

Producing Scientific- ASL Conversations with Your Students

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01

Introduction



Meet **Scott**

Ph.D. candidate in science education



Research interests:

- Science Teacher's Pedagogical Content Knowledge
- Informal STEM Learning
- Translanguaging

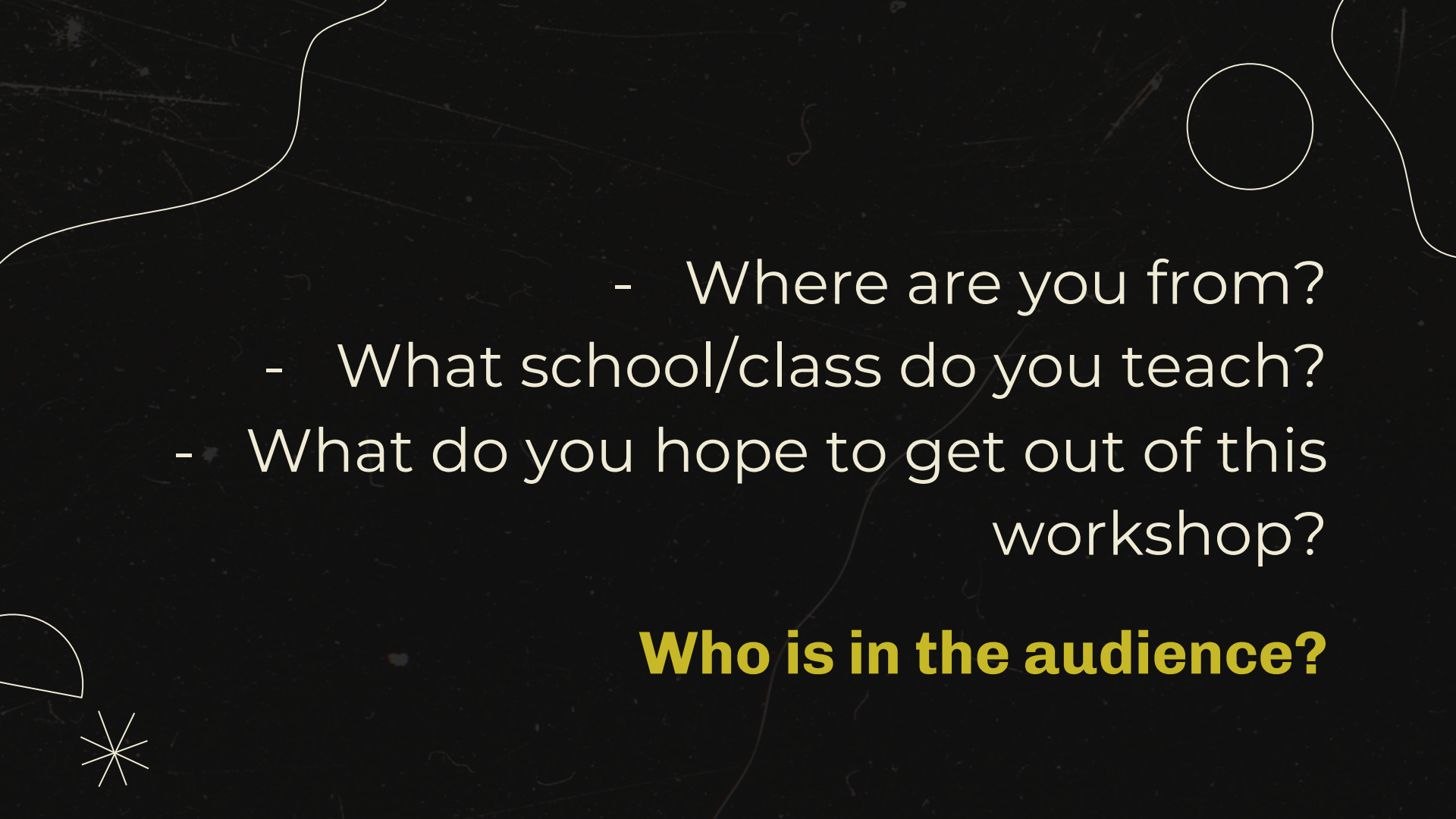
Former high school science teacher

Experienced the challenge with inconsistency with scientific-ASL lexicons

Will discuss some strategies on producing scientific-ASL conversations in your classroom

By leveraging existing scientific-ASL resources with theory about language of science



- 
- Where are you from?
 - What school/class do you teach?
 - What do you hope to get out of this workshop?

Who is in the audience?



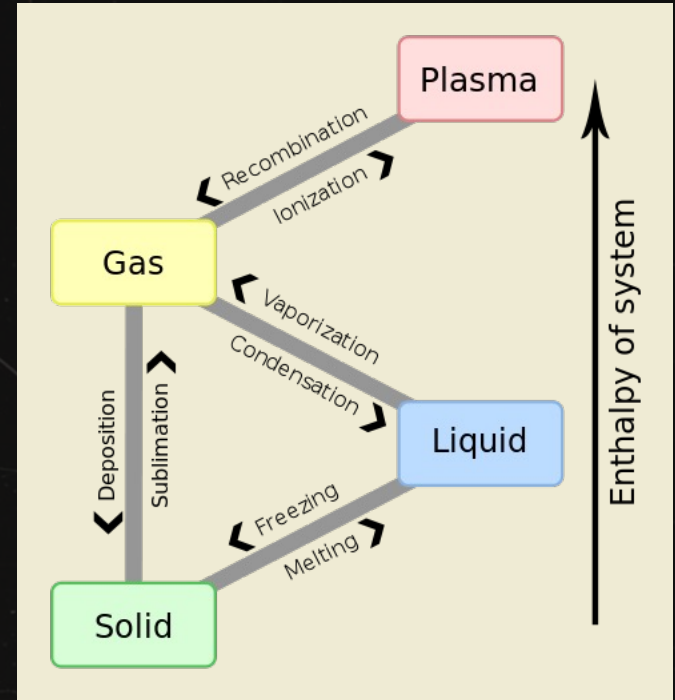
State of Matter

(ASL Clear, 2022)

- Matter
- Mass
- Volume
- Atom
- Solid
- Liquid
- Melt
- Gas
- Evaporation
- Plasma
- Ionization
- Deionization
- Condensation
- Freeze
- Sublimation
- Deposition
- Liquify
- Solidify

What did you notice about how the words listed below were signed?

- Matter
- Mass
- Volume
- Atom
- Solid
- Liquid
- Melt
- Gas
- Evaporation
- Plasma
- Ionization
- Deionization
- Condensation
- Freeze
- Sublimation
- Deposition
- Liquify
- Solidify



The Framework for K-12 Science Education

(National Research Council, 2013)

Next Generation Science Standards



01

Global competition to Global Citizenship

We only have one world
with finite resources –
creating a sustainability
future



02

Scientific literacy & Socioscientific Issues

Understanding how to
apply scientific
knowledge to our daily
discourse and behaviors



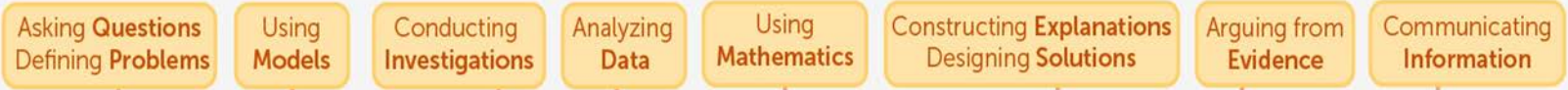
03

Epistemological shift

Change in how students
learn about knowledge
from static to dynamics

3D Learning

Practices



Core Ideas



Crosscutting Concepts

Motion and Stability: Forces and Interaction

Next Generation Science Standards



5th grade

Support an argument that the gravitational force exerted by Earth on object is directed down



Middle School

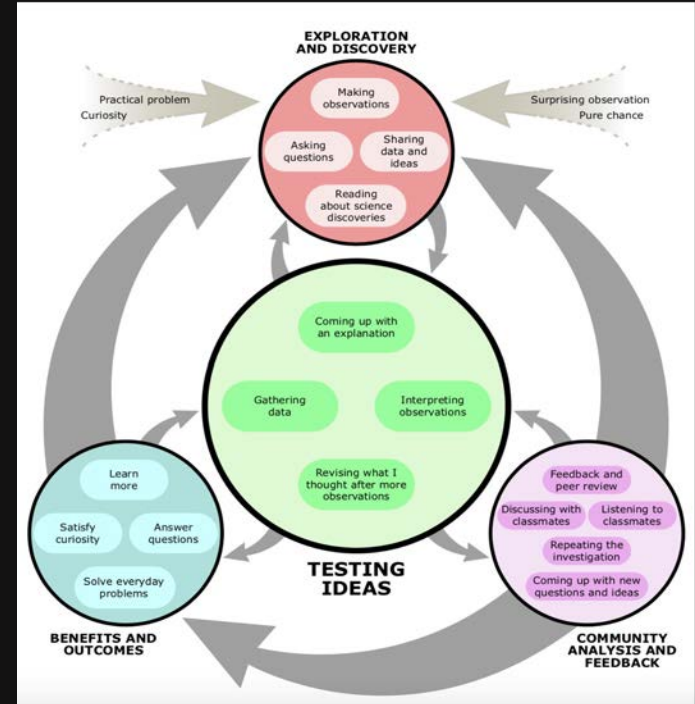
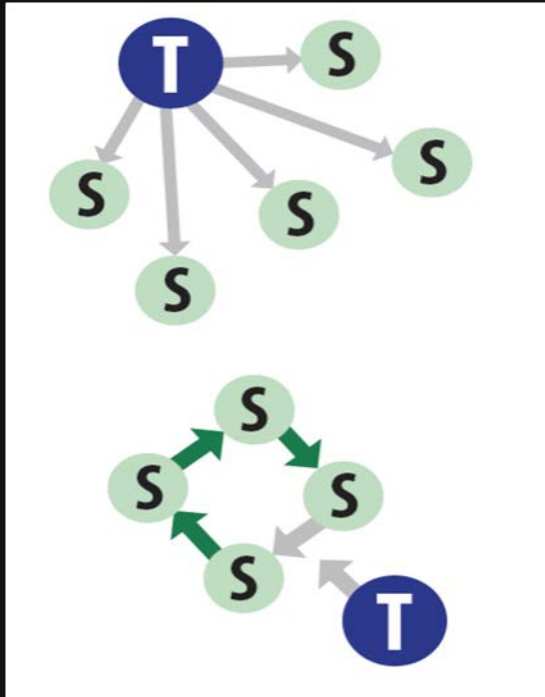
Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depends on the masses of interacting objects



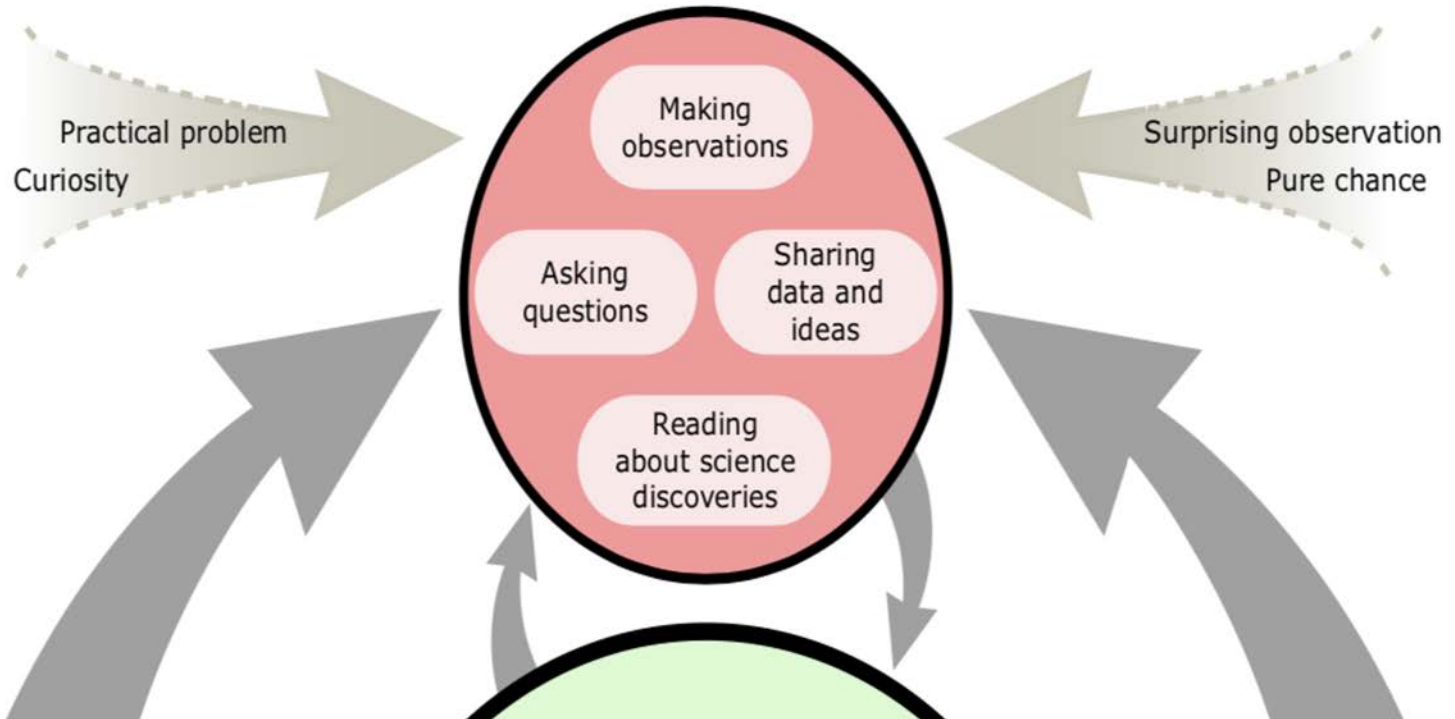
High School

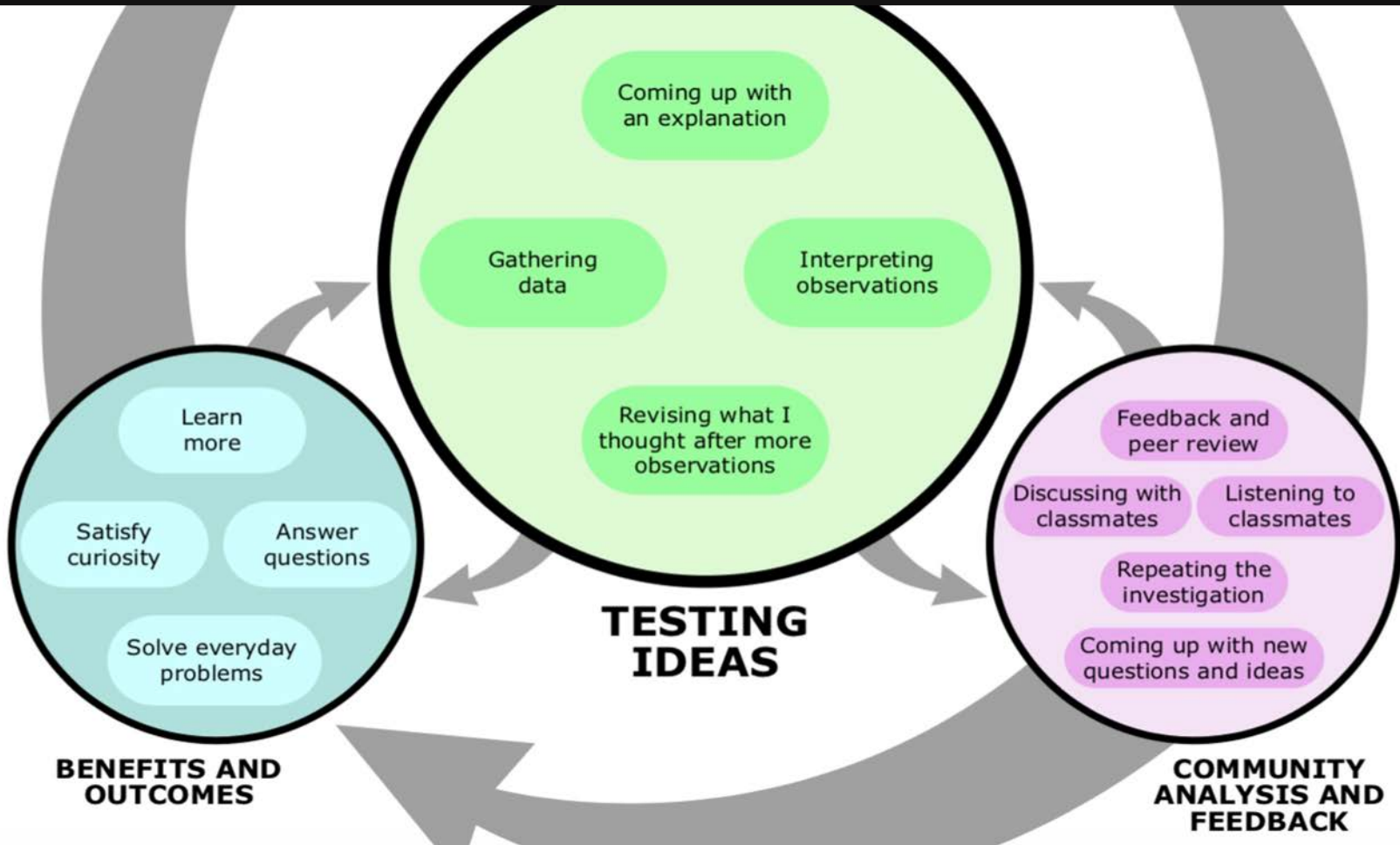
Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects

Redistribute learning responsibility from teacher-centered to student-centered



EXPLORATION AND DISCOVERY





Language of Science



**Distinct lexicon &
grammatical repertoires**

Lexicon = Technical Terms (technicality)
Grammatical = Reasoning about the term
(rationality)



**High rationality and low
technicality in the
language of science**

Scientific communication structured by
theme and rheme pattern



**Metaphorical power via
grammatical drift**

Discourse reflecting cultural language and
content-specific vocabulary of science

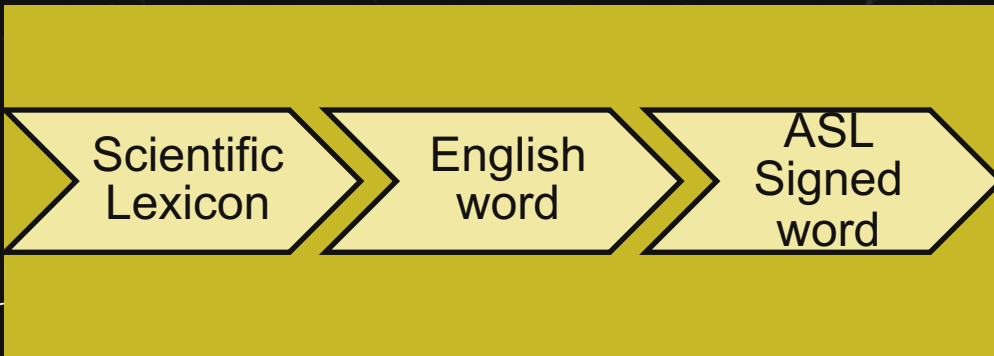
Excerpt of a science reading

Most of the Universe consists of matter and energy. Energy is the capacity to do work. Matter has mass and occupies space. All matter is composed of basic elements that cannot be broken down to substances with different chemical or physical properties. Elements are substances consisting of one type of atom, for example Carbon atoms make up diamond, and also graphite. Pure (24K) gold is composed of only one type of atom, gold atoms. Atoms are the smallest particle into which an element can be divided (Farabee, 2007).

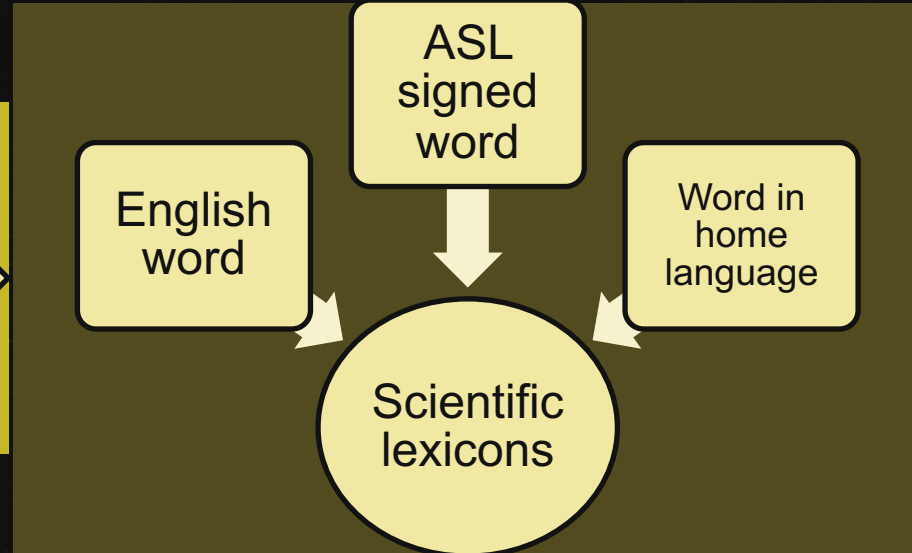


Leveraging grammatical features to work with limited scientific-ASL lexicon

Unpacked scientific term



Packed scientific term



Thematic progression in scientific communication



- Starting point of what we know

- Provide new information or explanation about the theme

Where is the theme? **Rheme?**

Most of the Universe consists of matter and energy. Energy is the capacity to do work. Matter has mass and occupies space. All matter is composed of basic elements that cannot be broken down to substances with different chemical or physical properties. Elements are substances consisting of one type of atom, for example Carbon atoms make up diamond, and also graphite. Pure (24K) gold is composed of only one type of atom, gold atoms. Atoms are the smallest particle into which an element can be divided (Farabee, 2007).



Where is the theme? Rheme?

What exactly are colors when we see them?

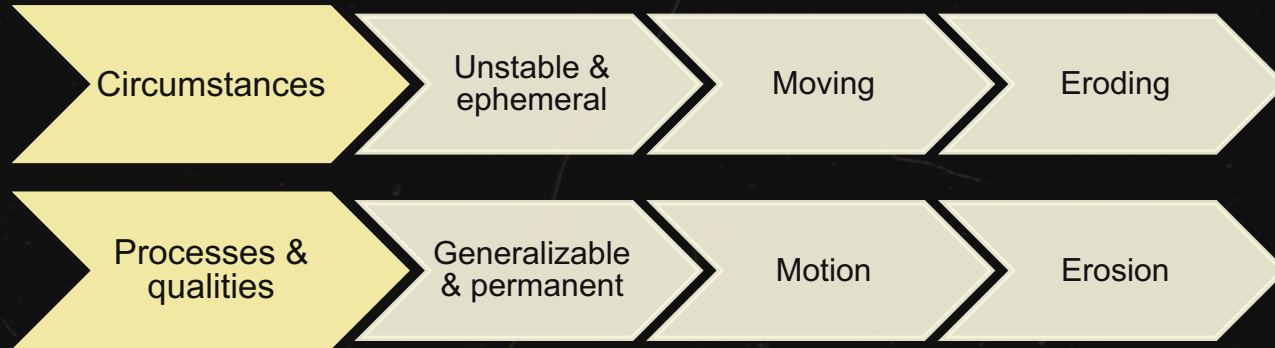


2:51 / 6:44



Metaphorical power via grammatical drift

Normalization of everyday term (Buxton et al., 2018)



Where is the metaphor

“In 2020, we had the largest number of mega-fire across the Western US that we have ever seen. When we have multiyear droughts that leave behind an enormous amount of **dead downed wood**, when an **ignition** does occur, there is an enormous amount of **fuel**. It allows for incredibly **explosive growth**. That spreads the fire quickly across the landscape. We just didn't see these mega-fires 20,30 years ago. And now we're seeing them annually.”

(Video excerpt from Climate change, HHMI Biointeractive video)

Where is the metaphor in ASL?

(Atomic Hands, 2022)

What exactly are colors when we see them?



The visible light you see is a form of energy, like heat and sound.

▶ ⏩ 🔊 1:00 / 6:44

🔍 📄 🛠️ 📺 ⛶

Small group **exercise**



Gather a group of 3 to 4 people to work together on translating a scientific passage to ASL



Choose one of the topics: Energy, Matter, Weather, or Friction



Pick one member from your group to share the scientific-ASL





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Tips to promote **scientific-ASL** conversations in your classroom

- ❖ Encourage students to express and receive their language and communication ability to talk about science
 - Show the scientific-ASL videos as language model
 - Provide multiple representations (Written text, role playing, visual demonstration, etc...)
- ❖ Fostering scientific communication
 - Make communication plan with your students on conversing about science with their peers
- ❖ Recognize communication breakdown and take steps to clarify
 - Develop check-in system
 - Teachable moment on conflict resolution



Thank you for coming and hope you enjoyed this workshop

Feel free to contact me via

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