

# Science Learning Games at a Regional Science Center: *DinoQuest* and *DinoQuest* *Online*

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# Building Science Learning Games (SLGs) for Informal Science Education in a Science Center

- On-site physical interaction SLG: *DinoQuest*
  - Life-size dinosaurs models (T-Rex, Argentinosaurus, Velociraptors)
  - Family-based problem-solving and collaborative learning in physical environment
- Web-based SLG: *DinoQuest Online*
  - Addresses CA science education standards for K-6 grades
  - Interoperates with *DinoQuest*
  - Designed for internationalization
  - Developed by UCI GameLab





## **Fast Facts about Discovery Science Center**

- - Located in Santa Ana, California
- - 80,000 Sq. Ft. inside
- - Annual budget: \$6,000,000. Earned Income: 82%, Contributed Income: 18%.

### At the Center:

- - 425,000 annual visitors (2007); 275,000 (2005, before DQ and DQO)
- - 88,000 annual student field trip visitors from schools
- - Provide in-service science training to 1,100 K-12 teachers/yr.

### In the Schools:

- - 150,000 annual students in science outreach programs

# Discovery Science Center Goals



- Create a physical exhibit that blends:
  - Natural History Museum Collection,
  - Science Center Hands-on Exhibits,
  - Video Game Culture,
  - Science research practices via “collaboratories”
- Create a Cyberinfrastructure for distance learning over the Internet.
- Engage and explain CA Science Education Standards.
- Create electronic performance tracking ability for better evaluation capabilities.
- Support workforce development.
- Create a mechanism that continues to drive visitors between a brick & mortar science center and the center’s Internet/Web site multiple times.
- Increase repeat usage of science center exhibits and increase visitation.
- Create a replicable and sustainable model.



# *DinoQuest* at DSC



# Go to Field Station and Select a Mission



## 8 Educational Missions:

Each aimed at California Science Standards

Mission topics: Predator / Prey, Trace Fossils, Anatomy, Habitats, Identification

Each mission focuses on a different collaboratory





Field Site CoLab

BioMech CoLab

Zoology CoLab

Habitat CoLab



**DinoQuest Research Team and Collaboratories**  
**Diverse Scientific Role Models (ethnicity, age, gender)**



## **The IR Transmitter!**

- **Picking up information throughout the DQ site.**
- **Tracking visitor's success on missions.**
  - *IR transmitter, sensor network technology, and interactive media from Creative Kingdoms, Inc.*



# **Technology: Embedded Sensors and Transmitter Activation**



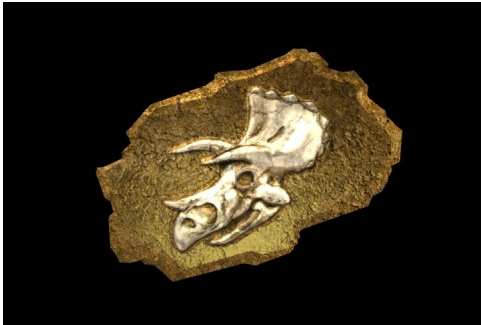
# Video Game Mechanics

Uplink data collected  
to *collaboratories*.



Earn Research Points for each item found.

Obtain fossils with encoded DNA as  
reward for completing each mission.



Ability to save data and come back another day.



# *DinoQuest Online*



## **Online Science Learning Games**

- Distance learning.
- Additional, in-depth science missions.
- Earn points and Dino DNA by completing missions.
- Level-up into multi-player dinosaur ecology simulation (*Dinosphere*).





# *DinoQuest Online* (released in June 2007)



Four SLG *colaboratories*

*MyLab* personal DQO-based collection site  
(associates DQ and DQO results like “Dino DNA”  
samples)

*Dinosphere* -- Assemble virtual dinosaur via  
DNA-based body system components



Same scientists as *DinoQuest* at DSC

Each collab game tied to CA science  
education standards, but experienced via  
discovery/exploration-oriented game  
genres

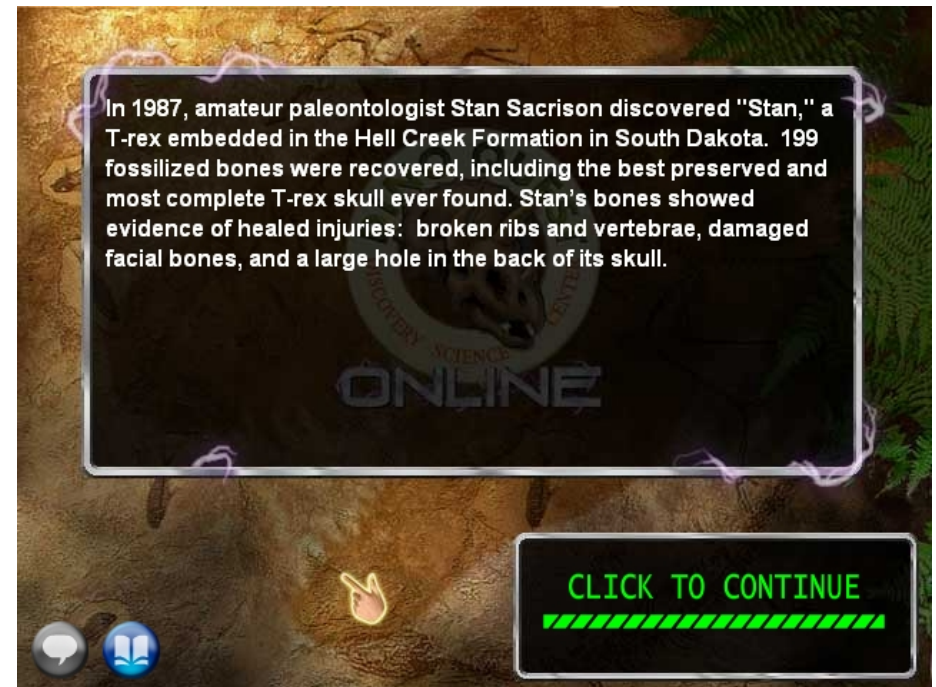
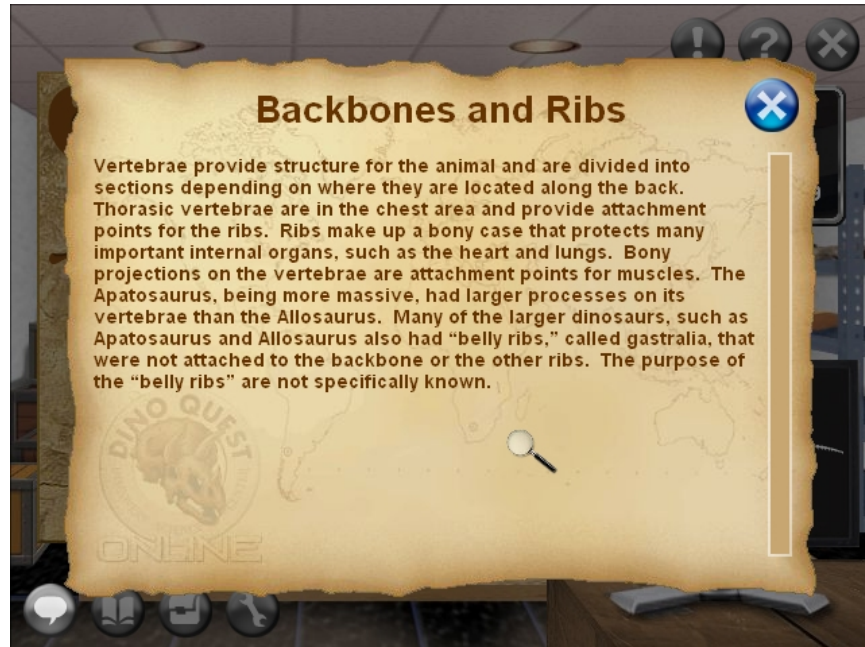
# Multiple Science Learning Games: *Dinosaur Dig Pit* Field Site CoLab Game



- Differentiated repetitive game play.
- Players act with resource limitations to encourage reflective action.
- Guidance and reflection events provided during play.



# Multiple Science Learning Games: Narrative Content





# *DinoQuest Online* Reconstruction CoLab

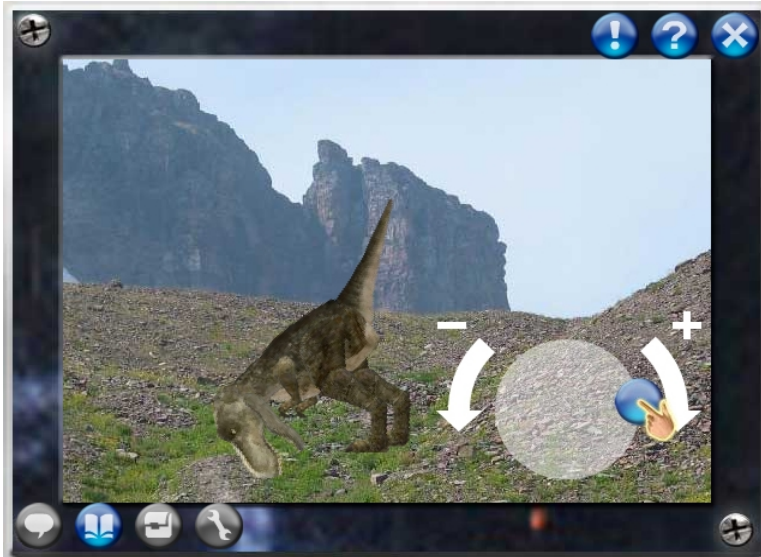


# DinoQuest Reconstruction CoLab (tutorial view)

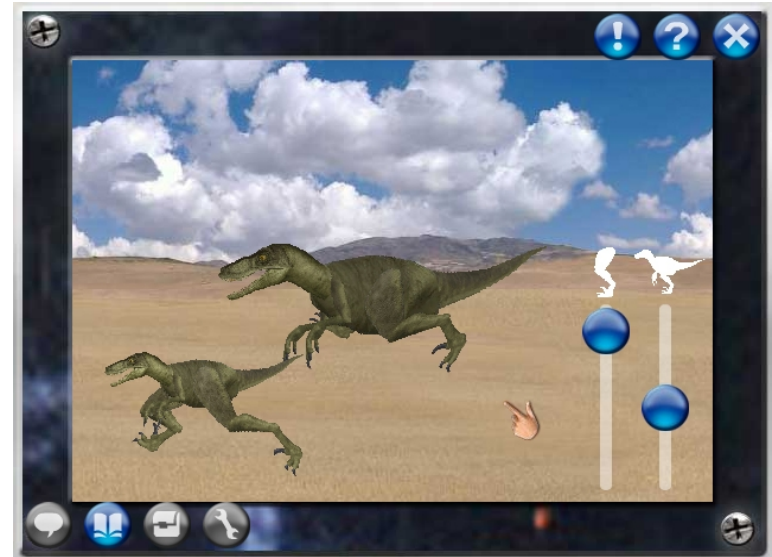




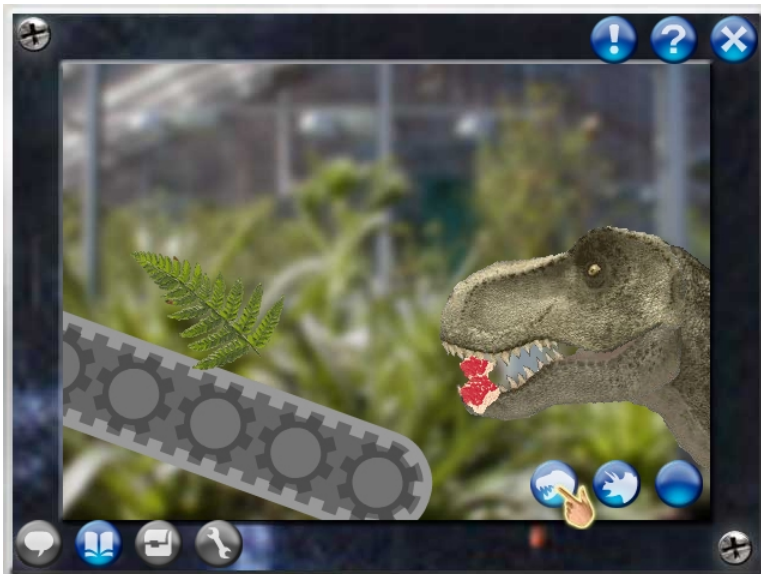
# Multiple Science Learning Games: *Biomechanical CoLab* Mini Games



- Mass and balance



- Proportion and speed



- Matching anatomical structures to diet



# DinoQuestOnline Ecolab



# Multiple Science Learning Games: *Zoology and Systems CoLab Games*



- Move Oxygen, CO<sub>2</sub>, blood cells, and waste through a cardio-pulmonary system.

- Design a working digestive system out of available organs and “connectors.”





# Multiple Science Learning Games: Resource Interaction CoLab Game Spaces



**MyLab** - shows missions completed both online and at the DSC



**DinoSphere** – design your Dinosaur with DNA collected from missions, then act to Survive in different ecological niches.



Go back online or go to DSC to obtain different DNA by completing more missions!

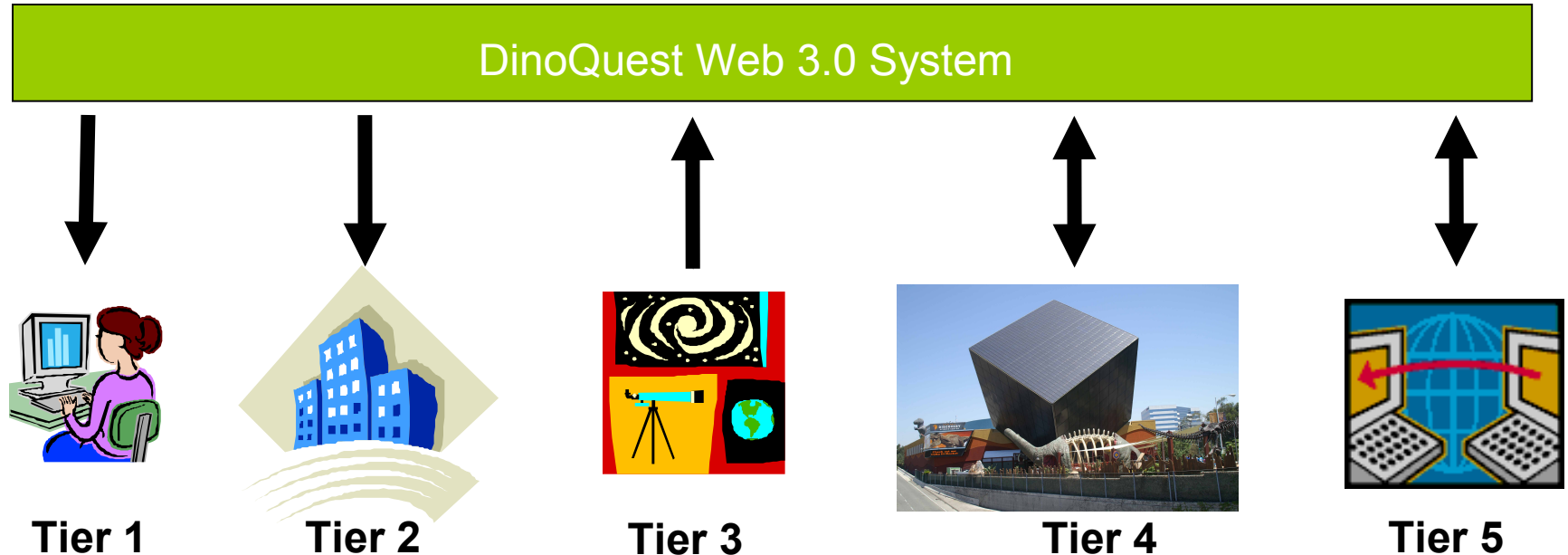


# Evaluation Framework

DinoQuest and DinoQuest Online allow for the following evaluations:

- *Player Centered*: scores, missions completed, and other variables identify progress and provide feedback in context.
- *Exhibit Centered*: ability to test content comprehension by player quiz pre/post completing mission.
- *Independent Evaluation*: which method is best and why:
  - physical exhibit
  - online learning games
  - both in combination

# DSC+UCI working to develop network of SLG-based science centers



Tier 1: Individual player connection: your Internet connection at home.

Tier 2: Local institutional connection: library, science center, school, or museum.

Tier 3: Regional science center provides local exhibit content connected online.

Tier 4: “Gateway” science centers provide open interfaces and content.

Tier 5: *Science Center Grid*: **Massive Multiplayer Online Science Learning Games** that span and interlink multiple science centers and museums.

# Project Contributors

- *DSC* – Joe Adams (President), Janet Yamaguchi (VP Education), JoeAnna Jenkins (CFO), Kellee Preston (VP Operations), Leslie Perovich (VP Marketing), Creative Kingdoms Inc., and others
- *UCI* – Robert Nideffer (creative director), Alex Szeto (game programming and art), Calvin Lee (database programming), Celia Pearce (design contributions).