LESSON 2 Grades 4 – 12
THE LAETOLI FOOTSTEPS OF ANCIENT TANZANIA
Lesson Duration: 2 – 3 Class Periods (30 – 50 Minutes) for Each Section

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LESSON 2 | Grades 4-12

The Laetoli Footsteps of Ancient Tanzania

Lesson Duration: 2-3 Class Periods *(30–50 Minutes each) for Each Section*

Fossilized footprints in Laetoli, Tanzania famous for its hominin footprints preserved in volcanic ash.

OVER ARCHING QUESTIONS:

1. Where are we going?
2. Where are we now in our understanding of this topic?
3. Why are we trying to discover more?
4. How will we get there?
5. How will we know that we have arrived at any new understandings about this topic?

CONTENT THEME:

Interpret past events from a current perspective and consider how time and circumstances bring changes in understanding human behavior and migration patterns.

STANDARDS/ESSENTIAL SKILLS:

All of the standards listed below are directly related to or can be closely connected to this lesson. Depending on the direction the teacher wishes to focus the lesson, these standards provide a foundation for teachers to adapt and implement a standards-based curriculum approach.

Social Studies IN 2001

K-8 HISTORY: Historical Knowledge: IN 5.1.1, 5.1.14, 5.1.18, 6.3.1, 7.3.1, Chronological Thinking, Historical Comprehension, Research: IN, IN 3.1.7, 6.1.9, 7.1.1, 7.1.2. 7.1.19, 7.1.20, 7.1.21, 7.1.22, 7.1.23, 7.1.24, 8.1.28, 8.1.29, GEOGRAPHY: IN 4.3.1, 5.3.1, 7.3.1, High School: USH 9.1, 9.5, GHW: 3.1, 3.2, 3.3, 4.1, 9.1, 9.2, Economics: 1.1

Language Arts: IN 2006

IN 2006: Reading: Word Recognition and Vocabulary Development (IN 4.1.2, 5.1.3, 6.1.4, 7.1.3, 8.1.3) Writing: Informational, Research and Persuasive Texts – Response to Literature (IN 5.5.2, 7.5.2, 8.5.2, 9.5.2)

Language Arts - Common Core 2010:

CCR Standards (Gr 4-12) are woven into activities: LITERATURE: Key Ideas and Details: 1, 2, 3, Craft and Structure: 4, 5, 6, Integration of Knowledge and Ideas: 7, 8, 9, Range of Reading and Level of Text Complexity: 10, WRITING: Text Types and Purposes: 1, 2, 3, Production and Distribution of Writing: 4, 5, 6, Research to Build and Present Knowledge: 7, 8, 9, Range of Writing: 9, SPEAKING AND LISTENING: Comprehension and Collaboration 1, 2, 3, Presentation of Knowledge and Ideas 4, 5, 6, LANGUAGE: Conventions of Standard English 1, 2 Knowledge of Language 3, Vocabulary Acquisition and Use 4, 5, 6

Science - IN 2000:

The Nature of Science and Technology: 1.1.2, 1.1.4 2.1.2, 2.1.3, 2.1.5, 2.1.6, 3.1.1, 3.1.3, 3.1.4, 3.1.54.1.1, 4.1.2, 4.1.3, 4.1.4, 4.1.5, 5.1.1, 5.1.2, 6.1.2, 6.1.3, 6.1.4, 6.1.5, 7.1.1, 7.1.4, 7.1.7, 8.1.1, 8.1.4, 8.1.8 Scientific Thinking: 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.7, 3.2.1, 3.2.3, 3.2.7, 4.2.1, 4.2.4, 4.2.7, 5.2.4, 5.2.7, 6.2.2, 6.2.5, 6.2.6, 6.2.7, 6.2.8, 8.2.1, 8.2.6, 8.2.7, 8.2.8, The Living Environment: 2.4.7, 3.4.3, 3.4.5, 5.4.1, 5.4.4, 5.4.5, 5.4.7, 5.4.8, 6.4.8, 7.4.1, 7.4.2, 7.4.5, 8.4.4, 8.4.7, 8.4.8, 8.4.9, The Mathematical World: 2.5.1, 3.5.1, 6.5.2, 8.5.8, Historical Perspectives: 1.6.2, 2.6.3, 3.6.4, 7.6.1, Earth and Science: ES 1.24 1.26, 1.28, Biology B1.21, B1.33, B1.34, B1.47, Environmental Science 1.7, 1.20

Math - IN 2000:

Number Sense: 5.1.5, 5.2.4, 6.1.6, 7.1.7, Computation: 6.2.6, Measurement 3.5.1, 4.5.1, 4.5.2, 6.5.1, 7.5.1, 7.5.2, 8.5.1, 8.5.3, Data Analysis and Probability: 4.6.1, 4.6.2, 5.6.1, 6.6.2, 7.6.2, 8.6.4, Problem Solving: 4.7.1, 4.7.2, 4.7.3, 4.7.4, 4.7.5, 4.7.8, 4.7.10, 5.7.1, 5.7.2, 5.7.2, 5.7.5, 5.7.75.7.8, 6.7.2, 6.7.4, 6.7.6, 6.7.7, 6.7.10, 7.7.1, 7.7.2, 7.7.4, 7.7.5, 7.7.11, Data Analysis: 4.6.1, 5.6.1, 5.6.2

OBJECTIVE:

The purpose of this lesson is to help students focus on the recurring images of "footprints" seen in the DVD, *The Historic Journey: "Yes We Can"* with understandings of how the footsteps of our ancestors left a path for students to follow. Among the images found at the beginning and ending of the DVD are the footprints in the sand for viewers to link the footsteps of those who walked in Africa with those who walk the Earth today. As far back in history as we can reconstruct, using fossils, bones and carbon dating techniques allows us to make connections with past events and their impact on how both current and future generations will view the past.

The students will:

1. Review the DVD and reflect on its content.
2. Identify and use vocabulary words related to the lesson.
3. Read and respond to background information on the ancient Laetoli footprints made by hominins in Africa.
4. Research and discuss information about the human and the volcanic ash that covered them.
5. Compare species and family groups.
6. Use knowledge about latitude and longitude to find specific locations.
7. Analyze the recurring theme that runs throughout the video of *"following in the footsteps of others who came before us."*
8. Write about the links between the past and present.
9. Create a *"legacy plan"* that shows the importance of living lives that set an example for others to follow.
10. Research and discuss career opportunities connected to various fields of study discussed in the lesson.

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BACKGROUND INFORMATION

LAETOLI FOOTSTEPS:

On the eastern coast of Africa, sets of fossilized footprints buried for millions of years were uncovered and brought immense excitement to the scientific community in the late 1970s. Discovered in 1977, this archeological find was located about thirty miles south of Olduvai Gorge in Tanzania and was excavated in 1978-1979. Scientists believed that hominin footsteps found in this location can be dated back approximately 3.7 million years.

Laetoli has attracted students learning about the ancient world for more than forty years. What sets Laetoli apart from the other sites in the world are the sets of footprints found there in the Rift Valley system. The Laetoli trackway site has always been the odd one. Laetoli was dry when it was formed, but it is greener now. Today there are several small lakes in its vicinity and a good deal of vegetation. Laetoli was the first place ever where an adult Australopithecine tooth was found.

Laetoli has a nearby volcano named "*Sadiman*", that is extinct today. About four (4) million years ago, however, it was active and one day it spat out a cloud of carbonate ash. This ash had a consistency very much like fine beach sand. It powdered down over the surrounding landscape in a half-inch thick layer before the eruption stopped. This fall of superfine cinders must have been extremely unpleasant for the local animals and birds while it was coming down, but there is no evidence that it did little more than make them uncomfortable, because they stayed in the area. That first puff of ash – probably not lasting more than a day – was followed by a rain. The ash became wet and, almost like a newly laid cement sidewalk, began taking clear impressions of everything that walked across it: elephants, giraffes, antelopes, hares, rhinos, and pigs. There were also terrestrial birds like guinea fowl and ostriches, and even the small tracks of millipedes. However, among those tracks were 54 footprints that were unlike the others.

A wildly improbable linkage of events captured the footprints of 3 early hominin that were uncovered centuries later. Sadiman had to blow out a particular kind of ash. Rain had to fall on it almost immediately.

Workers clearing debris from the Laetoli Footprints

(photo courtesy John Reader)

Hominins had to follow on the heels of the rain. The sun had to come out promptly and harden their footprints. Then another blast from Sadiman had to cover and preserve them before another obliterating shower came along. All this had to happen over a period of only a few days. All things considered, the preservation and recovery of the Laetoli footprints are nothing short of a miracle. The early findings seemed to confirm that hominins were fully erect walkers nearly three million years before the Christian Era (B.C.E.) and even possibly earlier, about 3.6 million years ago.

The footprints are much like modern human footprints. They had well-shaped modern heels with a strong arch and a good ball of the foot in front of it. The big toe was straight in line. It didn't stick out to the side like an ape toe, or like the big toe in so many drawings you see of the australopithecines and other earlier fossils. However, they probably had been erect walkers for at least a million years. The direction of the footprints indicated that the travelers had been walking north over some sections of land that had not yet been eroded. The footprints show there were two adults who were probably walking together. One set (with slightly larger prints) was a male; the other, possibly pregnant or carrying a small child, was a female. There was also a smaller set of

prints, probably made by a younger offspring, who walked inside the larger footprints.

After the original excavation in 1979, the excavation team reburied the footsteps with soil, sand, and large lava rocks to preserve the area from erosion. However, when it was unearthed again in the 1990s, the pathway of tracks had been damaged over time when plants grew and their roots covered the area. In 1995, working with the Tanzanian Department of Antiquities, a team of paleontologists re-excavated the footsteps and looked for new ways to preserve the footsteps. The government and other scientists want to keep the tracks located where they were found and preserve the national treasure in place.

Recent discoveries based on information released in 2010 by David Raichlen, an assistant professor at the University of Arizona School of Anthropology and other research team members from the University at Albany, City University of New York's Lehman College, and the American Museum of Natural History in New York, give us new ideas to consider. They wanted to solve the riddle of how the bi-pedal beings walked as they traveled through the trackway in Tanzania. Many scientists still debate, *"Did they walk crouched and bent over, or did they actually walk in an upright position, like modern man?"*

Using new forensic techniques, video documentation, micro scanners, and digitized laser equipment, this recent team studied how the hominins would have walked and distributed their weight. Their findings indicated that the travelers who walked upright through the sandy trackway were not moving in a crouched, bent, stance as some had believed earlier. The researchers were surprised when they discovered that their measurements and calculations of weight transference and the gait of the strides that were left behind, indeed, were very similar to modern man.

There is still more research that needs to be done related to early archeological findings and what they mean as we develop new ways to examine old fossils. Are you interested in archeology, paleontology or anthropology? Find out the differences in what each field of study does. How about African History? How do findings about early fossils help us tell the story of mankind? Continue to do research in these areas and see what you can discover.

NOTE: The following information adds clarity to some similar scientific terminology that is often mistakenly used interchangeably.

The terms "hominoid", "hominid", and "hominin" are not interchangeable, but their classification criteria are variously in a state of flux. In general, the hominoids are a primate superfamily; the hominid family is currently considered to comprise both the great ape lineages and human lineages within the hominoid superfamily; the "homininae" comprise both the human lineages and the African ape lineages within the hominids, and the "hominini" comprising only the human lineages…

The human lineages (the hominins) are characterized by a number of features, including bipedalism. In effect, hominins are the group of fossils more closely related to modern humans than to any other group. In terms of dating, the hominin group apparently originated sometime between 5 and 8 million years ago…

Science Week. (August 2001). Hominoid Taxonomies_

REFERENCE:

University of Los Angeles, California: Hominoid taxonomies_1 August 2001_, ScienceWeek, down loaded, November 15, 2010 *http://cogweb.ucla.edu/ep/Hominoids.html*

Journal for the Public Library of Science: PLOS8 One: Scientific Research Article: Raichlen DA, Gordon AD, Harcourt-Smith WEH, Foster AD, Haas WR Jr. (2010). Laetoli Footprints Preserve Earliest Direct Evidence of Human-Like Bipedal Biomechanics. PLoS ONE 5(3): *e9769. doi:10.1371journalpone.0009769.* Retrieved November 8, 2010 from *http://www.plosoneorg/article/info:doi/10.1371/journal.pone.0009769*

University of Arizona: USNews: *http://uanews.org/node/30731*

(*Courtesy History Channel*)

Louis and Mary Leakey in Tanzania, at Olduvai Gorge in 1959 discussing the 1.75 million year old remains of Zinjanthropus boisei a discovery that cemented humanity's African origin

A grass hill covers the site today.

Migration routes leaving Africa

Entering Europe, Asia, Australia and the Americas

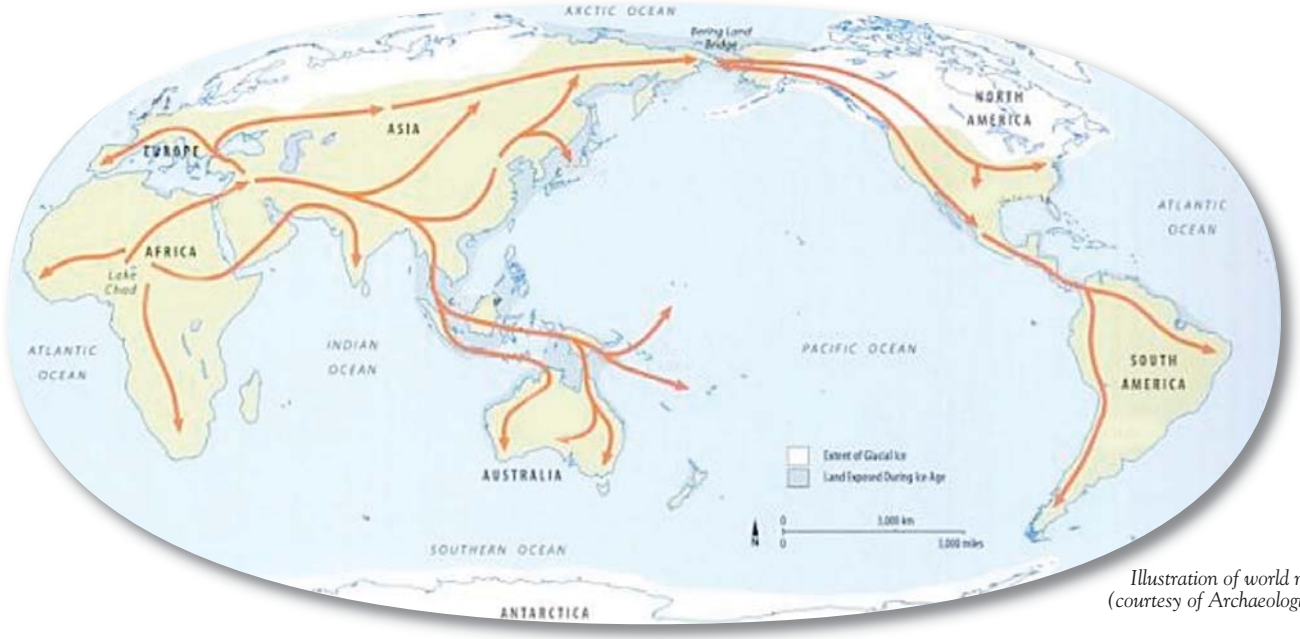


Illustration of world map (courtesy of Archaeologica)

KEY QUESTIONS:

1. What are the Laetoli footsteps of early hominins found in Tanzania located in East Africa?
2. Where is the Laetoli site found in Tanzania located using the latitude and longitude identification lines?
3. Why are findings by archeologists, paleontologists, and anthropologists important to us today?
4. How are Africa's history, heritage, and culture connected to America's history?
5. What does it mean to follow in someone's footsteps?
6. What are some things that student want to achieve in life that would inspire future generations to follow in their footsteps?

VOCABULARY:

Language Arts: theme, footprints, erect, impressions, shuffle, ancestor, descendant, legacy

Science: volcano, cinders, anthropology, paleontology, archeology, fossil, hominins, linkage, speculation, antiquities, carbonate ash, cinders, obliterating, excavation, paleontologists, bi-pedal, forensic, scanners, digitized, crouched, weight transference, gait, stride

Geography: Laetoli, Kenya, Tanzania, Sadiman, latitude, longitude

INSTRUCTIONAL MATERIALS:

1. DVD of *The Historic Journey, "Yes We Can"*
2. DVD player
3. Student Journals
4. Pencils/pens/markers
5. Handouts of the background information on the Laetoli footsteps
6. Chart paper/Overhead Projector

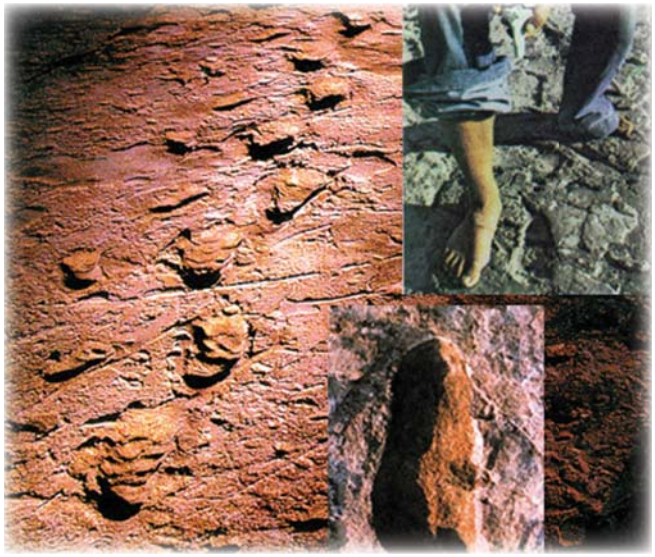
Extension Activities

1. Four yard sheet of craft paper
2. Six different colors of paint
3. Paper towels or clean, old clothes
4. Information on Hill Harper

DIFFERENTIATION AND/OR MODIFICATIONS:

1. Students will work in pairs or small groups on Activity 1.
2. Students may choose to work independently on reports or with a small group according to their interests for portions of the lesson on Activity 3.

The Laetoli Footsteps, made millions of years ago, are quite similar to the footsteps of modern man.



The Laetoli Footsteps, made millions of years ago, are very similar to the footsteps of modern man.

ACTIVITY 1:

FOLLOWING IN OTHERS' FOOTSTEPS AND CREATING A LEGACY PLAN

METHOD OF DELIVERY – Use small group discussion and vocabulary building activity, reading sheet handout, student-generated timelines

PROCEDURE:

The teacher will:

1. Divide the class into small groups of 3 – 4 students.
2. Prepare background materials and handouts on the Laetoli footsteps and Legacy Planning. *(You can use a copy of the Background Information.)*
3. Provide students with a list of the vocabulary words.
4. Collect globes or maps, documents and pictures that refer to the discovery of early humans to use as references.
5. Help students see the link between African history and early life forms with the significance of these findings to all races of people living today.
6. Prepare information on how governments seek to preserve antiquities found in their countries.
7. Prepare discussion on symbolism and how we preserve the past and follow in *"other people's footprints."*
8. Have material students will need to make a personal timeline to show the years of their lives for their *"Legacy Plan."* The activity will allow students to leave a plan for how others can follow in their footsteps.

The students will:

1. Work in small groups to review the video viewed previously and tell the parallel themes they discovered.
2. Determine meanings of the vocabulary words by analyzing root words, prefixes and suffixes.
3. Read the handout on the Laetoli footprints that describe how the footprints were discovered and their significance to us.
4. Describe the challenges the archeologists faced over the years to preserve the footprints.
5. Discuss the solutions and cooperation that occurred between the workers and the government.
6. Discuss how the footsteps shown in the video relate to following in the footsteps of others from the past who have influenced their lives.
7. Create a Legacy Plan to leave for future generations to follow by making a timeline of the first 40 years of their lives and then writing about what they have done well or will do that others could follow. *"What Legacy Will I Leave Others?"*

DIRECTIONS:

1. Remind the class that the beginning and ending of the DVD, *"The Historic Journey: Yes We Can"* had an image of footprints walking across the sand.
2. Have students discuss the significance of having the Laetoli footprints at the beginning and the ending of the video. Ask students what they think those footsteps represented. *(They show a connection between the African Continent, the cradle of civilization, and the departure from the African home-land of its people making the journey to America.)*
3. Then divide the class into work groups of 3-4 students each.
4. Ask students to divide a sheet of paper in their journals into 4 squares.
5. Each student will keep his/her own record of what their group decides.
6. Provide students with a set of the vocabulary words. This can be written on the board or provided as a handout.
7. Have students read through the vocabulary list with their teams and circle the words they know. Then let them share definitions of words they know with each other.
8. Next have students use 5 minutes to place the

vocabulary words from the list into 4 categories that their group decides upon and give each category a heading. (*Vocabulary list: theme, footprints, Kenya, Tanzania erect, impressions, shuffle, ancestor, descendant, legacy, volcano, cinders, anthropology, paleontology, archeology, fossil, hominids, speculation, Laetoli, Sadiman, latitude, longitude, antiquity)*

9. Ask groups to share their 4 group headings and the words they decided were related to them and tell why they put words in each group.
10. The teacher will write the headings and help students compare and contrast each teams' lists and reasons for placing words where they did.
11. Pass out handout on the Laetoli footprints and then have students read it. Have them look for vocabulary words.
12. Allow students to discuss the content. *"What are your thoughts on this passage?"*
13. Use maps, globes and Internet sties to locate where the footsteps were found. *(Laetoli, Tanzania in Africa. Tanzania, a country in the eastern part of Africa has a latitude and longitude reading of 6° 00' South and 35° 00' East.)*
14. Allow student to work in teams and explore assigned information from the reference sites listed below, or provide teams with different sets of materials already downloaded.
15. Allow each team to go to other teams and to share what they uncovered.
16. Now direct students in their groups to focus back on the symbolism connected with the footsteps of Africans and the footsteps we follow now and in the future.
17. Have students in the whole group give their thoughts on how Barack Obama walked in the footsteps of others to become the first African-American U. S. President.
18. Then ask students, *"Whose footsteps are they following in now?"*

    - If they are following someone who is doing negative things, what could they do to change their path?
    - If it is someone positive, then what can they do to stay positive by being involved in the same things and then passing those same values and goals on to others?
    - Have students share what they think the following phrases means:

Following in the Footsteps of our Ancestors – We could not have made it without them. Leaving Footsteps for our Descendants to Follow –They cannot make it without us.

19. Let students make a timeline by marking 41 lines. Label the timeline, My Legacy Plan.
20. On the first line write 0 and then they can number to 40. Each line represents a year of their life. Let them count by 5s and then write in milestone birthdays 5, 10, 15, 20, 25, 30, 35, and 40.
21. As students create their Legacy Plan, they will write down things they have already done that were important to them, and then, add events that they want to occur in their lives over the next few years until they become 40 years old. The good things that they want to happen are part of their Legacy Plan.
22. Ask students to write out a short essay on "A *Legacy Plan for Those to Come."* The timeline should reflect the answer to this question: *"What gifts of character will you leave behind to your descendents and others in the future?"*
23. Let students write about some positive things that they have done or will do up until the age of 40 that they would like for others to do in order to follow in their footsteps. (These things could include when they will graduate from high school, when they will graduate from college, when they will get married, each time they will vote for another president *(age 18 and then every 4 years of the election cycle)*, when their children will be born, when their children will begin school, when they will buy a home or a car, something they plan to do to help others, and what they plan to be doing at age 40 that is positive and productive and that others may admire about them.)

FOLLOW-UP:

1. Allow time for students to write and share their personal timelines.
2. Students may share their legacy plan with their small group.
3. Allow a few students to answer reflection questions about the lesson.
4. Remind students of the standards covered during the lesson.
5. Bring closure to the lesson by encouraging students to remember those who have gone before them and what legacy they will leave for others. Use this quote by David Brower:

An Anthropologist examines 3.6 million year old footprints.

"We don't inherit the earth from our ancestors, we borrow it from our children."

ASSESSMENT:

- Check vocabulary groupings to see what students know about the vocabulary words.
- Check students' personal timelines.
- Examine the essays for organization, content, and mechanics.

STUDENT REFLECTION AND DEBRIEFING QUESTIONS:

Students will answer the following questions:

1. What was the main point of the lesson?
2. What did I learn that was new information?
3. What will I do differently because of what I learned from this lesson?

TEACHER REFLECTION:

1. The student received the necessary materials to complete the lessons.
2. The students recognized a connection to the lesson topic and were able to see how it related to their lives.
3. The students satisfactorily met the lesson objectives when they completed the assignment, as measured by the related state standards.
4. Students were provided time to reflect on the questions above and to assess the activity and answer questions about their progress related to the topic.

RESOURCES:

University of Arizona US News
http://uanew.org/node/30731

BBC Website – The Laetoli Footprints
http://www.bbc.co.uk/dna/h2g2/A944336

National Geographic Website
http://www.nationalgeographic.com/xpeditions/lessons/17/g35/alemseged1.html

Lesson Plan on the Laetoli Footsteps for a high school class
http://www.indiana.edu/~ensiweb/lessons/footstep.html

Scientific American Magazine,
September 1998 – Abstracts
http://www.sciamdigital.com/index.cfm?fa=Products.ViewIssuePreview&ARTICLEID_CHAR=6EC88BD9 -D7E5-4048-AB6D-D5AFCCA929F

http://www.sciamdigital.com/index.cfm?fa=Products.ViewIssuePreview&ARTICLEID_CHAR=6EC88BD9D7E5-4048-AB6D-D5AFCCA929F

http://www.sciamdigital.com/index.cfm?fa=Products.ViewIssuePreview&ARTICLEID_CHAR=974C300824FF-4130-AE74-588FCF6CBA4

http://www.sciamdigital.com/index.cfm?fa=Products.ViewIssuePreview&ARTICLEID_CHAR=1315F31D781D-4204-8D2A-3AC7145FA65

Behavioral Science Department: Palomar College: What is Anthropology?
http://www.palomar.edu/anthropology/

ACTIVITY 2:

LANGUAGE ARTS: WRITING OPTION
METHOD OF DELIVERY: – Use of media, student-generated essays

PROCEDURE:

The teacher will:

1. Show the DVD, *The Historic Journey: "Yes We Can,"* a second time.
2. Then assign students to write a 3-paragraph or longer essay choosing from selected topics below.
3. Allow students to choose their topics and begin working on their essay.
4. Provide a graphic organizer to help them begin the writing process *(pre-writing)*.

The students will:

1. Choose one of the topics provided for their essay.

4. Provide a graphic organizer to help them begin the writing process *(pre-writing)*.

The students will:

1. Choose one of the topics provided for their essay.
2. Choose to work individually or with a buddy in a pre-writing planning activity.
3. Individually, complete a 3-paragraph or longer essay on the topic chosen.
4. Begin working in class and / or complete the activity as homework.
5. Use a writing plan that helps with organizing thoughts.
6. Consider how to include organization, word choice, voice, clarity, and language convention skills such as correct grammar, spelling, and punctuation.

DIRECTIONS:

1. View the video a second time.
2. Remind the class to look for recurring themes.
3. Then assign students to write a 3-paragraph or longer essay choosing from the items listed in the next column:

   - **Option 1:** How do you think the theme *"Walking in Someone Else's Footsteps"* is presented throughout the entire DVD?
   - **Option 2:** Using most of the vocabulary words presented in the lesson, write an essay entitled, *"Footsteps of the Past"*.
   - **Option 3:** What career opportunities are connected with studying bones, footprints, fossils and the past?
   - **Option 4:** Students may choose a topic related to *"footsteps"* and the students' understanding of the symbolism involved.
4. Provide a deadline date for the essay's completion.
5. Another extension activity could be to create poetry about the *"Footprints of Those who Came Before"*.
6. Have students use the state rubric for writing as their guide for organizing and editing work.

FOLLOW-UP:

1. Have students to begin the assignment in class and complete it at home.
2. Direct students to turn in their work in a published form.
3. Allow students to answer the student reflection questions.

ASSESSMENT:

- Check student writing samples using the State Academic Writing Rubric.
- Assess student understandings about symbolic meanings.
- Check understanding of vocabulary if students write essays using vocabulary words.

STUDENT REFLECTION AND DEBRIEFING QUESTIONS:

Students will answer the following questions.

1. What was the main point of the lesson?
2. What did I learn that was new information?
3. What connection do I feel to the topic we discussed?
4. What do I believe about the Laetoli footprints?
5. When you think of footsteps, how can that relate to me?
6. What will I do differently because of what I learned from this lesson?

TEACHER REFLECTION:

1. The student received the necessary materials to complete the lessons.
2. The students recognized a connection to the lesson topic and were able to see how it related to their lives.
3. The students satisfactorily met the lesson objectives when they completed the assignment, as measured by the related state standards.
4. Students have new understandings about careers connected to science and history.
5. Students were provided time to complete a self-reflective assessment activity and were able to answer questions about their progress related to the topic.

CROSS – CURRICULAR EXTENSION ACTIVITIES

MATH and SCIENTIFIC THINKING OPTIONS: GRADES 2 – 8:

"Whose Footsteps are These?" How do forensic scientists, paleontologists and archaeologists discover information about people using their footprints? These activities will give students insight into what these scientists do.

ACTIVITY 1: SCIENTIFIC THINKING
IS THERE A CONNECTION BETWEEN SHOE SIZE AND HEIGHT?

1. Students will work in 4 teams to compile information that will be placed on a class chart.
2. The class chart will include 4 columns. Column one will list every student and the teacher's names. Column two and three will list shoe size and heights.
3. Have each group assign a recorder.
4. Have students make a similar chart for their group's information.
5. Students log in their groups shoe sizes and heights on their team papers.
6. Have students take turns measuring /or recording each other's shoe size and height on the team's record chart.
7. Then have one team member record the information on a class chart.
8. Have one group member record shoe sizes for everyone in their groups on the large chart. Use displays such as bar and line graphs, line plots, stem and leaf plots.
9. Have another member record everyone's heights.
10. Ask the team to record the data in an Excel database program sheet if it is available and if they know how to use it.
11. If the class is not using Excel, let students work with their team to order the list by numbers, by shoe size and from shortest to longest, and also write the associated height that goes with the shoe size.
12. Ask students, *"What did each team discover?"*

ACTIVITY 2: SCIENCE/MATH
USING BODY MATH *(KG-6)*

1. Have students find footprint patterns of other small animals and let them complete activities found in the following resource as a family night project. *(GRADE KG-2)*. They can try to identify footprints and match labels with them. Animals could include a raccoon, wolf, rabbit, duck, bird, squirrel, dog, cat, horse, elephant, bear.
2. They could also calculate how far each animal would travel if they each took 20 sets of their footsteps.
3. Use an activity that requires students to use *"Body Math"*. They can compare and examine different body proportions to try to figure out the relationships between the length of their foot size and other body parts. Students will use a string to measure their neighbor's foot size and record the information on a chart. Then each student will use the string to measure other body lengths such as wrist to elbow, widest part of fist, around their fore-heads, from head to toe and other parts they may choose. See the pdf file below that has more activities. Then they can switch with another classmate and find similar measurements. When the class has completed 2 – 3 exchanges of classmate information, have students compare their answers. Students take on the role of detectives, as they try to estimate Bianca's height based on one clue — her foot size.

RESOURCES:

Family Science/Math Night: Who Goes There?
http://wupcenter.mtu.edu/educationfamilysciencenight/lesson_plans/Tracks_K-2.pdf

PBS Kids: Cyberchase- Bianca's Body Math
http://www.thirteen.org/edonline/gallery/cyb_wkshp_ff_act2.pdf
http://pbskids.org/cyberchase/

ACTIVITY 3: SCIENCE
THINKING LIKE A FORENSIC SCIENTIST

1. Use a sheet of long white craft paper four feet long.
2. Choose the shortest student, the tallest student, and one student with a medium height.
3. Also ask teachers in the building to help with this activity. Again, choose the tallest, shortest

and one medium height teacher. There should be both male and female participants in both groups.
4. Let these participants complete their portion of the activity when no one else is observing them.
5. Record the participants' height, shoe size and foot size in centimeters. *(Students may convert this measurement to inches as a team project.)*
6. Have a bucket of water and plenty of paper towel or old cloths handy.
7. Have all of the selected participants take off their shoes and spread different colors of paint for each person to place on the bottom of their feet.
8. Then, let each participant use their normal gait of walking and move across the paper from end to end.
9. Present the linear chart to the class when the teams are ready to begin their investigation.
10. Allow students to work in teams of 3-4 students to see if what they can discover about the people who walked along the pathway.
11. Allow each set of students to follow one set of footprints and measure the length of each foot print in their set and also the distance between each stride.
12. As they study their trail, ask students to find any other interesting things they observe. Let each group record their data and then compare the findings from each group.
13. Allow the class to speculate to whom each set of footprints belongs.
14. See if there is any correlation to foot size and the height of each participant. Ask the class to draw conclusions from the activity.

ACTIVITY 4: BIOLOGICAL SCIENCE DATING ARTIFACTS FROM THE PAST

As teachers share information about how scientists are able to determine the age of artifacts, fossils and other materials found from ancient times, the following points may be helpful:

1. Explain how carbon dating is used to determine the age of an object.
2. Examine what are radioisotopes and how they are used in carbon dating?
3. Compare the scientific classification of "*Man*" from "*Kingdom to Species*" and indicate the significance of each category.
4. Interpret the argument for evolution through the idea of the "*missing link*" between man and ape.
5. Analyze how recent advances in molecular biology and DNA technology can be used to gain information relative to the origin of man?
6. Analyze and critique how the sequencing of the Human Genome supports or detracts from the theory of evolution?

NOTE: There is a National Institute of Health sponsored website; *http://www.ncbi.nlm.nih.gov/*. Instructors can have students explore the website to explore genes *(and corresponding proteins encoded by the genes)* and genomes of various organisms that have been sequenced. Some activities can include research of similarities of genes and proteins of various species, genetic mutations associated with diseases, changes in amino acid sequences in corresponding proteins.

ACTIVITY 5: SCIENCE WHO IS HILL HARPER? BACKGROUND INFORMATION

Hill Harper is an African American actor and friend of President Barack Obama. He and President Obama attended Harvard Law School together where they both graduated with honors. His father was a psychiatrist and his mother was an anesthesiologist. He graduated from Brown University and earned a JP degree from Harvard Law School. He also received a Master's degree in Public Administration. During the Obama election campaign of 2008, however, Harper voiced his opinion about Barack Obama being a good candidate for president, and he served on the Obama for America National Finance Committee.

Harper began his acting career when he was seven years old. Recently, he has acted on a popular television program entitled CSI:NY. In the drama, he plays a fictional doctor, Dr. Sheldon Hawkes, a medical examiner who works in the New York City morgue. This crime scene investigation program uses many of the same types of evidence gathering techniques that a forensic scientist and paleontologist would use.

REFERENCES:

Manifest Your Destiny – Hill Harper's Foundation
Website- Bio of Hill Harper
http://www.manifestyourdestiny.org/HillHarper/bio

MSNBC Website from the Today Show -
Actor and Obama pal Hill Harper:
"He gets it right" October 24, 2008.
http://today.msnbc.msn.com/id/27341814/ns/today_on_the_trail/

Wikipedia – The Free Internet Encyclopedia-
(Remind students to check information from several sources because wikipedia's content can be altered easily.)
http://en.wikipedia.org/wiki/Hill_Harper

DIRECTIONS:

1. Share background information about Hill Harper, an African American actor.
2. Have students conduct research on Hill Harper and discuss how his education prepared him for several career options and opportunities.
3. Have students make a graphic display to compare jobs related to each field connected to Harper's fictional character's role and tell what degree in college they will need to earn in order to complete the chart.

See the worksheet at the end of the lesson *(SAMPLE)*

Career	Write the suffixes for each word and its meaning. Then divide the words into syllables.	Write a sentence using the word list that includes a job description for that person or field of work.	Then list the schooling required to work in this job medical doctor.
Medical Doctor			

Possible Answers:

- **Coroner:** er, *cor-o-ner,* A coroner examines dead bodies and determines how people death.
- **Anthropology:** y; *an-thro-po-lo-gy,* Anthropology is the study of humans and their ancestors through time, space and culture
- **Forensic scientist:** ic, ist, *-fo-ren-sic sci-en-tist,* A forensic scientist looks at evidence from crime scenes and apply scientific procedures to determine findings
- **Paleontology**, *pale-on-to-lo-gist:* ogy - ist; A paleontologist searches for prehistoric life and studies fossils of plants, animals and other organisms. This type of study is called paleontology.
- **Medical examiner:** al, er; *med-i-cal ex-am-iner;* A medical examiner is a physician who works for the government to determine the cause of unnatural deaths.
- **Archeologist:** ist; *arch-e-ol-o-gist;* An archeologist studies prehistoric people and their culture.
- **Forensic anthropologist:** ic,ist, A forensic anthropologist is a person who studies skeletons and can help to identify people from their bones.
- **Geneticist:** ist, *gen-e-ti-cist;* A geneticist studies human genes and DNA samples.

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ACTIVITY WORKSHEET 2
LAETOLI FOOTSTEPS

Name _____ Date _____

- Work independently or with a partner *(as the teacher directs)* to complete this activity.
- Create your own table on the computer to fit your answers into each box. Use the internet to help find your answers.
- Fill in each box with the best answer for each category.

Career	**Write the suffixes for each word and then divide the words into syllables**	**Then write a sentence using the words listed that includes a job description for a person or field of work related to science**	**Schooling required to work in this job**	**Name one or more people who have had this career. Choose people from various ethnic backgrounds**
(SAMPLE) medical doctor	*(al)* med-i-cal *(or)* doc-tor	A doctor checks and treats patients who are sick or well, hoping to prevent sickness and promote improved healthy living	1. High School – 4 years 2. Bachelor's Degree - Pre-medical classes – 4 years 3. Pre-med Test 4. Medical School – 4 years 5. Residency 3 – 8 years	Dr. Benjamin Carson Dr. Charles Drew Dr. Daniel Hale Williams Dr. Patricia Bath
coroner				
anthropology				
forensic scientist				
paleontology				
medical examiner				
archeologist				
forensic anthropologist				
geneticist				
Add another profession that uses a field of science of your choice:				

- ology, - logy = study of a science **ist** = one who does **er** = person who **- al** = pertaining to **ic** = like, pertaining to

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