

“Gee Whiz” Activity for a Freshman Engineering Class

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Freshmen Engineering at TAMU

- All freshman engineering majors take an introductory engineering sequence
 - ENGR 111 & 112
 - Currently there are two tracks
 - Largest: MEEL, CVEL, BMEL, INEL, AERL

Arrangement of the Course

- Two Instructors + TA + Peer Teacher
 - Engineering
 - Graphics
- Course involves project based learning*
- Each section is approximately 90 to 100 students

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*Currently, there is an NSF STEPS program supporting the project based learning. (NSF Grant No. 0336591)

Peer Teacher- Jennifer Roath



Classroom Group Activity



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Active classroom

- As an outgrowth of an earlier NSF program both courses involve active learning
 - Teaming
 - Pair interactions
 - Integration
- Teams of three to four students are formed
 - Each section will have 20 to 25 teams

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Projects

First Project

- Estimate the cost for fixing a campus street
- Used various estimating methods
 - Develop back of the envelope skills

Second Project

- Vibration damper for a one story campus building
 - Used Lego kits for modeling a building

Comments

- Non CVEN and MEEN engineers could not possibly see how this was related to their choice of engineering
 - I developed the idea of the “Gee Whiz” project to see if this would be of interest for the students

ENGR 112-513:515
Gee Whiz Group Activity
Spring 2007

Each group will find an **engineering application or a unique design**, in their area of interest, that when you read or hear about it, you say “**Gee Whiz.**” A poster presentation will be made during one of our last regular class times. Rather than oral presentations, we are going to have poster presentations. Students’ will prepare a poster outlining their “Gee Whiz” find. The poster size will be the same for all students (24” x 30”)

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Requirements

- You will turn in to me a two to three page summary of what is on your poster including the references. Due date will be the day of the poster presentation.
 - The grade will be equal to four (4) homeworks.*
 - The cover sheet, for the summary turned in to me, will be signed by all group members indicating that you have discussed the topic among yourselves before turning it in to me.
- * At the end of the semester I added the points directly to their grade

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Procedure

- Split class in half
- One group displayed their posters
- Other group evaluated posters
 - Every 5 to 7 min. we rotated
 - I also had the TA and Peer instructor evaluate the posters
- The class was active and engaged

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Poster Session

Group 17- TESLA (car)

4- Tesla's

2 Giant Magellan Telescope

2- Aircraft



2 AERL

2 MEEL

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Group 18 Ergonomics and Engineering



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INEL
AERL
OCEL
BMEL

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Group 7 World's Only 7 Star Hotel



3 MEEL
NUEL

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Group 21- 2nd Highest Score

Self-Healing Polymer

Microencapsulated healing agent and a chemical catalyst.

As cracks develop healing agent is released through capillary action

Polymerization of the healing agent is triggered by contact with the catalyst.

Applications

- Medicine
- Sports
- Transportation
- Paints

Polymer offers potential treatment for burn victims

Graphical illustration of self-healing Polymer.

2 CVEL
MEEL

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Group 23- 3rd Highest Score

IRRADIATING VEGETABLES

PROBLEM

- MICRO ORGANISMS REMAIN ON VEGETABLES AFTER MANY WASHINGS
- UNSANITARY FOOD CAN REACH THE PUBLIC AND CAUSE AN OUTBREAK
- THE SPINACH E-COLI OUTBREAK WAS A PUBLIC HEALTH NIGHTMARE

PROCESS

- FOOD IS EXPOSED TO LOW DOSES OF IONIZING RADIATION
- THREE TYPES
 - GAMMA RAYS
 - X-RAYS
 - ELECTRON BEAMS

SOLUTION

- LONS USED ON MEAT AND FISH NOT WIDELY USED
- EXPANDED ON TO INCLUDE THE PRODUCTION OF VEGETABLES TO USE
- BUREAU OF PLANT INDUSTRY OF WHICH EFFECT OF WHICH FOOD SUPPLY ENTIRE

SAFETY

- USUALLY COOKING AT HIGH TEMPERATURES FOOD DESTROY ALL OF THEIR NUTRITIONAL VALUE AND TEXTURE
- IRRADIATION USED DOES NOT DAMN NUTRIENTS SO FOOD IS NOT RADIOACTIVE
- FOOD SHOULD HAVE A LONGER TIME LIFE BECAUSE OF THE LACK OF MICRO ORGANISMS

REGULATIONS

- REGULATED AND DETERMINED SAFE BY THE FDA
- NUCLEAR WASTE REGULATED BY NRC


2 NUEL
INEL

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FIRST GENERATION NANOBOTS

Statement of the assignment

To design a non-biological nanobot that is able to be introduced in a human subject and is capable of treating spinal cord trauma and paralysis.



Objectives


- Increase the rate of axonal growth
- Direct axonal growth
- Identify a method of application
- Reconnect the damaged axons

Types of Injury

- complete- no function below level of injury
- Incomplete- some function below level of injury
- Injury can result in bruise or contusion, partial tear, or transection (complete tear)


Our Solution...Application

- CNTs injected directly into damaged area
- CNTs are coated in water soluble, thermosensitive material
- Prevents aggregation before injection
- Amount of CNTs injected is proportional to the size of the damaged area



Details of Injury

- Trauma to the spine where vertebrae, disc material, or ligament tissue or tear the spinal cord tissue
- Signal block
- Secondary cell death after about 1 month





Our Solution...Function

- Short CNT segments aggregate to form a scaffold
- Precoated by hydrophobic interactions
- Chains direct axon growth
- Labels used to identify target cell
- Nanotubes lined with nerve growth factors
- Increase rate of axon growth
- Nanotubes are biocompatible
- No need for removal

Theoretical Performance

- Carbon nanotubes will permanently reside in the patient
- The carbon nanotubes can shorten the distance between two cells
- Size of carbon nanotubes

Group 8- 3rd Highest Score

3 BMEL
AERL

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Results

- The table shown in the next slide gives a summary of the results
- 21 out of ~90 students had their final grade raised as a direct result of the activity
- I was a bit disappointed in the students' evaluations of each other, although they did not have much practice.
 - They do not want to damage (harm) a classmate

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Data from Activity

ENGR 112-513:515

Average	3.61
Max.	4.90
Min.	1.50
Std.Dev	0.71

Conclusions

- Used a group activity that allowed students in different majors to select topic of interest.
- Practice evaluation
- Students were actively involved
- Develop understanding

References

1. Mary Vollaro, ASEE, Session 3264, Portland. OR, 2005
2. Maj. John Bridge, USMA, West Point, NY, 2001.