Making Academic Posters

STA/BST 223

Table of contents

What is an academic poster?

- A large document with verbal and graphic elements that communicates your scholarship.
- A good poster tells a "story" about your research/project.
- May serve multiple purposes:
  - introduce your scholarship
  - highlight your research
  - explain the progress on your project
- Often displayed in an exhibit space in a poster session. Presenters stand by their posters to answer questions.

An Example

VANDERBILT UNIVERSITY

Cooperative learning and its effects on the academic achievement and interest level of major and non-major students in an introductory engineering course

Elizabeth Adolph[1], Margarita Prieto[1]
[1]Chemical and Biomolecular Engineering, Vanderbilt University

BACKGROUND

ES140 is a class designed to teach students about engineering analysis and design and to expose them to problem solving in discipline-specific contexts. All the engineering freshmen students take this class, and they choose 3 modules to take during the semester to learn about 3 different engineering fields. Previous instructors of the ES140 chemical engineering module have noted that 25-50% of students, particularly non-majors, are not interested in the module and are not engaged during class.

The aim of this project was to apply cooperative learning to improve the academic achievement and interest level of students in the ES140 chemical engineering module, particularly of those who are non-majors.

Cooperative learning involves the use of small groups of students working together to learn the material. This method has been shown to improve academic achievement, higher-order thinking skills, communication, and social skills of students compared to individualistic and competitive learning styles.[1]

Grouping strategies implemented:
(a) *Self-selected* working teams
(b) *Homogeneous* working teams: chemical engineering students together and non-chemical engineering students together
(c) *Heterogeneous* working teams: chemical engineering students and non-chemical engineering students together

Hypothesis: the overall interest level and academic achievement of students working in heterogeneous groups will be higher than that of the students working in homogeneous groups due to the exposure of the non-major students to the views and perspectives of the major students.

OBJECTIVES

1. Provide information to answer the "What works" question: ***In an introductory engineering module taught using cooperative learning, does the interest level and academic achievement of non-major students improve by having them work with major students in their group?***
2. Develop Collaborative Learning activities for the classroom and assess their effectiveness
4. Become familiar with the SoTL practices
6. Obtain teaching experience, and reflect upon opportunities for improvement

METHODS

Assessment of academic achievement

- **Pre-Quiz:** given at the beginning of the module was used to assess students initial knowledge of the topics covered in the module
- **Quiz:** given at the conclusion of the module determines how much students learned about the topics covered in the module

METHODS

Assessment of student interest level

- **Pre-survey:** given at the beginning of the module was used to determine students' interest in chemical engineering, the specific topics covered in the module, and teamwork and working in groups
- **Post-survey:** given at the conclusion of the module includes the same questions as the pre-survey and also asks students to rank the module lectures and activities according to how much they liked them and learned from them

Module Structure

Day 1

- **Lecture:** introduction to tissue engineering using examples from our research (use of polyurethane scaffolds in bone and skin regeneration
- **Activity:** students make polyurethane foams in groups and discuss how the foaming reactions contribute to the structure of the scaffold and why the scaffold is useful in tissue engineering

Day 2

- **Lecture:** introduction to kinetics and different drug release mechanisms
- **Activity:** students observe the release of dye (a model drug) from biomaterial scaffolds and determine the release mechanisms

Day 3

- **Activity:** students use curve fitting in Matlab to model drug release data over time, determine the mechanisms of drug release for each data set, and determine important constants related to the release mechanism
- **Lecture:** introduction to materials engineering and stress-strain curves
- **Jigsaw activity:** each student in a group is assigned 2 different mechanical properties to research

Day 4

- **Jigsaw activity:** students teach each other about their assigned mechanical properties
- **Activity:** students measure length as a function of applied tensile force for a polyurethane sample, create a stress-strain curve, and determine mechanical properties from the curve

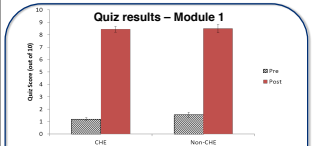
Day 5

- **Quiz:** covers introductory tissue engineering, kinetics, and materials engineering

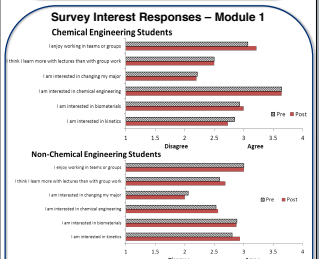
RESULTS

- The composition of the classroom with respect to major was not the same for the three modules. The percentage of chemical engineering students in each module is shown below:
  - Module 1 – Self selected groups: 47%
    - 7/10 groups were homogeneous
  - Module 2 – Homogeneous groups: 22%
  - Module 3 – Heterogeneous groups: 22%

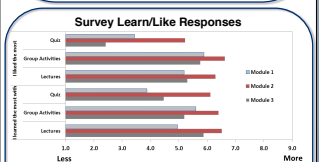
RESULTS



The quiz results show that students learned during the module; however, there were no significant differences between the average quiz scores from Modules 1, 2, and 3 or between chemical engineers and non-chemical engineers within each module.



There were no significant differences between the pre and post module responses, indicating that students' interest level was not significantly affected by the module. Furthermore, there were no significant differences in interest level between the modules.



Students in each module liked the activities more than the lectures, and they liked and learned from the quiz the least. Again, there were no significant differences in student responses between the modules or between major and non-major students.

DISCUSSION

- **Changes were made to the module structure during the project.** After the completion of the first module, we reviewed student feedback (particularly to the open-ended survey question "What would you change about the module?") and reflected on our teaching methods. We concluded that we had too much testing and were not effectively teaching certain concepts (mainly in the tissue engineering section). Therefore, we made the following changes to module structure for the second and third modules
  - Added making polyurethane foam activity
  - Added videos to tissue engineering lecture
  - Added drug release activity
  - Condensed testing into one quiz at conclusion of module
- **As the semester went on both of us (instructors) got more comfortable with the activities and lectures.** This was a great opportunity for us to start thinking about our strengths and weaknesses when teaching. However, it could also have influenced how students experienced the class in the different modules.
- **It is possible the effects of cooperative learning on academic achievement and interest require a longer period of time than the length of the module to be identified.** We are interested in repeating this project in the future taking into account the following reflection points:
  - There were **large variations in survey responses**, making it difficult to detect significant differences in interest level between the grouping strategies. We will study the literature on survey design to make sure that the questions we are asking are effective at determining differences between groups
  - Since the self-selected groups were mostly homogeneous, we don't think we need to have this strategy in the future. A possibility is to **have both homogeneous and heterogeneous groups in each module** exposed to the same concepts and teaching skills and repeat this experiment three times during the semester.

LITERATURE CITED

1. Totten S, Sills, T, Digby A, Russ P. Cooperative Learning: A Guide to Research. Garland Publishing, Inc; New York: 1991.

ACKNOWLEDGEMENTS

We would like to thank Dr. Scott Guelcher for allowing us to teach part of his ES140 class, Dr. Milt Cox for his guidance and leadership of our TAR working group, and TAR fellows Tamara Carley and Mike Myers for their feedback and support of our project.

CIRTL is funded through the Division of Undergraduate Education of the National Science Foundation (CIRTL; http://cirtl.net/; Award 0717768, 2008-2011).

www.cirtl.net

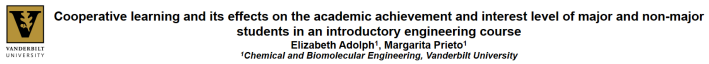
Why presenting a poster?

- Focus your thinking
- Clearly articulate your project
- Gather feedbacks:
  - constructive criticism
  - future ideas
- Interact with other scholars

Major Components: Title

Including the following:

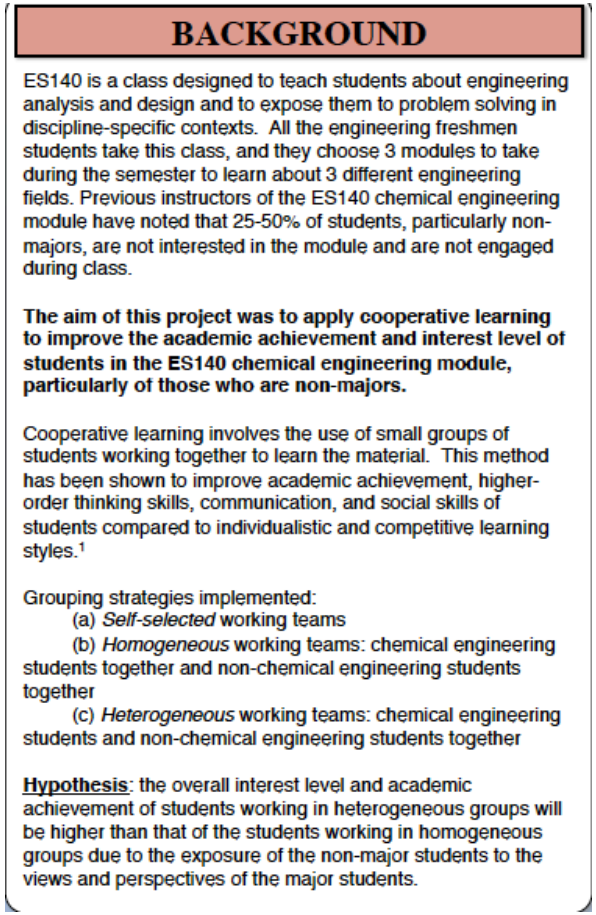
- Project title
- Who you are
- Where you are
- Who are your coauthors
- Organization logo (optional)



Major Components: Introduction

First step of story-telling

- Background information
- Scientific question to address
- Scientific hypothesis
- Issue of interest/objective
- Scholarly context for your topic



BACKGROUND

ES140 is a class designed to teach students about engineering analysis and design and to expose them to problem solving in discipline-specific contexts. All the engineering freshmen students take this class, and they choose 3 modules to take during the semester to learn about 3 different engineering fields. Previous instructors of the ES140 chemical engineering module have noted that 25-50% of students, particularly non-majors, are not interested in the module and are not engaged during class.

The aim of this project was to apply cooperative learning to improve the academic achievement and interest level of students in the ES140 chemical engineering module, particularly of those who are non-majors.

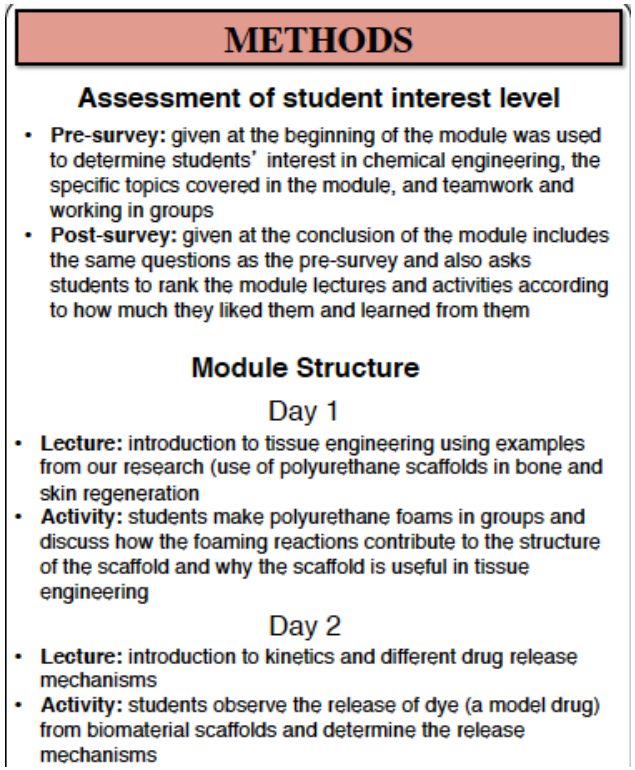
Cooperative learning involves the use of small groups of students working together to learn the material. This method has been shown to improve academic achievement, higher-order thinking skills, communication, and social skills of students compared to individualistic and competitive learning styles.[1]

Grouping strategies implemented:
(a) *Self-selected* working teams
(b) *Homogeneous* working teams: chemical engineering students together and non-chemical engineering students together
(c) *Heterogeneous* working teams: chemical engineering students and non-chemical engineering students together

Hypothesis: the overall interest level and academic achievement of students working in heterogeneous groups will be higher than that of the students working in homogeneous groups due to the exposure of the non-major students to the views and perspectives of the major students.

Major Components: Methods

- Or research methodology, scholarly approach, etc.
- Keep it concise & clear
- Clear notation definition
- Modeling procedures for data analysis



METHODS

Assessment of student interest level

- **Pre-survey:** given at the beginning of the module was used to determine students' interest in chemical engineering, the specific topics covered in the module, and teamwork and working in groups
- **Post-survey:** given at the conclusion of the module includes the same questions as the pre-survey and also asks students to rank the module lectures and activities according to how much they liked them and learned from them

Module Structure

Day 1

- **Lecture:** introduction to tissue engineering using examples from our research (use of polyurethane scaffolds in bone and skin regeneration
- **Activity:** students make polyurethane foams in groups and discuss how the foaming reactions contribute to the structure of the scaffold and why the scaffold is useful in tissue engineering

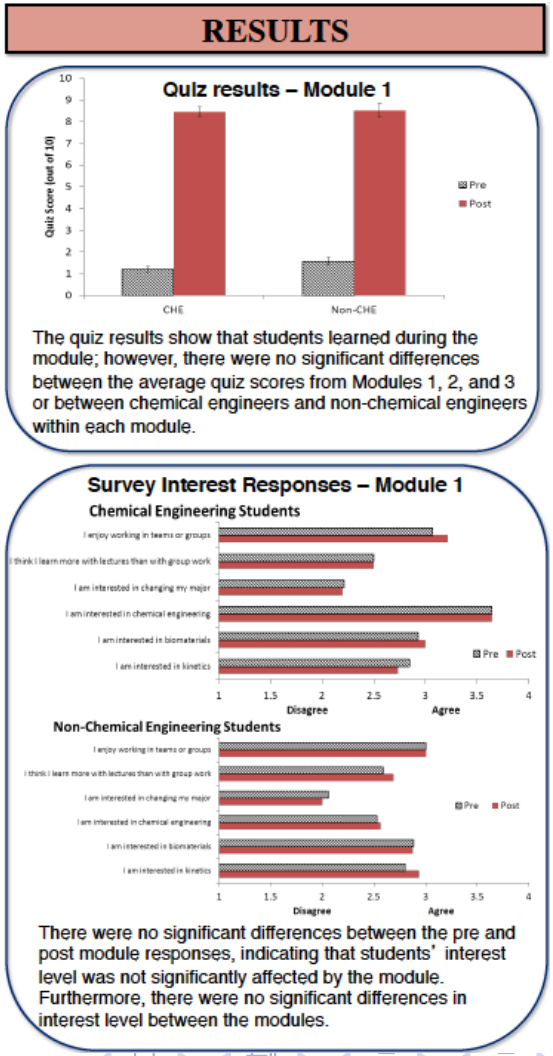
Day 2

- **Lecture:** introduction to kinetics and different drug release mechanisms
- **Activity:** students observe the release of dye (a model drug) from biomaterial scaffolds and determine the release mechanisms

Major Components: Results

Depending on your goal...

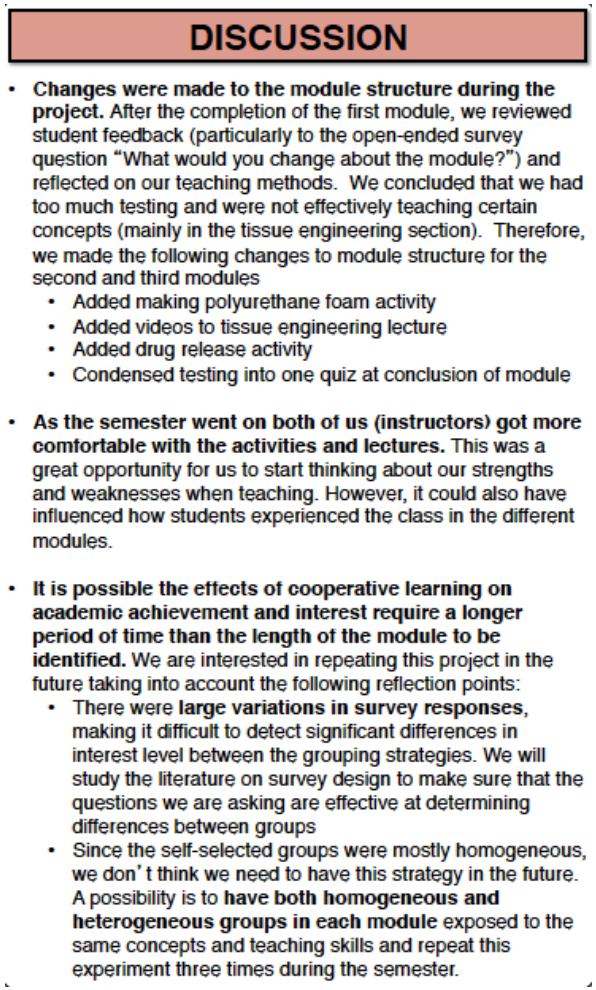
- Final model inference
- Prediction errors or misclassification rates
- Use as many graphs and tables (all about visualization).



Major Components: Conclusions

Or Discussions, Future Work

- Implications of the findings
- Discuss the significance of your results
- Explain how you would answer your central question given the new knowledge
- Explain the next steps you would take to continue the project

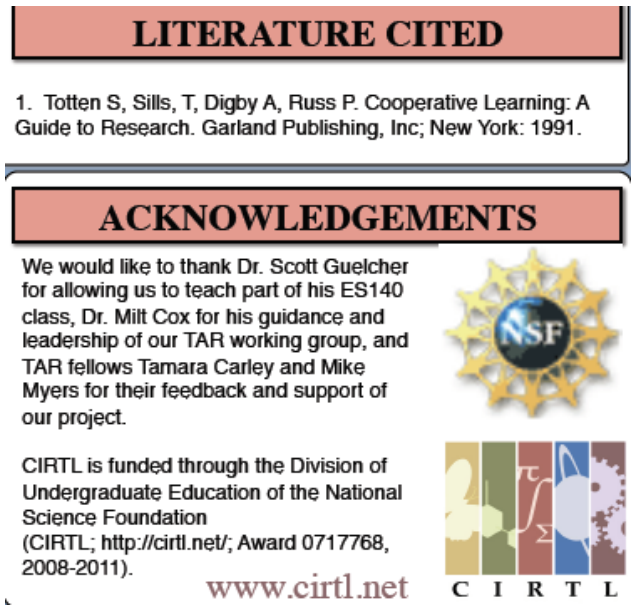


DISCUSSION

- **Changes were made to the module structure during the project.** After the completion of the first module, we reviewed student feedback (particularly to the open-ended survey question "What would you change about the module?") and reflected on our teaching methods. We concluded that we had too much testing and were not effectively teaching certain concepts (mainly in the tissue engineering section). Therefore, we made the following changes to module structure for the second and third modules
  - Added making polyurethane foam activity
  - Added videos to tissue engineering lecture
  - Added drug release activity
  - Condensed testing into one quiz at conclusion of module
- **As the semester went on both of us (instructors) got more comfortable with the activities and lectures.** This was a great opportunity for us to start thinking about our strengths and weaknesses when teaching. However, it could also have influenced how students experienced the class in the different modules.
- **It is possible the effects of cooperative learning on academic achievement and interest require a longer period of time than the length of the module to be identified.** We are interested in repeating this project in the future taking into account the following reflection points:
  - There were **large variations in survey responses**, making it difficult to detect significant differences in interest level between the grouping strategies. We will study the literature on survey design to make sure that the questions we are asking are effective at determining differences between groups
  - Since the self-selected groups were mostly homogeneous, we don't think we need to have this strategy in the future. A possibility is to **have both homogeneous and heterogeneous groups in each module** exposed to the same concepts and teaching skills and repeat this experiment three times during the semester.

Major Components: Acknowledgements & References

- Acknowledgements:
  Those who contributed important data, feedback, provided skills that benefit the project etc.
  Source of funding for the project (not needed for the course project)
- References: literature cited



LITERATURE CITED

1. Totten S, Sills, T, Digby A, Russ P. Cooperative Learning: A Guide to Research. Garland Publishing, Inc; New York: 1991.

ACKNOWLEDGEMENTS

We would like to thank Dr. Scott Guelcher for allowing us to teach part of his ES140 class, Dr. Milt Cox for his guidance and leadership of our TAR working group, and TAR fellows Tamara Carley and Mike Myers for their feedback and support of our project.

CIRTL is funded through the Division of Undergraduate Education of the National Science Foundation (CIRTL; http://cirtl.net/; Award 0717768, 2008-2011).

www.cirtl.net

C I R T L

Templates

- Choose a template for Powerpoint, or latex beamer.
  There are a lot of templates available on the Internet/Google.
  A useful online source:
  http://www.makesigns.com/SciPosters_Templates.aspx
- Design your own blocks...
- Other softwares: Photoshop, GIMP (only for Windows users, open source, download at http://gimp-win.sourceforge.net/)

Design Advices

- Font size is important:
  title: 60 to 72pt; authors etc 25% smaller;
  headings: bold 32 to 48pt; general text: 24 to 32pt (never below 20pt)
- Font choice is important:
  Title: non-serif font (e.g. Helvetica, Arial, Geneva);
  Text: serif font (e.g. Times, Palatino, Courier, Times New Roman)
- Title NEVER in all capital letters.

Content Advices

- Use professional tables and graphs to present your work.
- A nice combination of phrases and short sentences + equations/formulae.
- Use bullet points.

Course Project Requirements

- Size: 36×48 (inches) (Use this to select template!)
- 3 columns (preferable)
- Required Components:
  Introduction, Methods, Result, Acknowledgements, References.
- Optional Components:
  Abstract, Objective, Future Work.

Printing

- Save your poster as a .ppt file and as a .pdf file, and store it on a CD or Thumb Drive.
- Take it to stores with printing services (Black & White): Staples, Walgreen, Fedex, UPS, Walmart, etc.
- Beware of colorful designs/templates, since you are printing in black and white.