

Assembling the Evolutionary Tree of Life: A Short History of How to Write the Longest History

Michael Hanson, former IB Biology Teacher, current Assistant Principal

Michael Hanson is a Southern California native who earned his bachelor degree in biological sciences and a minor in biotechnology from California Polytechnic University of San Luis Obispo in 2004. He then followed in the footsteps of his parents and became a teacher. For the past seven years he has taught at Scotts Valley High School, nestled in the Redwood Mountains between Santa Cruz and San Jose. At SVHS, Michael has taught both standard and higher level biology within the International Baccalaureate Diploma Program. In 2011 he earned a Master's degree in Educational Leadership from San Jose State University. Michael has served as science department chair, teacher union president, and site advisory council chairperson. Last spring he piloted a program between Samsung, AT&T, and Kno that put 3G tablets and e-textbooks into the hands of his students. Recently, in the fall of 2013, he was promoted to Assistant Principal of SVHS and is looking to transition the school to a 1:1 eLearning environment.



Scotts Valley High School, California

Situated just 20 miles from Silicon Valley, Scotts Valley High School is a comprehensive public school located in Scotts Valley, California. With a current population of 775 students and 40 teaching staff the school is of modest size. In comparison to similar schools in the county, SVHS is the highest performing with regards to state testing and college acceptance rates and placement. The three major factors which contribute to this success are the relative affluence of the surrounding community, the district's ability to attract highly qualified teachers, and the high standards of the International Baccalaureate (IB) Diploma Program. The IB is a global organization that offers a stand-alone diploma for secondary education students and provides one of the most rigorous and holistic curriculum available anywhere. At SVHS the IB Program is embedded within the school and in grades 11-12 students may choose to enroll in a single IB course or attempt the challenge of taking a full IB course load and earning the IB diploma.



Learning Objectives

Students will:

- Understand that all living things are part of a family that share a common ancestor.
- Be introduced to the scientific system of naming organisms known as binomial nomenclature.
- Be able to list the seven traditional levels of classification—kingdom, phylum, class, order, family, genus, and species.
- Be able to explain how DNA and physical characteristics can be used to understand the relationships between organisms.
- Evaluate an evolutionary tree to understand the relationship between two organisms.

Grade Level: 9-12

Lesson Duration: 45 minutes

Materials and Resources:

- JP-IK MG101 A8 – an Intel® classmate PC
- Internet access
- Kno* application and e-textbook
- LCD projector

Background/Context

Ever since Charles Darwin first proposed biological evolution, scientists have worked on the task of uncovering the true historical account of life on Earth. Today this record can be viewed as the Tree of Life and its construction is nearly complete.

Activity

This lesson will look at the concept and development of the evolutionary Tree of Life from the early days of science to now. Students will first evaluate their familiarity with the diversity of species on Earth and their relationships to one another. Through a look at the Linnaean system of binomial nomenclature students will learn that physical characteristics were first used as the foundation of classification. Students will then see how Darwinian evolution came to challenge this early classification. The modern method of building evolutionary trees will then be looked at with a focus on the role of DNA. Over the course of the lesson, various types of evolutionary trees will be looked at ending with a comparison between current academic examples and those accessible to the average person. To accomplish these goals students will begin their work using an e-textbook made accessible through the Kno.com application. Using this technology students will search the text, make notations, and have access to the instructor's notes.

Assessments:

This lesson contains formative assessments utilizing the student response system embedded within the Kno application. This feature allows teachers to understand student strengths and weaknesses in regards to reading assignments. This instantaneous feedback provided to both teachers and students allows for data driven remediation in the moment. Other useful feedback features of the Kno platform include the ability for students and teachers to share their notes and highlights with one another and the reporting to the teacher of student textbook access time and level of interaction.

Wrap Up and Reflection

The tools and methods used in this lesson can increase the engagement and level of interaction of the student with the concepts as compared to the standard method of direct instruction. When students use the Kno textbook application they provide their teachers with immediate and focused feedback so that changes to lessons can be made far more effectively. Introducing students to web-based knowledge sources and providing them the opportunity to individually explore this content will also extend the opportunity for students to continue enrichment when the lesson is completed. Just as biological evolution has produced progressively higher level functions for life, it is likely inevitable that the inclusion of these devices in a 1:1 classroom will result in higher level learning opportunities.

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