Use of 3D Virtual World Technology for STEM Learning

2010 ITEST Summit

STEM and ICT Instructional Worlds: The 3D Experience (STEM-ICT 3D) _

Who is involved?

Appalachian
STATE UNIVERSITY
BOONE, NORTH CAROLINA™

Teleplace

CLEMSON
UNIVERSITY

What are we doing?

http://www.stem-ict-3d.org/

Video Created by Technology Education Interns

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Why are we doing this?

Educational Gains

- Students exhibited gains in engagement, efficacy, achievement (Barab, et al, 2005; Educause, 2006; Ketelhut, et al, 2006)
- Statistically significant effect of 3D virtual environments on both achievement in and attitude toward science (Kim, 2006)
- Significant shift from individualized to peer-based/peer-assisted learning with technology during the course of a pilot project. Teachers noted they had to "step back" as the students became the technical experts. (Sanders et al, 2008)

Expanded Opportunities

- ability to provide experiences which may not be available in real life
- resources to analyze phenomena from different points of view
- capability to work with virtual companions distributed over different geographical locations (Chittaro and Ranon 2007)

Overview

Three Themes:

1. Recruiting Students and Teachers
2. Delivering the Workshops
3. Implementing in Schools

Evaluation and Instruments:

External Evaluator: EvAP (UNC-Chapel Hill)

1. Attitude of Middle School Students Toward STEM (MARS)
2. Student Workshop Questionnaires
3. Professional Development Questionnaires
4. Teacher Focus Groups

(MARS validated through NSF #EEC-060240)

Theme 1: Recruiting

Students

- 24 students from four school districts recruited
  - Recruitment process determined by districts
  - Process varied greatly
  - Provided general guidelines for selection of students
- Students recruited up through the week before the program's start

Teachers

- 24 teachers recruited through relationships within school districts
- Contact with teachers a week before the program

Theme 1: Recruiting

Key Findings: Students

More consideration of students being chosen

- Some students not as committed to the program (Workshop Survey)
- Choose students with high test scores, [but] low grades- students more willing to take risks; make mistakes (Focus Groups)
- G & T students frustrate easily/risk-averse (Focus Groups)
- Schools were given different guidelines for choosing students (Focus Groups)

Changes to the program:

- Developed “Selection Rubric” for year 2 student cohort selection

Theme 1: Recruiting

Student Characteristics - Selection Rubric

- Demonstrates leadership potential
- Accepts responsibility
- Actively participates in his/her learning
- Self-motivated
- Self-starter
- Demonstrates ability to work with adults in a teaching/learning environment
- Demonstrates ability to work with students in a teaching/learning environment
- Keeps an open mind
- Displays a desire to learn
- Demonstrates aptitude in technology, science, and math
- Displays interest in technology, science, and math
- Adopts an exploratory and investigative approach when using technology

Theme 1: Recruiting

Key Findings: Teachers

Teachers need better pre-workshop preparation

- Not all teachers comfortable with technology- experienced frustration (Focus Groups)
- Did not know anything about virtual world before training (Workshop Survey and Focus Groups)
- Wanted additional training or introduction before summer or before meeting with students (Workshop Survey and Focus Groups)

Changes to the program:

- Teachers selected in fall
- Teachers attend orientation in January

Theme 2: Delivering the Workshops

Students

- Collaborated across sites on “suites” using ICT tools, Google Sketchup, Teleplace and others
- Attended multiple STEM field trips/demonstrations on campuses
- Collaborated with teachers to build instructional worlds

Teachers

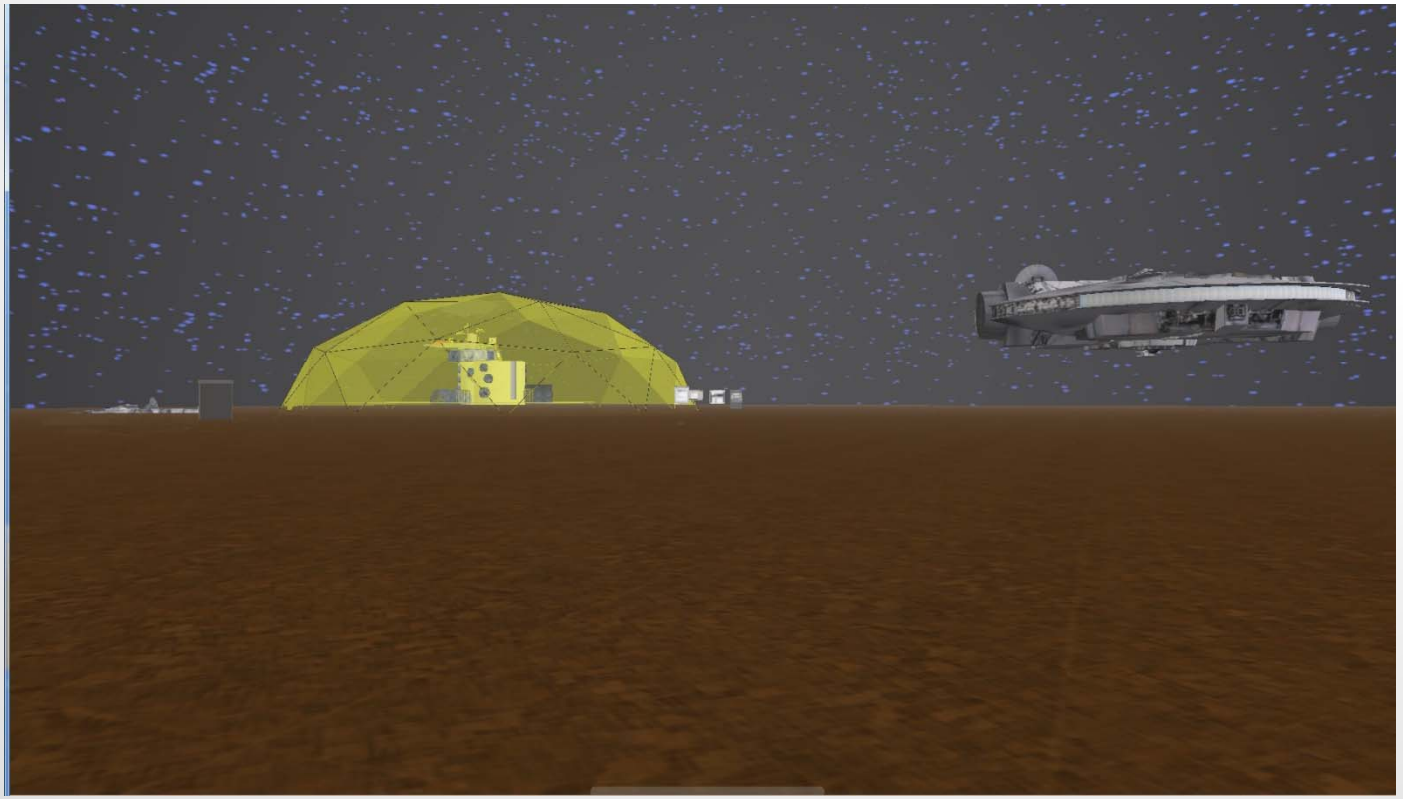
- Learned about “presence pedagogy”
- Developed skill with building in 3D
- Implemented P2 in 3D learning units

Theme 2: Delivering the Workshops

Students Worlds – Wild Kingdom

Theme 2: Delivering the Workshops

Students Worlds – Outer Space



Theme 2: Delivering the Workshops

Key Findings: Students

96% Learned a "huge amount" or "a lot" about collaboration

Significant increase from pre to post attitudes in these STEM areas (MARS):

- My math classes are preparing me for an engineering major in college (p=.012)
- Comfort level with computer skills including:
  - Formatting a text document (p=.024); Importing/exporting still images (p=.008)
  - Creating and updating a blog (p=.040); Using an on-line 3D virtual environment (p<.000)
- Significant decrease from pre- to post-test on responses to:
  - My middle school classes are preparing me for college (p=.035)

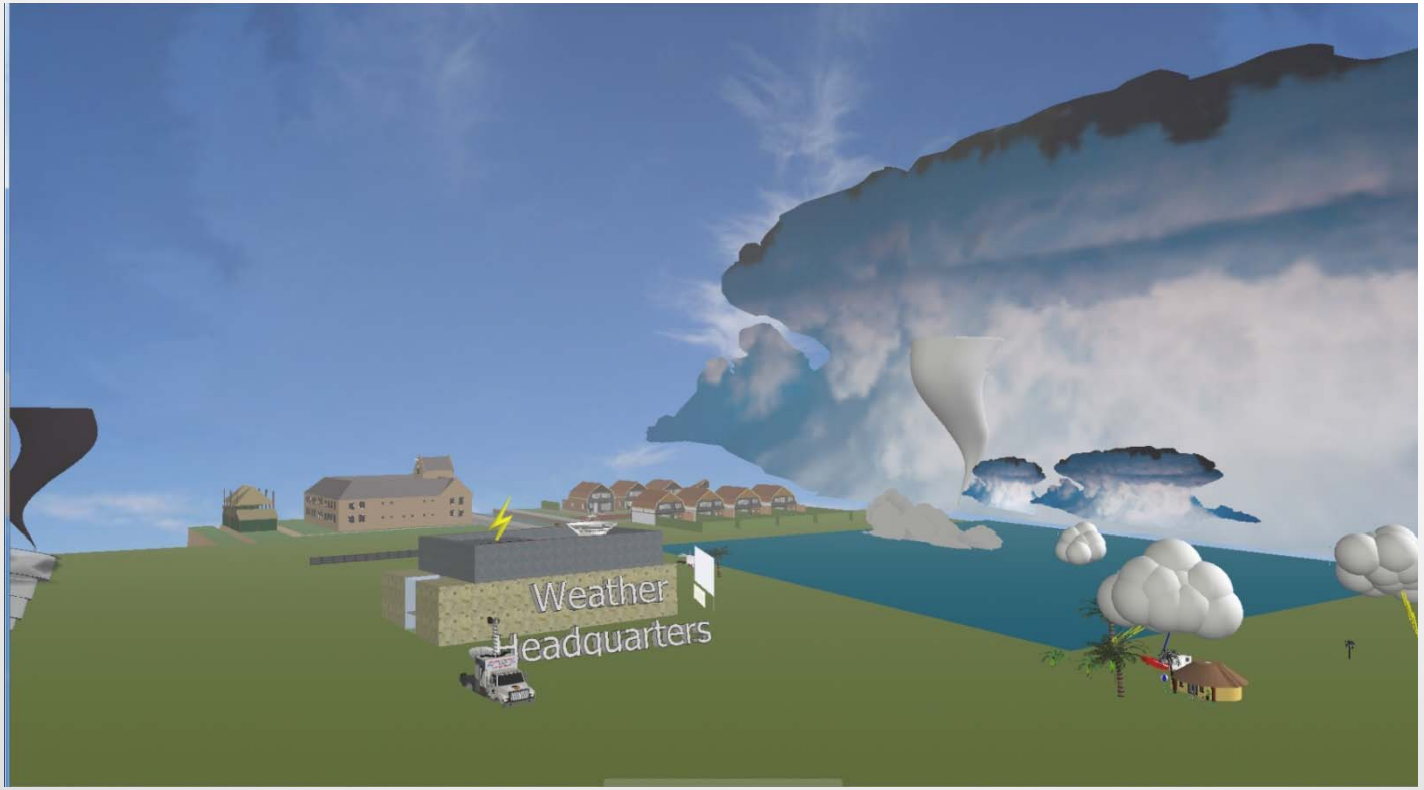
Changes to program:

- Maintain core curriculum
- Incorporate more experiences with STEM experts

Theme 2: Delivering the Workshops

Student and Teacher Created Worlds –

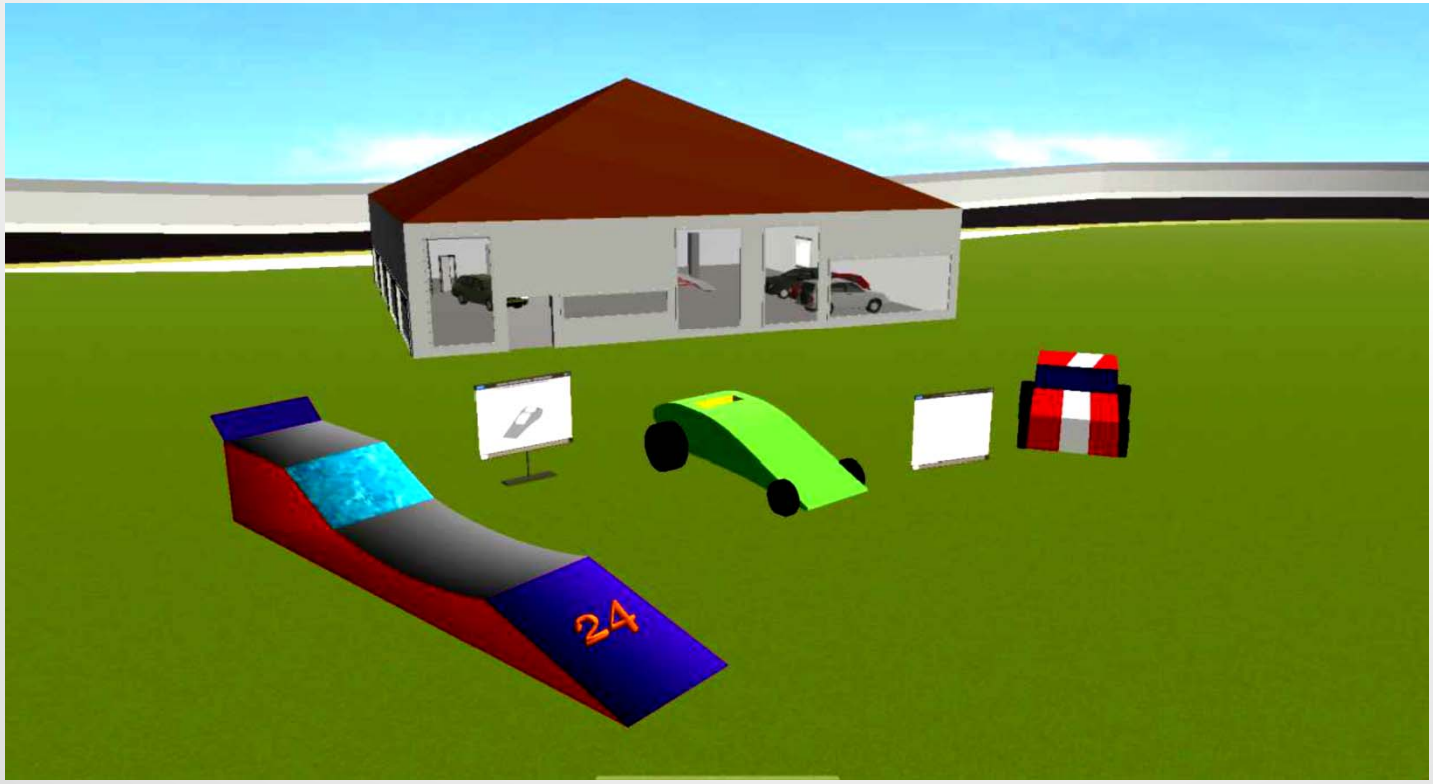
Series of Unfortunate Events



Theme 2: Delivering the Workshops

Student and Teacher Created Worlds –

Oconee Pickens Speedway



Theme 2: Delivering the Workshop

Key Findings: Teachers

Substantial learning about using 3D Pedagogy

- 77% reported that they learned “a lot” or “a huge amount” about being able to work with students (Final Workshop Survey)
- 86% of the teachers reported gaining a greater understanding of the pedagogical strategies that can be used for teaching in 3D (Final Workshop Survey)
- Teachers who teamed with other teachers expressed that this was positive (Focus groups)
- Instructors and 3D Modeler/Programmer were helpful resources (Focus Groups)
- Wanted additional training or introduction before the summer (Focus Groups)

Theme 2: Delivering the Workshop

Key Findings: Teachers

<u>Changes to program:</u>

- Teachers participate 3 pre-workshop professional development sessions
- Developing more opportunities for teachers to interact with each other
- Providing additional student instruction on teaching others

Theme 3: Implementing

Students

- Assisted teachers in limited classroom implementations

Teachers

- 4 have demonstrated on large computer or smart board
- 3 teachers have used in lab with class of students
- 1 using Google-Sketch up because of server/connectivity issues with QWAQ
- Three follow-up sessions so far: two online one face to face

District

- IT support brought ‘on board’ in each district
- “mini-tech conference” scheduled in March for district IT staff on implementation and technical issues

Theme 3:Implementing

Key Findings: Students

Students have had limited involvement

- Trained students were able to demonstrate when classes were not able to log-in
- Students are disappointed when technology doesn't work

Changes to program:

- Involve students in recruiting
- Students will provide tours/intro/basic Teleplace overview for ASU faculty
- Encourage teachers to develop plan for student engagement
- Create student showcase

Theme 3:Implementing

Key Findings: Teachers

Technology must be easy

- Seven expressed interest in using the technology in the future
- District-level server issues; Concerned that technology won't work when they need it to
- Some districts don't allow students to have email addresses
- Limited access to computers with software loaded
- Only allows 24 students in when most teachers have more than that

Changes to the program:

- The project must have champions both at the school level and at the district level. At the district level, need both instructional and technological champions.
- Individualized teacher follow-up professional development on technology (3D Modeler) and on pedagogy (Teacher Expert)

Discussion


Welcome to the Zoo!!
Go to the African portal to get to LA and SS.
Go to the Asian portal to get to Math and Science.

References

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