Build from familiar to unfamiliar

Develop insight in a familiar domain

- Explanatory metaphors remind us of familiar objects and relationships, then direct us to apply those insights to a new, unfamiliar domain.
  - “This is the basis for a lock: easy in one direction, hard in the reverse direction”
  - “It’s easy to mix two colors to get a third color; given a mixed color, it’s hard to reverse it in order to find the exact original colors”
- Be explicit about which part of the metaphor you’re focusing on, or the audience may fill in their own reason (it’s like a lock because...someone can break it?)
- What counts as “familiar” depends on the audience

Translate the insight back to the unfamiliar domain

- Explicitly map the familiar elements and their insights onto the unfamiliar elements:
  - “A one way function is a lock: easy in one direction, hard in the reverse direction...Finding 3^x mod 17 is easy...finding x given 12 is hard”
  - “A mixture of colors can be shared publicly because it disguises the secret color...the answer to 3^x mod 17 can be shared publicly because it disguises the value of x; many solutions are equally likely.”
- Walk through an example in both domains

Help your audience follow along

Attention is a precondition to understanding

- In order to muster the focus to understand something, the audience needs to know why it’s being presented. Motivate the problem and each individual point before explaining it in detail.
  - “Two people can do an amazing trick.”
  - “How is it possible?”
- What happens is more memorable when we know why it is happening:
  - “Bill calculates 11^5 mod 29” vs. “They make a mixture in order to disguise their private colors.”
- Leave out details you can’t motivate.

Reinforce key points and new terms

- With selective repetition:
  - “Easy in one direction, hard in the reverse direction”
- With visual, vocal, and verbal emphasis:
  - “This is called a one-way function.”
  - “Now the heart of the trick ...”

Signpost your structure

- Good writing uses punctuation; good explanations signpost their structure:
  - Overview: “First let’s explore how this trick is done using colors...”
  - Transition: “...now to do this with numbers...”
  - Outline: “The trick is based on two facts ... one ... and two ...”
  - Summarize: “This is the basis for a lock.”
  - Close parentheses: “…and that is the trick!”
- Use consistent wording – you wouldn’t close ( with]
Crafting metaphors
a template for explanations

Introduction
• Bring the audience to attention, show excitement, curiosity. Tell us why this is worth knowing.

• State the problem

• “First, let's explore this problem using [metaphor].”

• Restate the problem in metaphor's terms and preview the solution or insight: “The solution is based on [property of metaphor].”

Develop insight in the metaphor domain
• Walk through the process in metaphorical terms
  ▸ “The solution works as follows…”
  ▸ Develop key insight and flag it
  ▸ Transition back to the problem, restating the key insight from the metaphor (“And that’s how it’s done.”)

Transform the insight back to the problem domain
• Introduce the real elements (“Now to do this with [real element]…”)
  ▸ explicitly connect real elements to metaphorical elements
  ▸ Restate insight using real elements

• Walk through the real problem
• Add complications, exceptions
• Summarize

cmu.edu/student-org/pcr