

## Introduction

This module focuses on the most primal material—earth itself (in the form of clay)—as used in the deep past and contrasts it with materials very much of the present and future: rare earth elements. As different as they may seem, they are similar not only as “earthy materials” but in terms of how humans have become inexorably dependent on them, even as these things are dependent on humans.

### Module Objectives

Students will:

- identify the properties of clay
- identify the properties of rare earth materials
- discover the uses and applications of clay both historically and in modern times
- examine the many relationships between humans and materials
- recognize the existence of critical materials.

## Readings, Lecture, and Practice

Watch the Lecture: [Clay \(14:26\)](#)

Read: “The Entanglement of Earth in the Age of Clay” by Susan Gillespie

*To prepare for your quizzes and exams, take notes and think about how the lecture content relates to your readings as you watch the lecture.*

Practice: [Take the Clay Quiz](#)

*The practice quiz has 10 questions. You will have 90 seconds to complete each question. You may only take the practice quiz one time and you must finish it once you open it so be sure you have adequately prepared by **taking notes** while you watched the lecture and read the chapter and by studying before you begin. Your notes will be very useful for when you study for Exam 1 and 2.*

## Assignment: Application Video Analysis

**Key Concept:** Rare earth elements are a class of materials that when alloyed or mixed with other elements can offer a range of fascinating property changes from fluorescence to increased magnetism. Many of the modern sustainable systems like windmills, electric vehicles and LED lighting rely on rare earth elements. However, as we learned from “The Age of Clay”, our dependence upon rare earth elements for new technologies also make us dependent upon the people and processes for sourcing these elements. As a result, political challenges with where rare earths are mined continue to be a concern for these critical materials.

### Assignment Instructions:

## Module 2: The Entanglement of Earth

Before the video reflect on the lessons of this unit by considering the questions below. As you watch the video, think about how each question is answered.

- In what ways are societies today dependent on rare earth elements?
- How would you explain the “scarcity” of rare earth elements?
- Why are rare earth elements considered “critical materials”?
- How do fluctuating market prices and the technology needed to extract rare earth elements contribute to making rare earth elements “critical materials”?
- What are the different ways that the technology for utilizing rare earth elements can be made more sustainable?

Watch: [Rare Earths \(17:16\)](#)

**Write a 1-page essay** synthesizing the answers to the questions above with what you've learned in the lectures and readings. *(full sentences in paragraphs, double-space, 11-12 pt. font).*

This assignment will be graded out of 20 points on effort, use of the lecture, video, reading materials, and thoughtful reflection. See the rubric attached to this assignment for grading criteria. Be sure your name is on the paper. A cover page is not necessary.

Refer to the due dates document for submission dates and the assignment rubric for grading criteria.

### Application Video Analysis Rubric

Criterion	9-10 points	6-8 points	3-5 points	0-2 points
Response Content (10 Points)	Responses are appropriate, thoughtful, and indicate engagement with the video.	Responses have minor inconsistencies with the video or are not supported by content.	Responses have major inconsistencies with the video or are not supported by content.	Responses are inaccurate, careless, and/or opinions are not supported by content.
Mechanics (10 Points)	Grammar, sentence structure and punctuation are correct and paper is properly cited.	Minor issues with grammar, punctuation and/or sentence structure and citations.	Significant issues with grammar, punctuation and/or sentence structure and citations.	Major issues with grammar, punctuation and/or sentences and citations
Total				

### Assignment: Material Entanglement and Impact Paradigm Reflection

Humans and things develop interdependencies (entanglements) that trap them and constrain or limit their actions. The entanglement model developed by Ian Hodder is a method for analysis: humans

depend on things, things depend on other things, things depend on humans; thus, humans depend on things that depend on other things and on humans.

### Part 1 Instructions:

- **Create a new document**
- **Save it as** entanglement\_yourname (Example: entanglement\_kevinjones). You will add to this document like a journal or blog during each module of this course.
- Make the heading for your first entry. Use the date and this module's material at the top of the page. (Example: 1/23/16 Module 15: Diamonds)
- **Create** a tanglegram that illustrates your relationship with the material from this module. (\*If this module covered more than one material, then choose just one material to explore your entanglement.)
  - Refer to the example tanglegram in the Module 2 reading, *Entanglement of Earth*. Make sure that this tanglegram demonstrates the new information about the relationship of materials to society that you learned in this lesson (e.g., our dependence on trade to acquire materials)
  - *Note that you may hand draw your tanglegram and take a picture to insert in your document or use any other type of application that suits you. There are many free concept mapping applications found online. Just search mind-mapping applications.*
- **Add your tanglegram** under your new entry.
- **Source an image** that illustrates an aspect of your entanglement (or supports your lack of entanglement) with the material from this module. The image can be found, created, or photographed. If the image isn't yours, be sure to include a reference.
- **Add your sourced image** under your tanglegram.
- **Caption** the image telling what it is and its context.
- **Discuss** your thoughts related to your personal relationship with this material and how that relates to society.
  - Consider:
    - How do the social and cultural properties of this material affect you and society?
    - Based on what you've learned about this material what might be the consequences of the corrosion, degradation, or scarcity of this material?

*Note: Your entry should be no more than two paragraphs. Entries are evaluated for content, thoughtfully supported writing, and mechanics. Refer to the *Physical and Social Properties of Matter* document to guide your discussions.*

### Part 2 Instructions:

- **Open** your Impact Paradigm Document
- Add at least one question to any one of the categories. If you're having trouble coming up with a new question, think about the particular case studies of the material in this module, and the new information that you've learned about the relationships between materials and society.

## Module 2: The Entanglement of Earth

What is one new way to think about the social life of materials that you learned in this module?

- Submit BOTH your Material Entanglement Reflection Document AND your Impact Paradigm Document

Refer to the due dates document for submission dates and the assignment rubric for grading criteria.

### Material Entanglement and Impact Paradigm Reflection

Criterion	9-10 points	6-8 points	3-5 points	0-2 points
Response Content (10 Points)	Responses are appropriate, comprehensive, and indicate thoughtful engagement with the information and concepts from the lecture, readings, and videos. Novel ideas, creativity, and attention to complexity are a plus. Tanglegram is fully supported by responses and image.	Good effort. Responses and arguments are not as clearly presented, or as comprehensive and thoughtful as in a full credit answer. Tanglegram is fully supported by responses and images.	Responses are less appropriate to the assignment, less thoughtful and engaged, with less complete information. Tanglegram is partially incomplete or unrelated to images and responses.	Responses are inaccurate, careless, and/or opinions not supported by content.  Tanglegram is incomplete.
Mechanics (10 Points)	Grammar, sentence structure and punctuation are correct. Works are cited properly when appropriate.	Occasional grammar or mechanics issue or works are cited incorrectly.	Some issues with grammar, punctuation and or sentence structure or chosen image or other works are not cited when appropriate.	Major issues with grammar, punctuation and or sentences. Chosen image or other works are not cited when appropriate.

### Additional Resources

- Video: Traditional clay processing in Botswana <https://youtu.be/AO0F8y3aNOo>
- Video: Global Race for Rare Earths <https://youtu.be/as7-8wLAtdA>
- Rare Earth Elements: Articles & Information <http://geology.com/articles/rare-earth-elements/>