smaller steps:

1. Waste cooking oil taken straight from cafeteria and put into steel drums where it is heated to 80° Celsius

-As oil is heated, the molecules expand, creating a natural filter

-The waste sediments (biosolids) filter and settle to the bottom, where it is then drained out

-Left with clean cooking oil

2.Cool to 60° Celsius

3.Mix in Methoxide

-Combo of 0.2 gallons methanol and 32.78 grams of sodium hydroxide 4.Reaction of waste cooking oil and methoxide creates biodiesel and glycerin

-Glycerin settles to bottom where it can then be drained

-Glycerin is hazardous because it contains methanol -Glycerin is filtered using a series of water heaters that leaves us with non hazardous glycerin

5.Biodiesel is washed and filtered using a series of different processes6.Ready to sell

7.Glycerin is then used to create liquid-soap

-Add more catalyst (Sodium Hydroxide), waste vegetable oil, and water -0.2 gallons of glycerin creates 4-6 gallons of hand soap

- -1.0 gallons of waste vegetable oil creates 1.0 gallon of biodiesel and 0.2 gallons glycerin (4-6 gallons liquid hand soap)
- -The biodiesel can then be used for vehicles/machinery on campus or sold on the open market
- -Liquid soap can replace the purchasing of hand soap from an outside supplier

waste cooking oil



biodiesel and liquid soap program



iit and public

<u>ANNUALIZED RETURN ON ASSETS (ROA) -- formula modified for context; no "net" caluculation available</u>

ROA estimated using the formula of "= Operating Profit / Total Assets"

Results

Benefits

- -Eliminate an item from IIT's waste stream
- -Increase the recycling rate
- -Create learning opportunities for students
- -Gain additional exposure as a leader of sustainability -Save IIT money that can be used for other areas of growth
- -Create a profit for IIT

Marketing

- -quality
- -tech news
- -adversting

Future Plans

-Develop a student organization of engineers that are willing to conduct research and create a more efficient and profitable process for converting waste vegetable oil into biodiesel and hand soap

- -Grow in scale in order to be able to supply the entire campus with hand soap and create enough biodiesel to secure the City of Chicago and Cook County as customers
- -Become the nation's leader in the research and production of biodiesel from waste vegetable oil



Revenue Model

DIESEL and LIQUID SOAP PROGRAM	Mor	<u>nthly</u>	<u>Annulized</u>	BIODIESEL and LIQUID SOAP PROGRAM	
Number of Operating Months	1		10	NEW REVENUE and/or EQUIVILANT SAVINGS	
nue and Productions Assumptions				Biodiesel Sales	
Number of "base" Biodiesel production run batches per month Costs of Goods Sold per BATCH (material costs only) "CONVERSION PROCESS"		16		Estimated gallons of Biodiesel produced annually (see above) 2,432.0 Annual average price of Biodiesel Sold \$3.85	
Number of gallons of Waste Vegetable Oil (WVO) per batch	16			Liquid Hand-Soap Savings	
Bio-Diesel Production cost/unit 1 Gallon of WVO \$0.00	\$0.00	sions based on a	above drivers \$0.00	Est. of gallons of liquid hand soap used (annually) by IIT Annual average price paid by IIT per gallon \$5.25	
0.2 Gallons of Menthanol \$0.65	\$10.40	\$166.40	\$1,664.00	Liquid Hand Soap Sales	
32.78 Grams of KOH \$0.36 Material Only COGS Subtotal \$1.01 per gallon of WVO used Output from Base Biodiesel Production	\$5.76 \$16.16	\$92.16 \$258.56	\$921.60 \$2,585.60	Est. of gallons of soap available for sale (annual PROD used by IIT) Average annual selling price per gallon of hand soap \$5.25	
Gallons of Biodiesel produced per gallon of WVO 0.95	15.2	243.2	2,432.0	TOTAL REVENUE AND SAVINGS	
Gallons of Glycerin per gallon of WVO prod. Run 0.18	2.9	46.1	460.8	COST OF GOODS SOLD (COGS) annual estimates	
Liquid Hand Soap Production per "base" Biodiesel production Run				Student workers \$8,000.00 Lab Manager \$40,000.00	
0.18 Gallons of Glycerin \$0.00 from base production 13.0 Grams of KOH \$0.14 Water Added \$0.00	\$0.00 \$2.24 \$0.00	\$0.00 \$35.84 \$0.00	\$0.00 \$358.40 \$0.00	Estimated on-campus facilities rent and utilities (annualiozed) \$6,000.00 Depreciation of Production Equipment Only (straight-line; 10 yr life) \$500.00	
Addditional WVO \$0.00	\$0.00	\$0.00	\$0.00	GROSS PROFIT from OPERATIONS	
Material Only COGS Subtotal \$0.14 per gallon per base prod. Run	\$2.24	\$35.84	\$358.40	Other Overhead Expenses Annual Fees	
Gallons of Liquid Hand soap produced per "base" run 5 Production Labor	80.0	1280.0	12,800.0	National Diesel Board health & administration regulations American Society of Testing and Measurement biodiesel tests \$1,000	
Student Labor; Number of 2 Hours worked per month 40				Annual cost of bond with Illinois Department of Revenue \$2,000 OPERATING PROFIT	
Wage rate per hour (gross) \$10.00 Subtotal Direct student cost \$800.00			\$8,000.00		
Lab Manager Salary (annual) \$40,000			\$40,000.00	ASSETS PURCHASED	
Lab Manager Salary (armual)			\$40,000.00	<u>Leasehold Improvements</u> Blast Curtain \$15,964	
				HVAC System \$19,036	
				Production Equipment Microprocessor (bought from Loyola Univ; includes training) \$5,000	
				Total Assets	

Job Description: Student Salvage Store Worker	
Job Category:	Facilities
Position Title:	Biodiesel Apprentice
Department: Annual Est.	Facilities, Campus Energy & Sustainability
General Description:	Biodiesel apprentices take used cooking oil and refine it to make biodiesel.
\$9,363.20 Key Responsibilities:	-Make biodiesel from waste cooking oil
	-Be able to handle chemicals properly
\$945.00	-Have excellent communication skills
	-Ability to work well in groups
\$66,255.00 \$76,563.20	-Refine the biodiesel process and come out with innovative ways to improve the quality of biodiesel produced
Additional Responsibilities as assigned.	
QUALIFICATIONS	
Education & Experience: \$54,500.00	Currently enrolled IIT student in good standing.
\$22,063.20	(Chemical Engineer Majors preferred)
\$5,500.00	Experience in material handling, inventory control, and website maintenance preferred.
Preferred Skills: \$16,563.20	Demonstrated Ability to: -Access computer programs & use computer operations related to position requirementsWillingness to work with and further the
\$40,000.00	-Take direction and complete work independently with minimal supervision.
Physical Environment:	Shared Workspace
Other Physical Environment:	-Work well with chemicals and fumes
Location:	IIT Main Campus (MC), 3300 S. Federal, Chicago
Requisition Number:	1234567
Required Applicant Documents:	Resume & Cover Letter



EnPRO 352

A Recyclables Business Model for IIT

Problem

Increasing the Recycling Rate at the Illinois Institute of Technology (IIT) while creating revenue as well as helping to create a more self-sufficient, sustainable campus.

Background

The recycling rate and per capita waste for IIT are in the 75th quartile of reporting universities. Joseph Clair, the Director of Campus Energy and Sustainability at IIT, came to EnPRO 352 requesting a business plan for a student run organization that will increase the recycling rate while also decreasing the total amount of waste and saving money or creating revenue for IIT.

Awareness

Creating a more aware campus is our end goal, from student to staff. The proper disposal of organic waste is essential. Waste cooking oil from the campus can be recycled and used to create biodiesel and hand soap. Also the proper disposal of old materials is key.

Acknowledgements

IIT- Controller's Office:

IIT- Department of Facilities and Management:

IIT- Director of Campus & Conference Centers:

IIT- Director of Campus Energy and Sustainability:

IIT- Director of Research Resources, Graham Resource Center:

IIT- IPRO 312 Professor:

IIT- Marketing Coordinator for Recycling Services:

IIT- Purchasing:

IIT- Sodexo:

Brickman-Representative:

DePaul University-DePaul Procurement Office:

Loyola University- Biodiesel Lab Manager:

Mother Butter's- Owners:

Northwestern University- Procurement Administrator:

Recycling Services Inc- Owner:

Brian Laffey

John Sebby

Kelly Schaefer

Joseph Clair

Matthew Cook

Blake Davis

Bernadette McMahon

Frank FioRito

Eddie Skidmore

Jovanny Zepeda

Will Haverkamp
Abe Reising

Zach Waickman

Jen Donnelly

Tim Donnelly

Sheila Watkins

David Levinson

Conclusion

This EnPRO challenged the members to think outside the box. Since items such as aluminum, paper, and glass were not an option we had to search elsewhere. There were numerous challenges, both ethical and otherwise, which the group had to overcome. However, we were able to overcome these obstacles and begin the workings for three extremely useful programs.

With the implementations of these three areas, it will not only provide revenue to IIT, but also help to increase the recycling rate and make IIT more self-sufficient. In addition to all this having the student business, which will be running the composting, hand-soap & bio-diesel, and salvage programs, will allow for more jobs available to students while attending IIT. Everything mentioned above and accomplished throughout this semester's EnPRO will also help with the appeal of the campus, and IIT itself.

SUMMARY of the ANNUAL BENEFITS by the NEW RECYCLING PROGRAMS	Paper Recycling Program	Salvage Store Program	Composting Program	Bio-Diesel & Hand Soap Program	TOTAL
Program Savings Program New Revenue	\$60,000 n/a	\$20,000 \$20,000	\$10,350 \$4,600	\$945 \$75,618	\$91,295 \$100,218
TOTAL REVENUE and/or Savings	\$60,000	\$40,000	\$14,950	\$76,563	\$191,513
Number of Students Empolyed # of Supervisory Personel (New for programs)	1	2	2	2 1	7 1
Total COGS & Operating Expenses	\$8,000	\$21,000	\$9,000	\$60,000	\$98,000
OPERATING PROFIT	\$52,000	\$19,000	\$5,950	\$16,563	\$93,513
ASSETS (Incremental for Program Operations)	\$3,500	\$1,288	\$5,000	\$40,000	\$49,788
ROA (Modified for context no "net" profit available)	1486%	1475%	119%	41%	188%



Salvage Store

Methodology

Research

When we discovered the many contracts the university was already involved in, we need to look elsewhere for materials.

In doing so, we came across the many electrical devices and office supplies the university drives on. Now that we had discovered items which we would be able to take control of, we needed to come up with a way of recycling these items. Several ideas were passed back and forth:

- Selling materials to electronics stores (i.e. Best Buy) in exchange for gift cards - Selling materials directly to a recycling center (insuring 100% of the material was recycled)

Kellly Schaeffer

In passing one of our members mentioned these ideas to Kelly Schaefer. Kelly stated she was familiar with a program that DePaul University had implemented successfully, a university online salvage store. This would be a place where different offices and departments on campus would be able to donate their unused items for sale to the IIT community. This would include tables, chairs, shelving, or any other unused items. Kelly put us into contact with Brian Laffey in the Controller's Dept. who had been considering this type of program.

We set up a meeting with Brian Laffey of the controller's office and he also invited Frank FioRito of purchasing to sit in on the meeting. We also began to research DePaul University and their program.

DePaul

DePaul's program includes external sales to the public. So what this meant was that any individual, even those not affiliated with the university, would be able to purchase these items. We contacted Abe Reising who manages the Salvage store, along with two student staff he manages, and gathered further information about how they got their program started and everything involved with running a program such as this.

Met With Finance/Purchasing

Once we had this idea and done some background research, we decided to talk with some of the departments at IIT to see if they indeed would be open to a program such as this for recycling their unused office items. We met with two individuals, Frank FioRito and Brian Laffey. Talking with these two individuals we found out they were extremely excited about a program of this type and would be willing to get involved. They directed us to Northwestern and the program that university was working on.

Northwestern

Northwestern had a similar program implemented, however theirs was purely internal and departmental. Their program was put in place solely for the purpose of the departments trading items. These items would then easily be able to be grant items as well as direct purchases from departments. Conducting further research on this program allowed us to gain insight on the differences of the two programs in order to decide which type would be more viable for IIT.

Hybrid Model

Once all the research was done, and we knew we would have departments to get involved, we had to decide what type of program we wanted to implement: internal or external. Upon further discussion we agreed upon doing a hybrid of both. Creating sections for departmental grant items to be sold only to other departments as well as sections for any other items to be sold to the public.

TechSalvageStore.com

In order to show how this program would work, we have purchased and set up a functional website with example items. We have also included a release form for individuals to fill out to insure it is indeed their property as well as gain information on grant items. This site is not fully functional in separating items from departmental and public access.

Process

- 1. Department has an item to dispose of such as furniture, electronic equipment, office equipment.
- 2. Department submits an Asset Disposal Form (ADF) which can be a link online under facilities on the work tab at my.iit.edu *See ADF form on bottom right*
- 3. Once the ADF is filled out, they will receive an electronic reference # assigned to them and the Salvage staff will receive a request (auto email) for the item to be retrieved.
- 4. Student salvage staff will check requests daily and determine if items can be picked up by the student salvage staff or if a facilities work order needs to be placed for large/heavy items.
- 5. Once the item(s) to be disposed have been retrieved, the items will need to be placed in the appropriate area:
 - a. Grant items: Can be posted to the salvage site if reusable condition and made only available to university departments. If item can not be reused, it needs to be returned to federal gov't. b. Capital Purchases: Items that are tagged as assets (totaling over \$25000) must go through the controller's office to have their asset tags removed before they can be salvaged c. Electronic items such as computers which contain sensitive info: The harddrives will be wiped by a staff member to be completely secure before resale d. Regular Items: The student staff will determine the value
- 6. Items that are sold will be picked up at the Salvage Store room. Items that are listed for resale or waiting in transit will also be housed in this room. Suggestions for the room include:
 - -The M & M building
 - -Contacting Elizabeth Morales, Dir. Of rental property management 312-567-3361 to inquire about space
- 7. There will be set pickup hours that the salvage store would be open and posted on their website.

Revenue Model

SALVAGE STORE	<u>Monthly</u>	<u>Annulized</u>
Number of Operating Months	1	10
REVENUE and/or SAVINGS		
Revenue Estimates (monthly average of revenue from sales) Savings Estimates (monthly average of new purchases avoided) Total SAVINGS & REVENUE ESTIMATES	\$2,000 \$2,000 \$4,000	\$20,000 \$20,000 \$40,000
OPERATING EXPENSES Number of Students Number of hours/month Gross Student wage/hour Subtotal of Student Payroll/mo.	2 80 \$10.00 \$1,600.00	\$16,000
Related Operating Expenses Other Expense Items (i.e., on-campus storage facility rent) Total Operating Expenses	\$500 \$2,100	\$5,000 \$21,000
OPERATING PROFIT	\$1,900	\$19,000
ASSETS Camera Moving Eqipment Website/Software (annual fees) Total Assets		\$200 \$414 \$674 \$1,288

ANNUALIZED RETURN ON ASSETS (ROA)

formula modified for context; no "net" caluculation available ROA estimated using the formula of "= Operating Profit / Total Assets"

1475%



Results

Benefits

- -reuse materials
- -save from buying salvage items
- -increase communication between departments

Marketing

- -quality
- -promote website
- -tech news
- -adversting

Future Plans

- -find space
- -transportation
- -staff training
- -implementation

escription: Student Marketing		QUALIFICATIONS			
dinator for Recycling Awareness		Education & Experience:	Currently enrolled IIT student in good		
ategory:	Business Marketing		standing.		
ion Title:	Student Marketing Coordinator for Recycling Awareness		A background in customer service or business marketing would be beneficial.		
rtment:	Campus Energy & Sustainability				
	Business marketing student promotes recycling awareness through various event/programs and the creation of advertisements campus-wide in accordance with the Office of Sustainability.	Preferred Skills:	Demonstrated Ability to: -Communicate effectively to large groups and multitask with various projects.		
Responsibilities:	Initiate campus-wide events and becomes actively involved in the collaboration of a variety of organizations offered at IIT. Implement knowledge of recycling to students, staff, and faculty through a calendar of programs (attached) that will be offered during the academic year.		-Provide an enhanced creative perspective to current recycling awareness programs on campus. -Willingness to work with and further the sustainability goals of the university. -Take direction and complete work		
	SALVAGE ROOM: Promote the flow of materials with the creation and distribution of various		independently with minimal supervision.		
	advertisements for the storefront. Collaborate with the salvage workers to increase the	Physical Environment:	Shared Workspace		
	number of viewers of the salvage store website.	Other Physical Environment:	-Good attendance & punctuality are essential to the efficient operation of the entire sustainability team.		
	COMPOSTING: Publicize the current composting service offered at IIT to increase	Location:	IIT Main Campus (MC), 3300 S. Federal, Chicago		
the appropriate disposal of organic waste.		Requisition Number:	1234567		
	COOKING OIL SOAP: Design labels for the		Resume & Cover Letter		
future soap products to be sold and used on campus as a green alternative.					
	WEBSITE: Collaborate with the Office of Sustainability on the improvements of the current recycling at IIT website. Update information of green improvements on campus and potential upcoming projects to increase the recycling rate.				
	Other Duties: Participate in job-related training as deemed necessary by the University or department.				
. 15 11111					

