A Final Project Poster Presentation at a Science Festival

Rosalie Bélanger-Rioux
Preceptor and Assistant Director of Undergraduate Studies

Harvard University
Mathematics Department

SIAM ED16, October 2016
Outline

- The Big Idea
- The small ideas
- About the course
- The nuts and bolts
- The festival
- Evaluation
The Big Idea

Students developing their science and math communication skills, both oral and written, and adapting to the audience.
The Big Idea

Students developing their science and math communication skills, both oral and written, and adapting to the audience.
The Big Idea #2

Students apply the math learned in class to science problems they are interested in.
The Big Idea #2

Students apply the math learned in class to science problems they are interested in.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
- Some students don’t test well, another way to evaluate them seems more fair.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
- Some students don’t test well, another way to evaluate them seems more fair.
- Projects might prepare our students better for life and their career.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
- Some students don’t test well, another way to evaluate them seems more fair.
- Projects might prepare our students better for life and their career.
- Students have different learning styles and motivations.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
- Some students don’t test well, another way to evaluate them seems more fair.
- Projects might prepare our students better for life and their career.
- Students have different learning styles and motivations.
- A way to really tie in the math to life science applications of interest to the students.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
- Some students don’t test well, another way to evaluate them seems more fair.
- Projects might prepare our students better for life and their career.
- Students have different learning styles and motivations.
- A way to really tie in the math to life science applications of interest to the students.
- Students get to share their work with each other. Sense of pride.
The small ideas

- Projects develop different skills: independent thinking, longer-term planning and decision-making, ownership in picking a topic and a way to present it.
- Some students don’t test well, another way to evaluate them seems more fair.
- Projects might prepare our students better for life and their career.
- Students have different learning styles and motivations.
- A way to really tie in the math to life science applications of interest to the students.
- Students get to share their work with each other. Sense of pride.
- A sense of community service, of connecting with children and teenagers, of participating in STEM education.
About the course

- “Linear algebra, probability and statistics for the life sciences”, one semester course.
- Small (9 students last year).
- A mix: mostly first- or second-year students, 2 graduate students.
- Prerequisites: integral calculus.
- Prequel: “Modeling and Differential Equations for the Life Sciences” (multivariable calculus and differential equations).
- Other options for learning this material: a standard course in multivariable calculus, then one in linear algebra and differential equations. Not particularly applied. Or a one-semester course in multivariable calculus for the social sciences.
The nuts and bolts – expectations

- Read and understand a scientific article that uses math from our course and applies it to the life sciences.
- Write a 10-page report, explaining the math and the application. The goal is for your peers in the course to be able to read your report and understand the math and the application.
- Present your project:
  - at the Cambridge Science Festival to children and their parents, or
  - in a regular presentation in front of the class.
- Alone or in teams of two.
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
The nuts and bolts – timeline

(WEEKLY HOMEWORKS FOR A SEMESTER-LONG COURSE.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course.

- Start them earlier?

- Homework 6 and 7 – Make teams of 2 if desired, decide on final project presentation format (festival vs standard presentation).
- Submit 2-paragraph final project proposal:
  ▶ Describe the topic (math and application), and its relevance. Link to the article you plan to focus on.
  ▶ Find a reference document that will help you understand the math required, and explain that in a couple sentences.

(MIDTERM)

- Homework 8 – Work on your final project!
- Ask for something?
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course. Start them earlier?
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course. Start them earlier?
- Homework 6 and 7 – Make teams of 2 if desired, decide on final project presentation format (festival vs standard presentation). Submit 2-paragraph final project proposal:

  ▶ Describe the topic (math and application), and its relevance. Link to the article you plan to focus on.
  ▶ Find a reference document that will help you understand the math required, and explain that in a couple sentences.

(Midterm)

Homework 8 – Work on your final project!
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course. Start them earlier?
- Homework 6 and 7 – Make teams of 2 if desired, decide on final project presentation format (festival vs standard presentation). Submit 2-paragraph final project proposal:
  - Describe the topic (math and application), and its relevance. Link to the article you plan to focus on.
  - Find a reference document that will help you understand the math required, and explain that in a couple sentences.

(Midterm)

Homework 8 – Work on your final project!
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course. Start them earlier?
- Homework 6 and 7 – Make teams of 2 if desired, decide on final project presentation format (festival vs standard presentation). Submit 2-paragraph final project proposal:
  - Describe the topic (math and application), and its relevance. Link to the article you plan to focus on.
  - Find a reference document that will help you understand the math required, and explain that in a couple sentences.

- (Midterm)
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course. Start them earlier?
- Homework 6 and 7 – Make teams of 2 if desired, decide on final project presentation format (festival vs standard presentation). Submit 2-paragraph final project proposal:
  - Describe the topic (math and application), and its relevance. Link to the article you plan to focus on.
  - Find a reference document that will help you understand the math required, and explain that in a couple sentences.
- (Midterm)
- Homework 8 – Work on your final project!
The nuts and bolts – timeline

(Weekly homeworks for a semester-long course.)

- Homework 1 – Growth Mindset reading and essay.
- Homework 4 – Read science news (provided list of links and some topics directly related to class), send me a link to an article you are interested in, that uses some math from our course. Start them earlier?
- Homework 6 and 7 – Make teams of 2 if desired, decide on final project presentation format (festival vs standard presentation). Submit 2-paragraph final project proposal:
  ▶ Describe the topic (math and application), and its relevance. Link to the article you plan to focus on.
  ▶ Find a reference document that will help you understand the math required, and explain that in a couple sentences.
- (Midterm)
- Homework 8 – Work on your final project! Ask for something?
The nuts and bolts – timeline (continued)

- Homework 9 – Submit a “presentation plan” draft: materials, props, guiding questions, audience, takeaways. Questions they have.

- Homework 10 – Submit final “presentation plan”: adapting the math and science to the audience, adapting to the audience, drawing them in.

- Homework 11 – Meet with me at least once to talk about things. Work on your report!

Reading week: festival presentations.

Exam week: written report due for all. In-class presentations for those who did not go to the festival.
The nuts and bolts – timeline (continued)

- Homework 9 – Submit a “presentation plan” draft: materials, props, guiding questions, audience, takeaways. Questions they have.
- Homework 10 – Submit final “presentation plan”: adapting the math and science to the audience, adapting to the audience, drawing them in.

Reading week: festival presentations.

Exam week: written report due for all. In-class presentations for those who did not go to the festival.
Homework 9 – Submit a “presentation plan” draft: materials, props, guiding questions, audience, takeaways. Questions they have.

Homework 10 – Submit final “presentation plan”: adapting the math and science to the audience, adapting to the audience, drawing them in.

Homework 11 – Meet with me at least once to talk about things. Work on your report!
Homework 9 – Submit a “presentation plan” draft: materials, props, guiding questions, audience, takeaways. Questions they have.

Homework 10 – Submit final “presentation plan”: adapting the math and science to the audience, adapting to the audience, drawing them in.

Homework 11 – Meet with me at least once to talk about things. Work on your report!

Reading week: festival presentations.

Exam week: written report due for all. In-class presentations for those who did not go to the festival.
Homework 9 – Submit a “presentation plan” draft: materials, props, guiding questions, audience, takeaways. Questions they have.

Homework 10 – Submit final “presentation plan”: adapting the math and science to the audience, adapting to the audience, drawing them in.

Homework 11 – Meet with me at least once to talk about things. Work on your report!

Reading week: festival presentations.

Exam week: written report due for all. In-class presentations for those who did not go to the festival.
The nuts and bolts – timeline (continued)

- Homework 9 – Submit a “presentation plan” draft: materials, props, guiding questions, audience, takeaways. Questions they have.
- Homework 10 – Submit final “presentation plan”: adapting the math and science to the audience, adapting to the audience, drawing them in.
- Homework 11 – Meet with me at least once to talk about things. Work on your report!
- Reading week: festival presentations.
- Exam week: written report due for all. In-class presentations for those who did not go to the festival. Submit a written draft?
The festival
The festival

- Communication lines opened in January, throughout the term.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).

End of April, perfect for end-of-semester evaluation.

Robot zoo and science fair or Harvard Ed Portal Science, Art and the Body event.

Morning of indoor activities, most hands-on, most prepared by after-school tutors and organizers of the tutoring program. They set up some easels and tables for us for a few hours. Audience was children taken by their parents (sometimes children taking their parents).

Location was not very accessible, and starting time was 10am on a Saturday towards the end of the semester.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).
- End of April, perfect for end-of-semester evaluation.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).
- End of April, perfect for end-of-semester evaluation.
- Robot zoo and science fair or Harvard Ed Portal Science, Art and the Body event.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).
- End of April, perfect for end-of-semester evaluation.
- Robot zoo and science fair or **Harvard Ed Portal Science, Art and the Body event**.
- Morning of indoor activities, most hands-on, most prepared by after-school tutors and organizers of the tutoring program.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).
- End of April, perfect for end-of-semester evaluation.
- Robot zoo and science fair or Harvard Ed Portal Science, Art and the Body event.
- Morning of indoor activities, most hands-on, most prepared by after-school tutors and organizers of the tutoring program.
- They set up some easels and tables for us for a few hours.
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).
- End of April, perfect for end-of-semester evaluation.
- Robot zoo and science fair or Harvard Ed Portal Science, Art and the Body event.
- Morning of indoor activities, most hands-on, most prepared by after-school tutors and organizers of the tutoring program.
- They set up some easels and tables for us for a few hours.
- Audience was children taken by their parents (sometimes children taking their parents).
The festival

- Communication lines opened in January, throughout the term.
- Large, 10-day science festival in Cambridge, MA.
- Lots of events, lots of venues (universities, schools, museums, industry, etc).
- End of April, perfect for end-of-semester evaluation.
- Robot zoo and science fair or Harvard Ed Portal Science, Art and the Body event.
- Morning of indoor activities, most hands-on, most prepared by after-school tutors and organizers of the tutoring program.
- They set up some easels and tables for us for a few hours.
- Audience was children taken by their parents (sometimes children taking their parents).
- Location was not very accessible, and starting time was 10am on a Saturday towards the end of the semester.
Evaluation

- Evaluation rubrics for the oral presentations, provided to students in advance.
- Opportunity for extra credit if go over expectations.
- Adapted from Emma Smith Zbarsky (Wentworth Institute of Technology) and the Association of American Colleges and Universities learning rubrics.
- During festival, I took notes on the printed rubrics for each student, then later went back and turned those into a grade. Also allowed me to give written feedback on their work.
Students loved it!