U-Futures T²S (Teacher Transformation Series) Workshop

“Change over Time”

Facilitators:
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Timeline: 8:30 AM to 3:30 PM, TBA, 2016
Ten Minutes Breaks at 10:00 AM and 2:00 PM, Lunch 11:30-12:30

Objective: Strengthen science background knowledge on Phylogenetics and the Tree of Life.

Learning Goals: In this workshop, teachers will more fully understand the dynamic processes of how living things change over time. They will be able to apply this content knowledge using best practices in science education.

NGSSS - In addition to the Characteristics and Practices of Science, the following standards are also addressed:

- **Big Idea 14: Organizations and Development of Living Things**
- **Big Idea 15: Diversity and Evolution of Living Things**
- **Big Idea 16: Heredity and Reproduction (maybe)**

Scientific and Engineering Practices - behaviors that scientists engage in as they investigate about the natural world

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanation (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating and communication information

Crosscutting Concepts - a way of linking the different domains of science

- Patterns
- Cause and effect: Mechanism and explanation
- Scale, proportion, and quantity
- Systems and systems models
- Energy and matter: Flows, cycles and conservation
- Structure and function
- Stability and change

From the NRC’s book *A Framework for K-12 Science Education*. 2012
Driving Question: What evidence do we have to show change over time?

Day 1 AM Session

Welcome and Introductions

Pre Test – Living Tree

Geological time scale – Time line of important dates and cool creatures in Earth history

Journal Article- Phylogenics & Tree-Thinking– This lesson will include a lesson for teachers on how to read journal Article.

Go Extinct Board game

PM Session:

The Great Clade Race – Make poster

Using IPAD’s – What did T-rex taste like?

Tree of Life Activity poster

Day 2, AM Session

Review DQB: What evidence do we have to show change over time?

Chewing on change: Exploring the evolution of Horses in Response to climate change
Lesson one: Exploring teeth fossils

Journal Article: Fossil Horses, Orthogenesis, and Communication Evolution in Museums
Along with close reading strategies for students

PM session:

Chewing on change: Exploring the evolution of Horses in Response to climate change
Lesson Three- Poster Discussion on Equine Phylogenetic tree

Post Test – Living Tree Concept Map

Evaluation and Implementation Report
U-Futures T²S Science Content Workshop

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Pre / Post test

Use the following terms to make Living Tree:

Sister taxa, Outgroup, Root, Terminal nodes, Branches, Internal Nodes