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The Power of Animations in STEM Courses

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Enriching STEM Education with Web Animations

Dr. Adrian Heinz (PI), Dr. Xin Xu (Co-Pi)
Students: Michael Watkins, Nisha Muddhary
Outline

- Introduction. Purpose
- Project goals
- The Animation development cycle
- Demo of animations
- Data collection and analysis
- Discussion: Challenges and future work
Introduction

Why this project?
- Lack of STEM professionals.
- Students should be encouraged to pursue STEM disciplines.
- STEM students do not receive enough research exposure.
- STEM students do not experience interdisciplinary collaboration.
Project Goals

- IT students will
  - Become more engaged in STEM courses.
  - Gain experience in a real-life development project.
  - Acquire technical expertise by learning to use new applications.
  - Collaborate with professionals in other STEM areas.
  - Be exposed to interdisciplinary research.
The Development Cycle

- STEM faculty members as “Clients”
- IT students as developers.
  - Meet with client to gather requirements.
  - Develop a prototype.
  - Gather preliminary feedback.
  - Further modification.
- Weekly meetings with STEC4500/STEC2500 faculty to report progress and discuss challenges.
Work Summary

- Ongoing project since 2011
- Completed over 30 animations in STEM areas
  - Biology
  - Chemistry
  - Math
  - Exercise Science
  - IT
- Presented animations at conferences in Orlando (FL), Ponte Vedra (FL), and San Antonio (TX)
- Journal Submission. In preparation
- Website: http://stemanim.ggc.edu/
Current Work

- Fall 2013
  - 3 Senior students
  - 4 Animations
    - 3 Biology
    - 1 IT
- Spring 2014
  - 4 Students. Freshman, sophomore and seniors.
  - Goal: 4 animations
Data Collection and Analysis: Algebra Functions

Pre Survey: Having an animation would be helpful in learning transformations of functions

- Strongly agree: 12
- Agree: 6
- Neutral: 14
- Disagree: 0
- Strongly disagree: 1

Post Survey: Having an animation was helpful in learning transformation of functions.

- Strongly agree: 20
- Agree: 14
- Neutral: 1
- Disagree: 0
- Strongly disagree: 0

![Bar graph showing survey results before and after animation usage.](image-url)
Student Feedback

- Great way to see what’s going on
- It really helps by giving the students an actual visual of what we are learning
- It helps visualize the graphics
- The computer animation helped me learn
- I think it is more effective than a teacher attempting to draw it out
- I’m a visual learner and I found the animations to be extremely helpful
### Content related questions
Sample size 30

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<th>Questions</th>
<th>Pre Number of students answered correctly</th>
<th>Post Number of students answered correctly</th>
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<td>4</td>
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<td>26</td>
</tr>
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</table>
Animations

Demos.
- Michael Watkins
- Nisha Mudbhary
FRUIT AND SEED DEVELOPMENT

FLOWER
- Sepal
- Petal
- Ovary
- Stamen
- Stigma

FERTILIZED FLOWER

FRUIT
- Outer stem
- Ovary
- Seed
- Inner stem
- Remains of flower parts

TIME

POLLEN (COLOURED)

Flower stem
During the Cretaceous period dinosaurs fed, fought, and loved in a luscious coniferous forest. Plants did not have any flowers or fruit and, so, were dependent upon wind and water to carry their pollen the next plant. The inefficient process requires millions of pollen grains in the hope that a few will reach their destination.

200 million years ago, flowers evolved to trick or pay animals (pollinators) to carry their pollen from one individual to another.

Since then the Angiosperms or flowering plants have become the dominate form of plant life with over 400,000 species. We rely on them for oxygen, food, clothing, and shelter.
Stamen

Carpel

Stamen
Presentations/Publications


Discussion

- **Challenges**
  - Recruiting student developers!!!

- **Future work**
  - Continue the development of web animations
  - Further Collaborate with faculties from other discipline
    - To help recruiting students
    - Develop a set of animations for a certain course
  - Additional data collection & analysis to discover the impact of the web animations on student learning
Questions?

Thank you!