More Motivation, Adventures in Alice Project, Usage of Alice in K-12

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Computer Science Declining Enrollments, Few Women

Figure 1. Computer Science Listed as Probable Major Among Incoming Freshmen
Source: HERI at UCLA

CompSci 4 – Alice Class at Duke for non-majors

• Lecture for 10-20 minutes
• Students work on problem with computers in pairs
• Bring students back together

Success - Alice attracts diverse group

• At Duke
  – CompSci 4 Spring 2005
    • 22 preregister, 30 enroll (12 female + 3 African Amer.)
  – CompSci 4 Fall 2005
    • 20 preregister, 31 enroll (17 female – 1 African Amer.)
  – CompSci 4 Fall 2006 – 2 sections
    • 64 students, 33 female, 7 African Amer.
  – CompSci 4 Fall 2007 – 2 sections
    • 84 students - > 50% female
  – CompSci 4 Fall 2008 – 2 sections
    • 100 students - > 50% female
  – Similar in Spring 2009, Fall 2009
  – Advertised in school paper
    • picture of ice skater
    • Web site of animations
Games Created by Duke CompSci 4 Students

- Non-majors
- Most never programmed before
- Final projects after 10 weeks of Alice
- 50% of students are women
- Spring 05, Fall 05, Fall 06, Fall 07, Fall 08, Spring 09

Game: Candyland

Select girl and boy to play
Click on red and green buttons to move them.

Game: Frogger – Get frog across road

Game: Eragon

4 tasks to win the game
Game: Tic Tac Toe

Game: DDR
Click on arrow keys,
Player moves foot to square

Game: Dating Game

Game: Rumble Putt

Game: Sarah Palin’s Seaplane Adventure
TODD’S SNOW MACHINE HAS BROKEN DOWN...
AND IT’S UP TO YOU TO SAVE HIM!
Sarah Palin’s Seaplane Adventure (cont)

Alice into K-12

• Non-majors course at Duke
  – Popular, fills up with seniors
  – College students pretty set with their major before they come
• Students in middle school are starting to form decisions on careers
• They have exposure to Teachers, Doctors, Astronauts, etc.
  – BUT DON’T KNOW WHAT COMPUTER SCIENCE IS

Success - Alice Excites 4th-6th Grade Girls

• Duke Femmes Event, April 07
• 60 girls – 4 groups of 15
• Taught them Alice for an hour
• Handout to take home
• Event again in 2008, 2009, 2010
Thank you from 4th Grade Girl

Adventures in Alice Programming
Grades 5-12 Outreach
www.cs.duke.edu/csed/alice/aliceInSchools

Adventures in Alice Programming
• Integrate Alice into high school and middle schools by training teachers
• Six sites:
  Durham, NC    Charleston, SC    Virginia Beach, VA
  Denver, CO    Oxford, MS        San Jose, CA
• Durham site
  www.cs.duke.edu/csed/alice/aliceInSchools

Duke: Adventures in Alice site
• Summer 2008
  – 3-week Teacher workshop
    • 35 teachers, mostly middle school, some high school
    • Few had ever programmed before
    • Subjects: english, math, science, history, art, technology
    • Taught them Alice, Developed Lesson Plans
  – Two one-week middle school camps
    • Taught Alice
    • Lots of time to build their own Alice worlds
    – Overlap between the two
    – Followup Teacher workshop Summer 09
  – New one-week workshops in Summer 09
How to Use Alice in Middle Schools

• Teachers
  – Examples in lecture
  – Make interactive quizzes
  – Make worlds on concepts for students to view

• Students
  – Projects (in place of a poster, a model)
  – To take quizzes
  – To view and answer questions about a world

We have developed Three Introductory Tutorials

1. Simple, Short (15 min) tutorial to try Alice
   – Add an object, use built-in methods
2. One hour tutorial for younger kids
   – Writing methods, simple events, camera
3. Four part tutorial for middle school kids
   – More detailed on placement of objects, writing methods, events, camera control
   – How to put a person on a horse
   – Answer a cell phone
   – 2-3 versions of each of these tutorials

Many short tutorials on CS Topics

• CS Topics
  – Programming – sequential and “at the same time”
  – Methods
  – Events
  – Looping
  – Conditionals (making a choice)
  – Functions (compute and return an answer)
  – Lists
  – Variables

Other “Fun” Topics Blended in

• Storyboards
• Changing camera views
• Scene changes and lighting
• Making Billboards
• Making objects invisible and visible
• Sounds
• Glueing objects to others
K-12 Example worlds and Lesson Plans

Developed by teachers from last summer

Science Example: How volcano is formed

**How a volcano is formed (slide 2)**

Deep under the earth’s crust heat from the core makes the mantle move like a lava lamp.

**How a volcano is formed (slide 3)**

Over thousands of years, the volcano builds up...
How a volcano is formed (slide 4)

And emerges above the ocean as an island.

Math Example:
Teacher Lesson Plan on quadrant plane

- Click on lighthouse
- Enter x,y position
- Objects randomly move

Magic Tree House Quiz
Famous Children’s Book Series

5. What type of tree is the treehouse on?
- maple
- oak
- a magic tree of no special type
- elm
- I don't know

score 5.0

Other Ideas for Projects

- Story from Ancient Egypt
- Spanish Quiz in which you see a word and have to click on the object the word represents
- Animate a scene from a book you have read or a poem you have written
- Create a world about school safety
- Memory game – remember a random color sequence
- Math Quiz – Answer the questions

Alice worlds for these and more are on our website.
Other Teacher Lesson Plans

• Math
  – Finding surface area
  – Rate of Change and Slope

• Science
  – Create a food chain
  – Sun, Earth and Moon system
  – Tornados
  – Physics – Newton’s law of gravity
  – Alternative Energy

Other Teacher Lesson Plans (cont)

• History/Social Studies
  – The continents – view world and answer questions
  – Animated overview of Japan
  – Animated overview of Egypt

• English
  – Write and animate a poem
  – Animate a poem or scene from a story
  – Write a movie trailer

Usage of Alice by Middle School Students in Alice Camp 2008

We examined the student’s worlds - What type of objects did they use?

• Girls top five
  – People, animals, environments, nature, 3D-text

• Boys top five
  – Vehicles, people, buildings, scifi, special effects
Typical Boy Example

SciFi, vehicles, fire

More fire

And more fire
And more fire!

Girl Examples – Dancing chicken

Girl Example 2 – Egypt story

Girl Example 3 – Attack of the lemurs
How did the Students use Alice?

- Examined worlds to see which concepts they used

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<th>3+ times</th>
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<tr>
<td>color property</td>
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CS Topics

Basic topics

Feedback from Parents

- “[My daughter] thoroughly enjoyed her week with you. It was a great experience!”
- “I’m convinced. Kids like Alice and Alice is a good way to teach kids programming. [My son] is doing my python course and he’s not all that interested in python and never touches it between the courses. However, in the evenings when he comes home from the Alice course, he works on his Alice worlds.”
Summarizing

• We developed
  – Tutorials
  – Examples of possible use in Middle Schools
• Teachers developed
  – Lesson Plans for history, science, math, language arts, art, and technology
  – Animation Fair
• Middle School Students
  – Were engaged, developed their own worlds
  – Animation Fair
  – Difficult to get away from the computer

All materials are on our website.

Followup with 2008 Teachers

• Teachers use Alice during the school year
• Followup 2-3 day workshop in Summer 2009
  – June 15-16

• Visited one of the schools
• Presented at the Durham public school technology day

Alice Symposium and workshops in 2009

• Two day Alice workshops on Alice 3 and Alice 2.2
  – June 15-16
• June 17, 2009 – Alice Symposium
  – Submit papers
• Three one-week Alice workshops
  – June 22-26
  – June 28- July 2
  – July 6-10

Future of Alice

• Plan to extend our NSF grant to a larger effort in NC and a few other states
• What we need from you....
  – Your usage of Alice, any materials/lesson plans you develop this summer/fall and use. They must meet NC teaching standards.
  – Troubles you encounter along the way with schools/Alice, anything