How BRIDGES help with Engagement

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SIGCSE 2022

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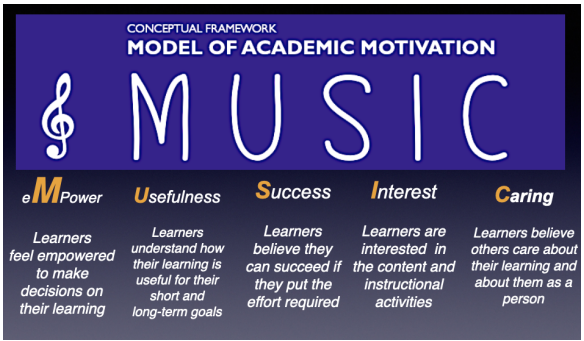
Engagement and Motivation

- Well understood that student engagement and motivation can drive student success.
- Engagement and motivation are closely tied to each other
- How do we motivate and engage students? Many models have been proposed, such as the MUSIC model of motivation (Jones, 2009)



Engaging Students: Experiences from an OOP Course

Two semesters of a project based OOP course, using student reflections after each course module

- e**M**powerment: Project choice, freedom to be creative, experimentation and tinkering
- **U**sefulness: Working with real-world data/tools, team environment
- **S**uccess: Assignments with clear instructions, predictability, reflect on personal successes/failures, feedback
- **I**nterest: Fun factor, games, real world images used as part of course
- **C**aring: Sensitive to student needs, prompt feedback, deadline flexibility

Activity: Discussion

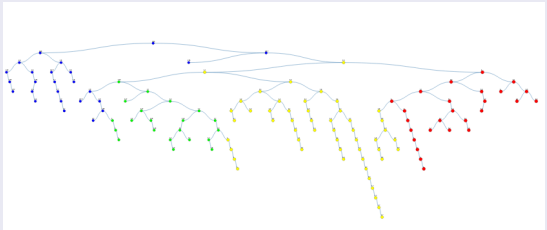
What are your thoughts on engaging students as part of course activities?

- How do you engage your students?
- What tools/techniques have you used in the past to motivate s tudents?
- Is there something you havent tried and would like to try?

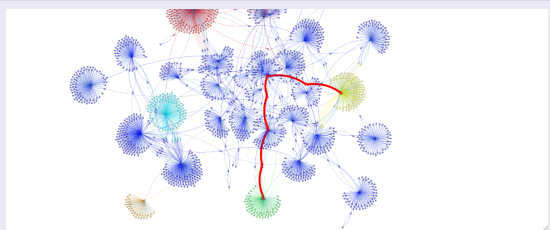
Making it Interactive/Visual

- Visualizations of classic CS concepts can be helpful in making them real and more meaningful.
- Complex data structures and algorithm concepts can be augmented/explained better with visualizations.
- Interactive applications is a more attractive approach to experimentation - changing parameters to see its effect on a phenomenon, solution, performance.

Indexing USGS Earthquake



Bacon Number [IMDB Data]



Activity

- Review BRIDGES tutorials

Make it Real!

- Using **real-world data** in course work is an important engagement tool
- Students respond to working with data from real-world scenarios; appreciate the use of images, maps, games
- Data is everywhere, the harder part is
  - Accessing data in a ready-to-use form for course work
  - Mapping the right data to course work to meet objectives.
- Example: A BRIDGES example for retrieving Earthquake records

```
// create Bridges object
// command line args provide credentials and server to test on
Bridges bridges (atoi(argv[1]), argv[2], argv[3]);
if (argc > 4)
    bridges.setServer(argv[4]);
// set title
bridges.setTitle("Accessing USGIS Earthquake Data (USGIS Data)");

// read the earth quake  data
DataSource ds (&bridges);
vector<EarthquakeUSGS> eq_list = ds.getEarthquakeUSGSData(max_quakes);

// print the first quake record
```

Activity: BRIDGES Data Access and Assignments that use real-world data and Visualizations

- Accessing Earthquake Data
- Bacon Number Computation (Graph BFS)
- OpenStreet Map (Graphs - Shortest Path)
- Image Representation/Compression (Spatial Search Trees - Kd-Tree)
- Algorithm Benchmarking - Comparing Sorting Algorithms

The Power of Choice

Providing choices in learning materials (lectures, assignments, etc.) provides flexibility and choice for students as they might have different preferences/interests

- Challenge: Designing multiple versions of learning materials that meet the same learning objectives involves a higher load on instructors
- Examples:
  - Assignments that can use different real-world datasets
  - Different assignments that rely on the same underlying algorithm
  - Lecture slides that explain ther same concept in different ways.
- Choice in learning materials has shown in prior work being appreciated by students.

Activity

- Group 1 (Different datasets):
  - Linked list using IMDB data
  - Linked list using USGS Earthquake data
- Group 2 (Different assignments, same algorithm)
  - Bacon Number (Graph - BFS)
  - Maze Solution (2D array - BFS)