

CRACKING INTO THE CROSSCUTTING CONCEPTS

The CCCs



CCCs and Speed Dating

- Goal – Introduction to the specific language used to define the CCCs.
- Draw a card – this card will either be a CCC title or definition.
- Mingle to find your match
 - There are multiple copies of each CCC title and definition so you will end up in larger groups.
- When you find your matches, the group should sit down together.
 - There should only be 7 groups!
- **4 minutes max** to speed date!



“Speed Dating” Definitions

| | |
|---------------------------------|---|
| Patterns | The CCC of ____ highlights that structures or events are often consistent and repeated. |
| Cause and effect | The CCC of ____ investigates how things are connected by identifying the reasons behind an occurrence, and what that occurrence results in. |
| Scale, proportion, and quantity | Different measures of size and time affect a system’s structure, performance, and our ability to observe phenomena. |
| Systems and system models | The CCC of ____ helps us understand the world by describing how things connect and interact. We can use simple representations to explore these interactions. |
| Energy and matter | These things are neither created nor destroyed, but may flow into and out of a system and influence its functioning. |
| Structure and function | The way something is built and the parts that it has determine how it works. |
| Stability and change | Over time, a system might stay the same or become different, depending on a variety of factors. |

Speed Dating Discussion

- Were any definitions particularly difficult or easy to match? Why?
- Are any of these definitions surprising or confusing to you?
- Stay with your speed dating “matches” for this next activity!



Station Rotations – Name that CCC!

- Fill in the handout as you visit the 7 stations.
 - You will see 3-5 examples of mostly science content that is related to one CCC. Some stations have examples of non-science content.
 - Identify the CCC that unifies all of the examples at the station.
 - Record matches on the worksheet.
 - Use the notes column to record thoughts or ideas for other things that could fit into this CCC.
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- You can visit the stations in any order.
 - You have **7 minutes**



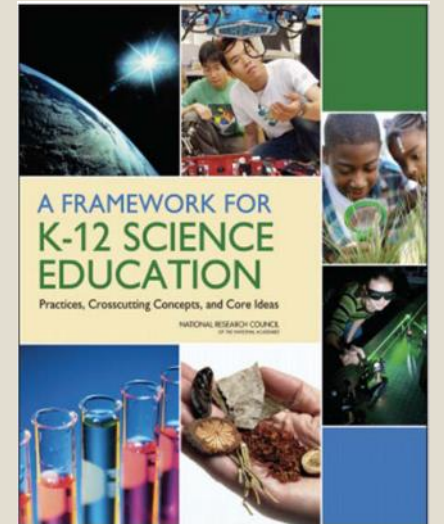
Name that CCC! Discussion

- Discuss the following for each CCC
 - Explain why you thought the examples were representative of that particular CCC.
 - What other content ideas do you have for each CCC?
- ****Important Takeaway:** The CCCs can be used as a framework to classify phenomena.



Why Crosscutting Concepts?

- “These crosscutting concepts were selected for their value across the sciences and in engineering. These concepts help provide students with an organizational framework for connecting knowledge from the various disciplines into a coherent and scientifically based view of the world.”
- Previously “students have been expected to build such knowledge without any explicit instruction.... Explicit reference to the concepts, as well as their emergence in multiple disciplinary contexts, can help students develop a cumulative, coherent, and usable understanding of science & engineering.”
- K-12 Framework, Dimension 2, page 83



Cracking the Concepts Jigsaw



- Divide into 7 teams and briefly skim your assigned concept in the K-12 Framework
 1. Patterns p. 85-87
 2. Cause & Effect p. 87-89
 3. Scale, Proportion, and Quantity p. 89-91
 4. Systems and System Models p. 91-94
 5. Energy and Matter p. 94-96
 6. Structure and Function p. 96-98
 7. Stability and Change p. 98-101

- Close read and annotate your assigned crosscutting concept in the Framework book and refer to the grade band specific Crosscutting Concept Packet provided for your notebook.

One-sentence summary

- Discuss your CCC with your team and create a one-sentence summary to share with the rest of the group. (5 minutes)
- Write your sentence summary on the poster sheet provided and write down the other sentence summaries on your notetaker.
- *The one sentence summary is a simple strategy that allows students to condense information presented in a reading. The strategy encourages students to focus on learning rather than on specific details. This requires students to synthesize information and identify important learning.

Interconnections Between CCCs and DCIs

- "...the CCCs can provide a connective structure that supports students' understanding of sciences as disciplines and that facilitates students' comprehension of the phenomena under study in particular disciplines."
- "...these CCCs should not be taught in isolation from the examples provided in the disciplinary context."
- "... use of a common language for these concepts across disciplines will help students to recognize that the same concept is relevant across different contexts."
- *K-12 Framework, p. 101*
- Discuss one of these claims regarding the CCCs with your shoulder partner. What does this claim mean for your instruction?

Progression of the CCCs Reference Guide p. 20-26



TN Science Standards
Reference
Suggestions for Implementing Three-
dimensional Science Instruction
Tennessee Department of Education | January 2018

Patterns: Observation and explanation

Framework Description: *Observed patterns of forms and events guide organization and classification, and they prompt questions about relationships and the factors that influence them. (NRC, p.84)*

| Early Elementary (K-2) | Upper Elementary (3-5) | Middle Grades (6-8) | High School (9-12) |
|---|--|--|--|
| <ul style="list-style-type: none">Students recognize, classify, and record patterns they observe in nature or man-made objects. | <ul style="list-style-type: none">Students recognize, classify, and record patterns involving rates of change.Students use patterns as evidence in an argument or to make predictions, construct explanations, and engage in arguments. | <ul style="list-style-type: none">Students recognize, classify, and record patterns for macroscopic phenomena based on microscopic structure.Students recognize, classify, and record patterns in data, graphs, and charts.Students infer and identify cause and effect relationships from patterns. | <ul style="list-style-type: none">Students recognize, classify, and record patterns in quantitative data from empirical research and mathematical representations.Students recognize that different patterns for the same system may be present depending on the scale at which the system is analyzed. |

CCC – Card Sort

- Work in groups of 3 to sort the cards according to:
 - The Crosscutting Concept in which learners are engaged in the snapshot AND/OR
 - The Crosscutting Concept the teacher could emphasize as a part of the instruction described in the card sort.



Card Sort Discussion

- Take turns sharing a card your team felt least confident about classifying.
 - Discuss where different teams placed the card.
 - Use the Framework and the TN Science Standards Reference guide to find evidence that would support the placement.
- Use Two or Three Before Me (Keeley, 2016) to discuss the card in focus.
 - Two or three different teams are encouraged to share their rationale for the placement, building off the explanation that came before them (e.g., “I agree with...” “I am not sure that is true. We thought...”). After 2-3 teams share, the teacher can provide additional insight on the best placement of the card.



References

- California Academy of Sciences Activity - CCC Speed Dating and Station Rotation.
<https://www.calacademy.org/educators/ccc-speed-dating-and-station-rotation>
- Introducing The NGSS. ASTE 2018. Workshop Activity. Crosscutting Concept Card Sort by Morgan Presley
- Keeley, P. (2016). *Science formative assessment: 75 practical strategies for linking assessment, instruction, and learning*. Thousand Oaks, CA: Corwin Press.

