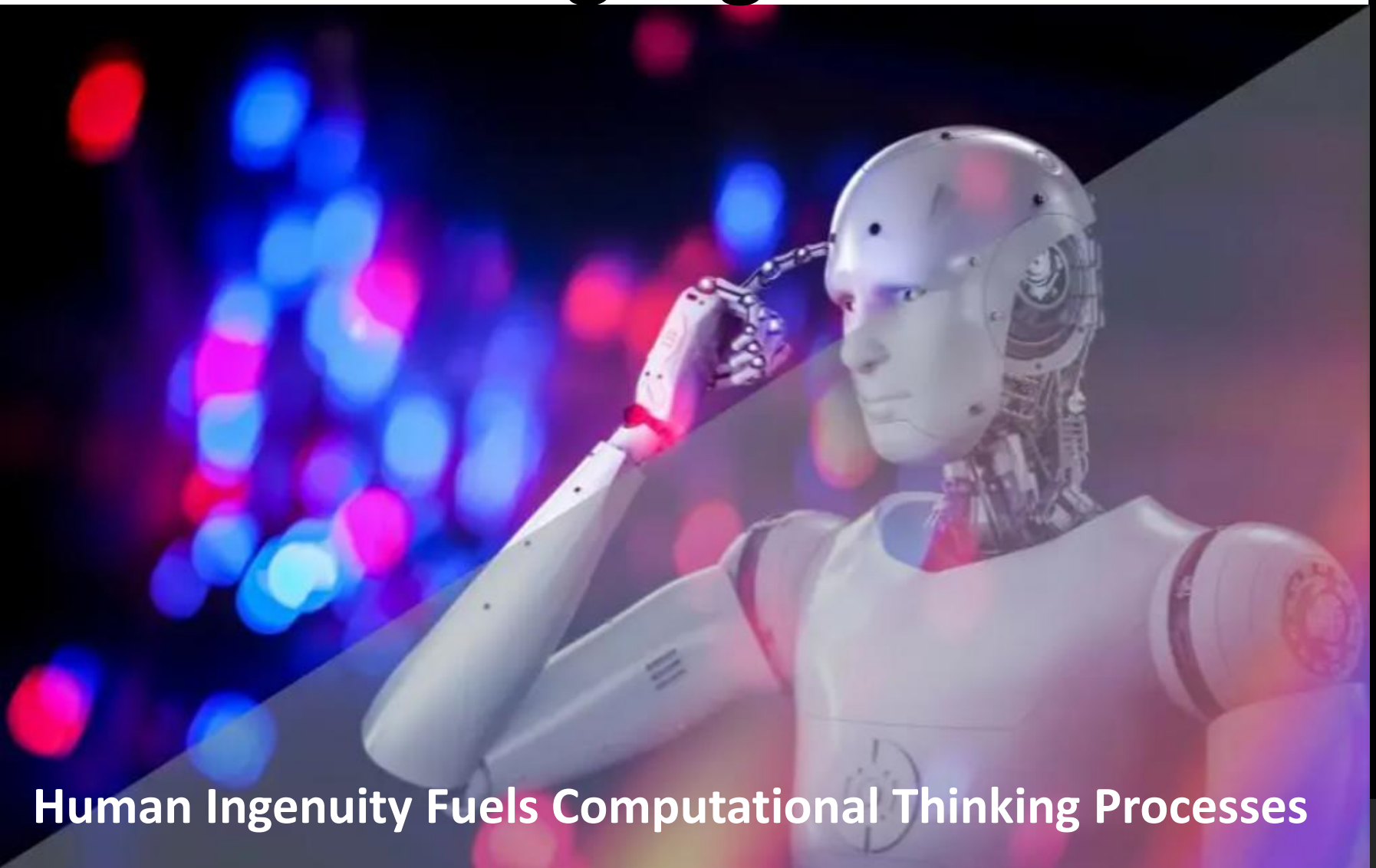
Computational Thinking for Dummies!

How to Incorporate Logical Problem Solving into Health Science Classes (and Other CTE Classes)

Agenda

- Ice Breaker Activity & Spark Activities~ Introduction of Computational Thinking Concepts
- Phases of Analysis: Pre-analytical, Analytical, Post-analytical phases
- Infusion of Computational Thinking into Lessons
- Algorithmic Formatting Models and tools for computational thinking in YOUR classroom!
- Q&A
- Final Tips & Take-a-ways

Human Ingenuity Fuels CTE Training Algorithms



Human Ingenuity Fuels Computational Thinking Processes

Computational Thinking is a step-by-step process to identifying issues and solving problems…
AKA
Common sense

Pre-analytical phase
(Prep & Plan)

Analytical phase (Ponder)

Post-Analytic Phase (Practice)

Preparatory & planning stage that occurs first, very early in the introduction of the topic:

Pre-Analytical Phase

Pre-Analytical Phase

Prime the student for learning

- This phase is where the instructor **opens lesson** among students and outlines the topic to be learned.
- Readings, **vocabulary/ terminology is introduced**.
- Games, activities, discussions, and other hands-on tasks are great **ice breaker** for new information.
- Allows the instructor to **informally evaluate** what students know about the topic
- Allows students **to generate questions, allows the class to bond**, and sets the tone for the lesson.
- The pre-analytical phase must have **basic and fun topic foundation measures** to avoid or limit processing errors later with more complex ideas.

Spark Activity
What the Cup??
Serious Hand Play
Timed Activity

Can you complete the task three times in a row???

https://education-static.apple.com/ecc-get-started-with-code-2-20170421/video/2_Lesson_04_Student_Template.m4v

Computational Thinking Processes

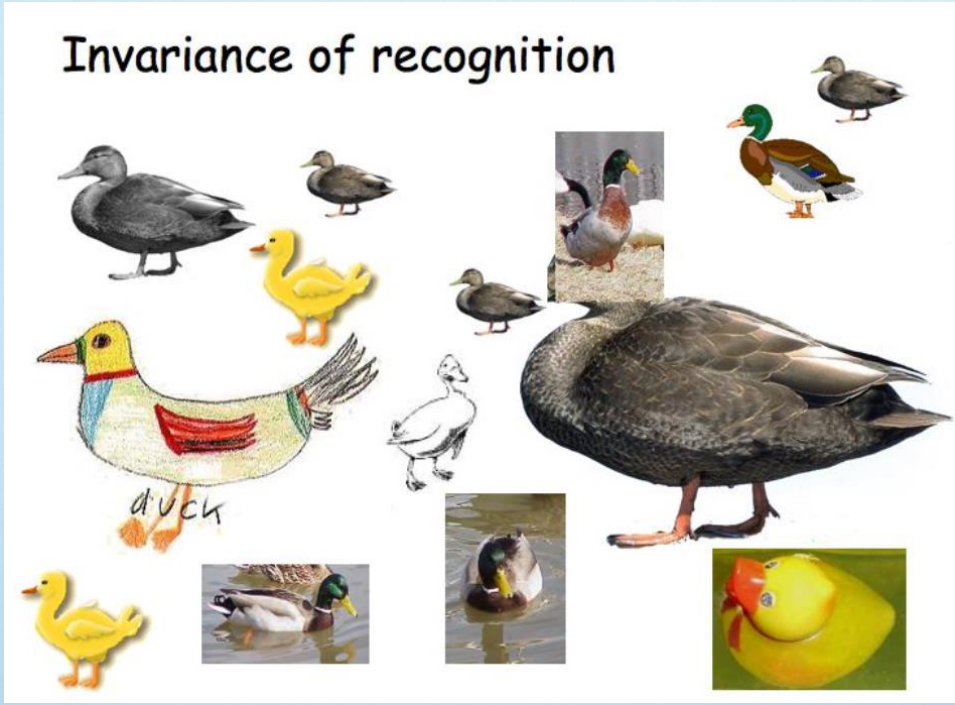
A step-by-step process to achieving a specific goal by identifying patterns and solving problems.

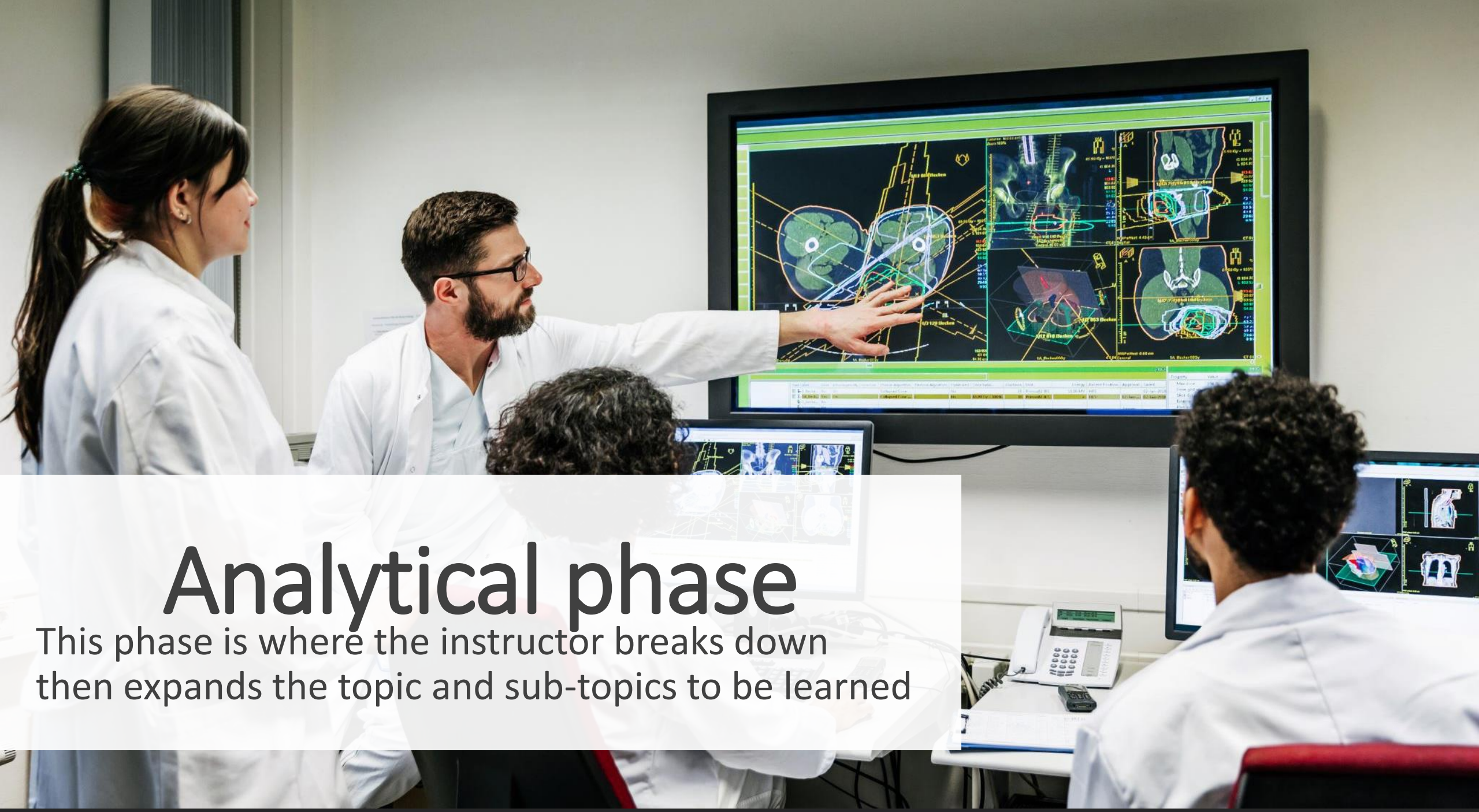
Identification

Naming the task, problem, or goals to be addressed or achieved.

Recognition

The ability to collect and analyze data, realize patterns, similarities, or connections between the different parts of the task and successful completion, preferences are formed





Analytical phase

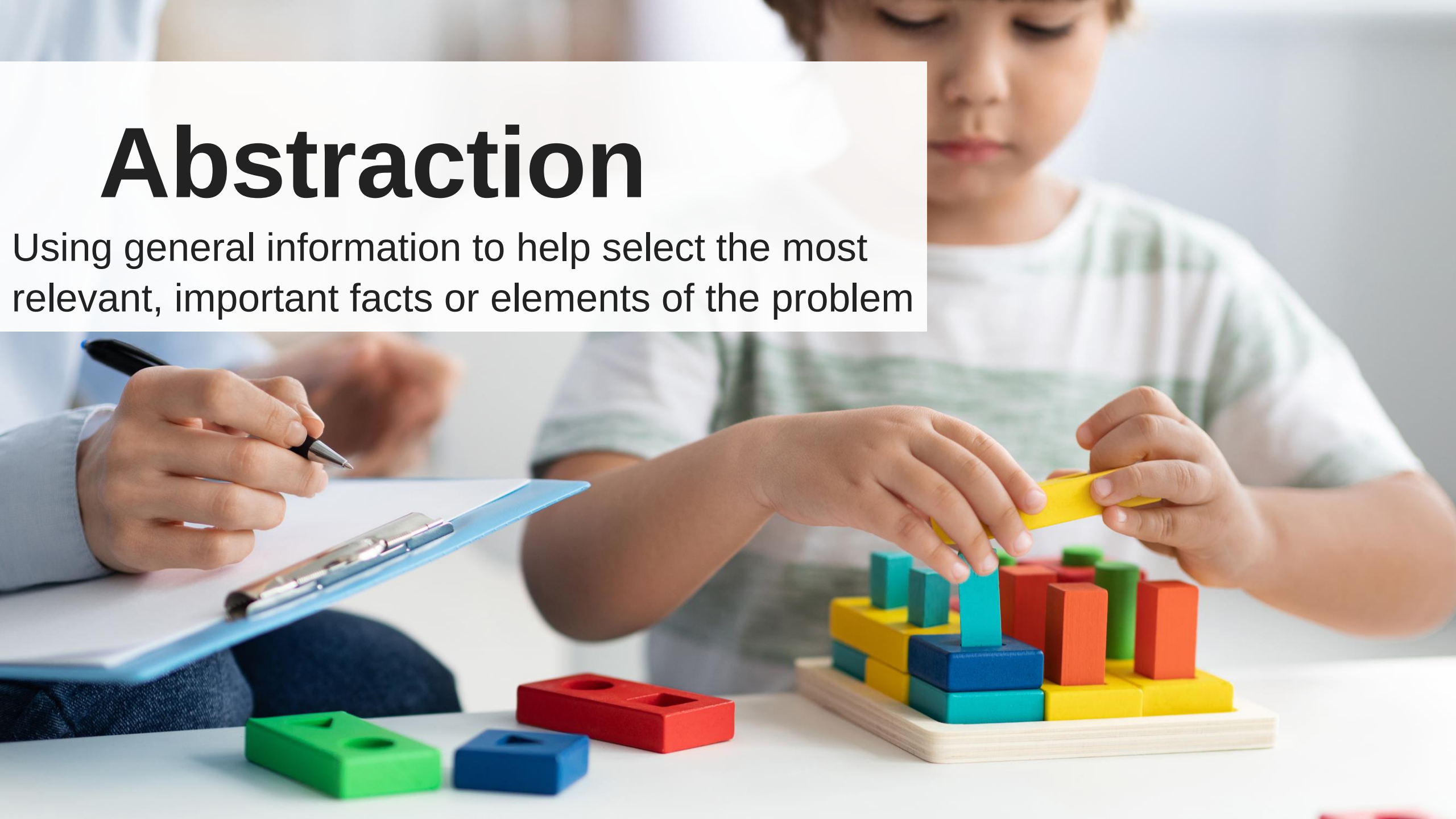
This phase is where the instructor breaks down then expands the topic and sub-topics to be learned

Analytical Phase

- During this time readings**, vocabulary/ terminology is used** for games, activities, discussions, and other hands-on tasks for greater understanding of the new topics.
- This allows the instructor to **formally evaluate what students know about the topic**, allows students to generate **higher-level questions**, allows **student leaders** to emerge, and **advances the misssion** for comprehending the lesson.
- The analytical phase must have **rigorous topic exploration** measures to avoid processing errors later with more complex ideas.

Abstraction

Using general information to help select the most relevant, important facts or elements of the problem



Decomposition

The process of dividing up a topic, task or system into the smaller parts…sub tasks, sub problems, subgoals, acheivement levels

What the Cup??
Serious Hand Play
Timed Group Activity

Can you complete the task three times in a row???

https://education-static.apple.com/ecc-get-started-with-code-2-20170421/video/2_Lesson_04_Student_Template.m4v

Making the Algorithm-

Designing the process of creating a precise step by step plan/ procedure/directions to achieve a particular outcome

- What are noted as challenges?
- Why are they challenges?
- What patterns did we recognize?
- How do we breakdown the process?
- What are important elements of the task?
- How do we craft the instructions?
- Other options for completing the task!

Write Down the Steps

https://education-static.apple.com/ecc-get-started-with-code-2-20170421/video/2_Lesson_04_Student_Template.m4v

Section 1:

- Clap hands X2
- Bang desk X4
- Clap hands X1
- Grab cup with right hand
- Tap/slap cup on the table

Section 2:

- Clap hands x1
- Grab cup with right hand
- Tap the top of the cup with left hand
- Flip cup up with right hand
- Hit cup bottom on table
- Switch cup to left hand
- Tap table right hand
- Tap table with cup in left hand crossing over the right hand

The Computational Thinkers

concepts

Logic
Predicting & analysing

Evaluation
Making judgements

Algorithms
Making steps & rules

Patterns
Spotting & using similarities

Decomposition
Breaking down into parts

Abstraction
Removing unnecessary detail

approaches

Tinkering
Changing things to see what happens

Creating
Designing & making

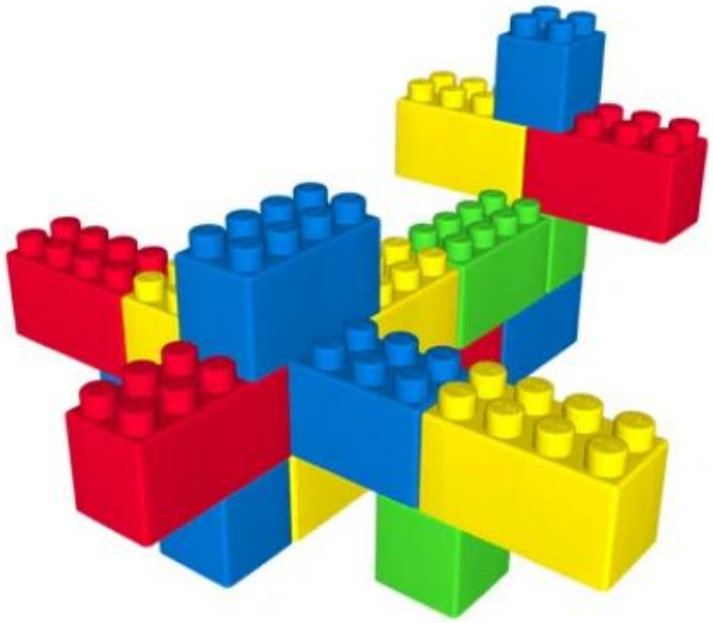
Debugging
Finding & fixing errors

Persevering
Keeping going

Collaborating
Working together

What the Duck??
Serious Toy Play
Timed Group Activity

- **Confidence-Building Strategies With Toys**
- **Meaningful Discussion**

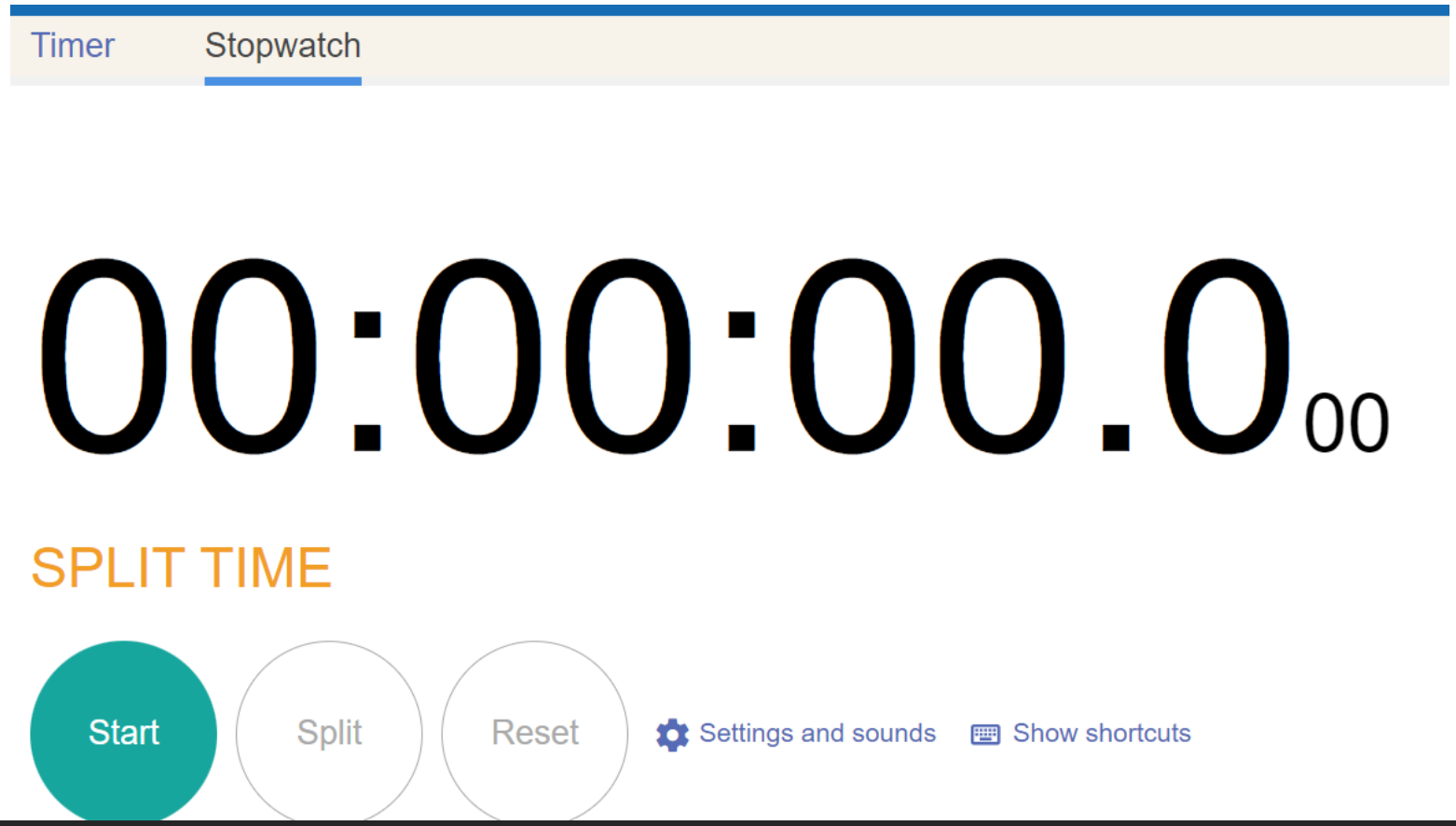


Make each group make a Lego duck

No technology, no collaboration between teams

Complete task, take a picture, make note completion time, then submit to presenter

What the Duck??...SHHH It's a Secret! Serious Duck Play Timed Group Activity



Timer

https://www.timeanddate.com/stopwatch

Timekeeper must record completion times

Ducking Ridiculous

Which one is correct??

Why? Or why not?

Which do you prefer?

Why?

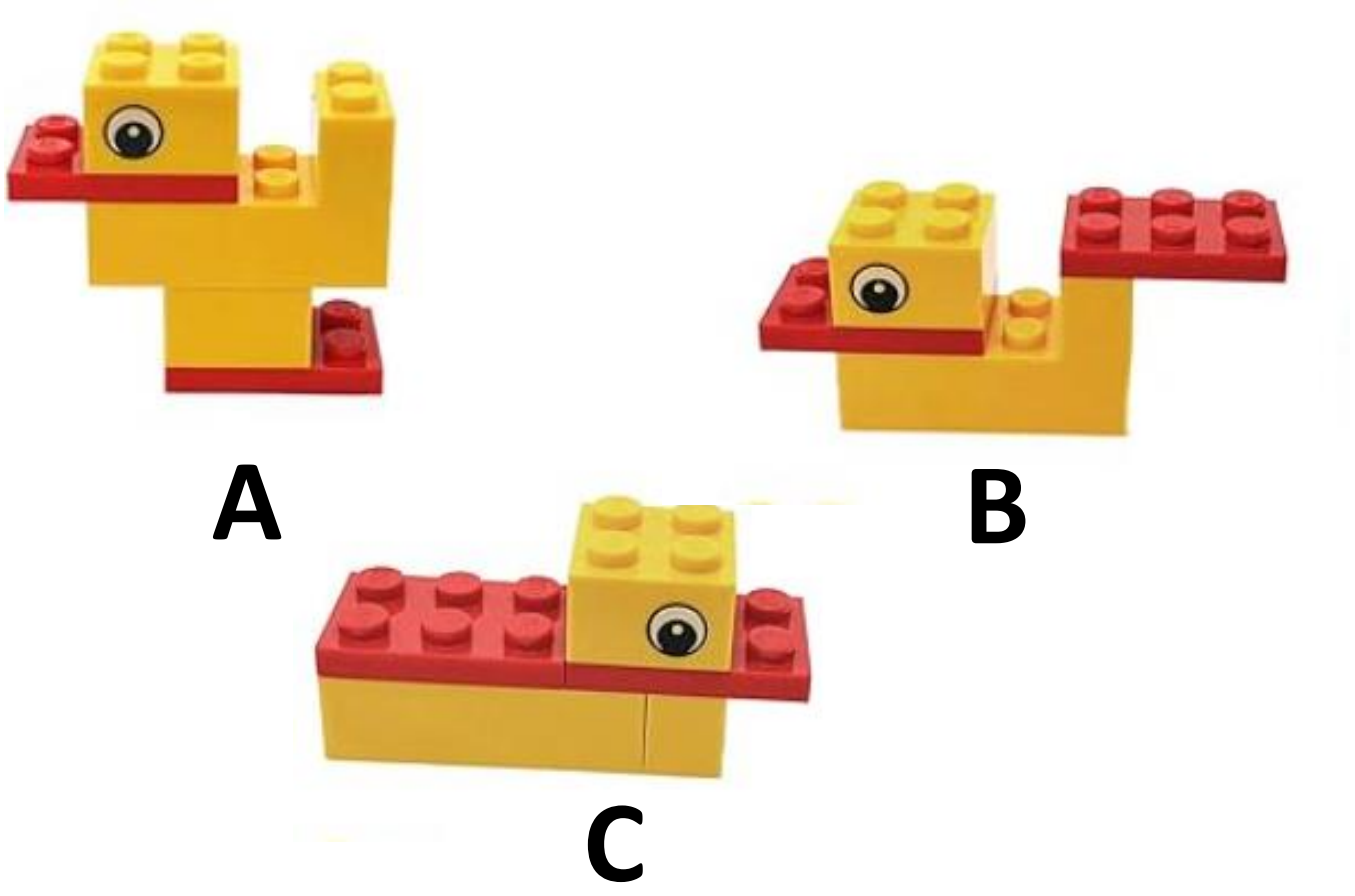
Get the Duck Out of Here!

Remove:

- The lame ducks
- The sitting ducks
- The Quacks

Recreate:

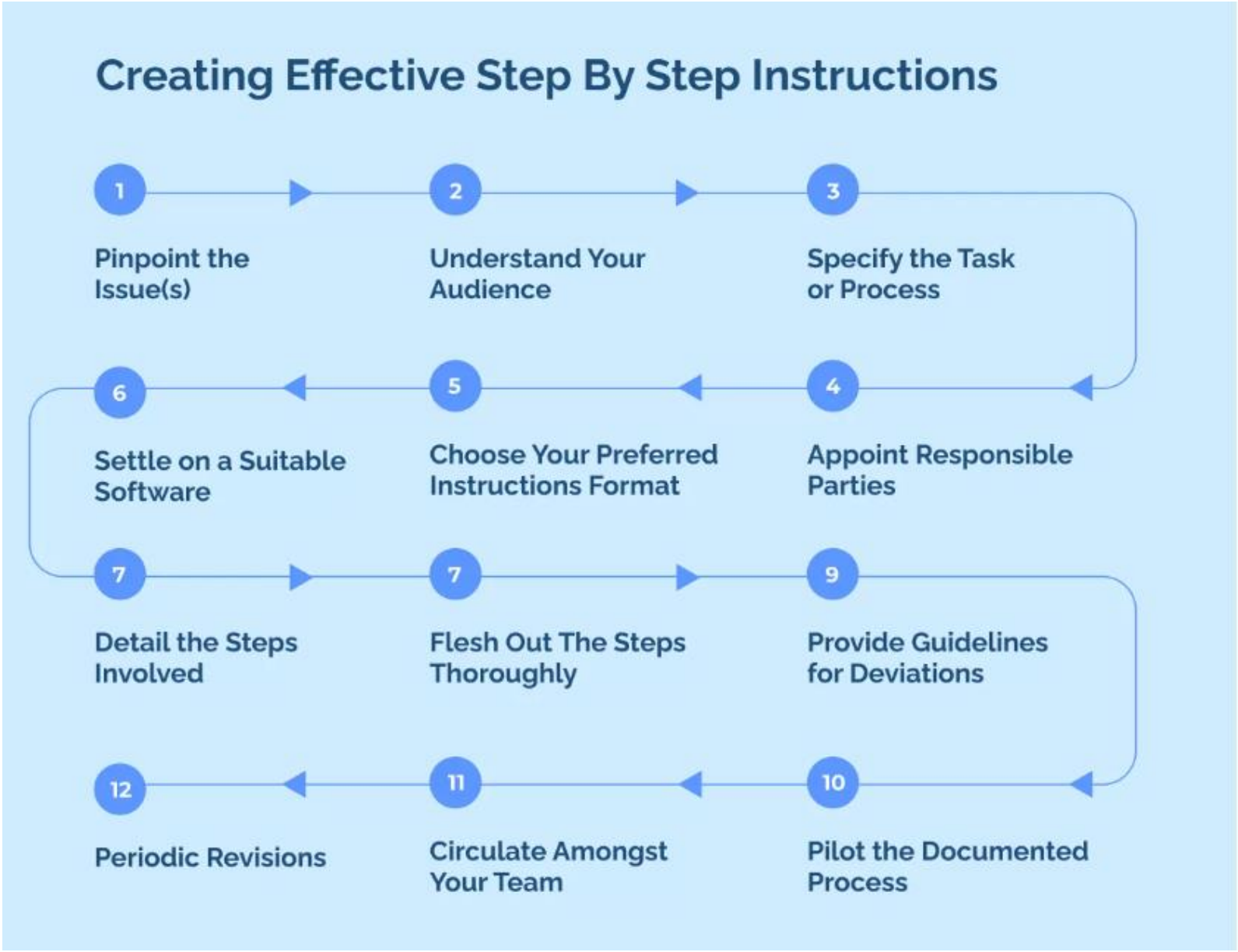
- The prize ducks



Making the Algorithm-

Designing the process of defining a precise step by step plan/ procedure to achieve a particular outcome

- Challenges with the task
- Strengths of your design/instructions
- Details about process
- Other options for completing the task
- Which duck is correct?
- Why?
- Participant bias vs preference



https://change.walkme.com/step-by-step-instructions/

Algorithmic Formatting:

Talk to your duck!

What the Duck are You Talking About?

Post Analytic Phase

The concluding stage that occurs last in the presentation of new topics.

This phase is where the instructor confirms what the students learned.

Students should now **be able to "teach" or demonstrate** what they learned.

Students can make games, activities, lead discussions, and participate in other hands-on tasks as a demonstration of what they retained.

Allowing students to teach/present info to their peers allows the instructor to formally evaluate what students **understand about the topic and address any misconceptions.**

Debugging- talk through the process

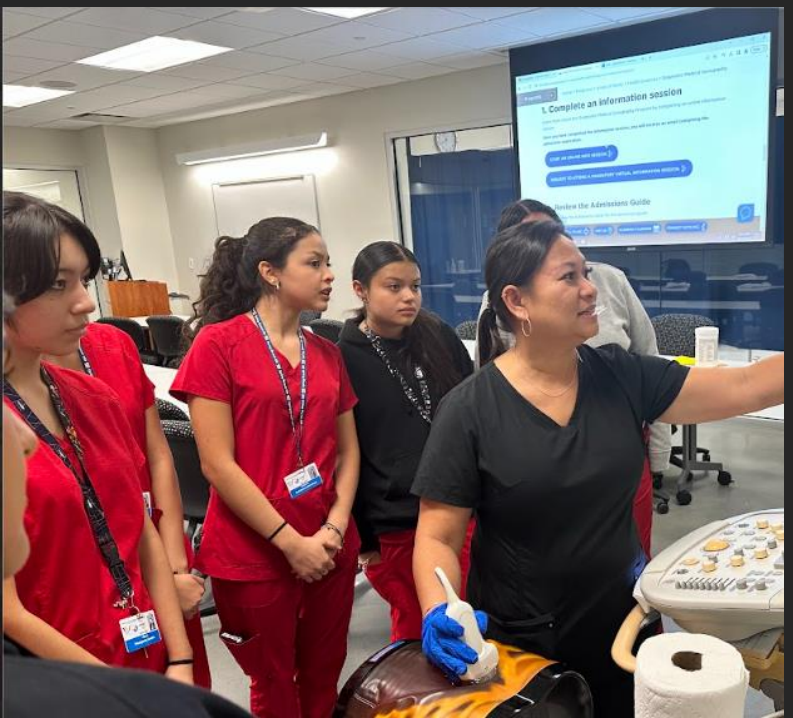
No Algorithm = Outcome Variations

A


I will
EMBRACE
CHALLENGE
10/24/2023
SWBAT: Complete
Child development
By: Evelyn valenzuela

B

C

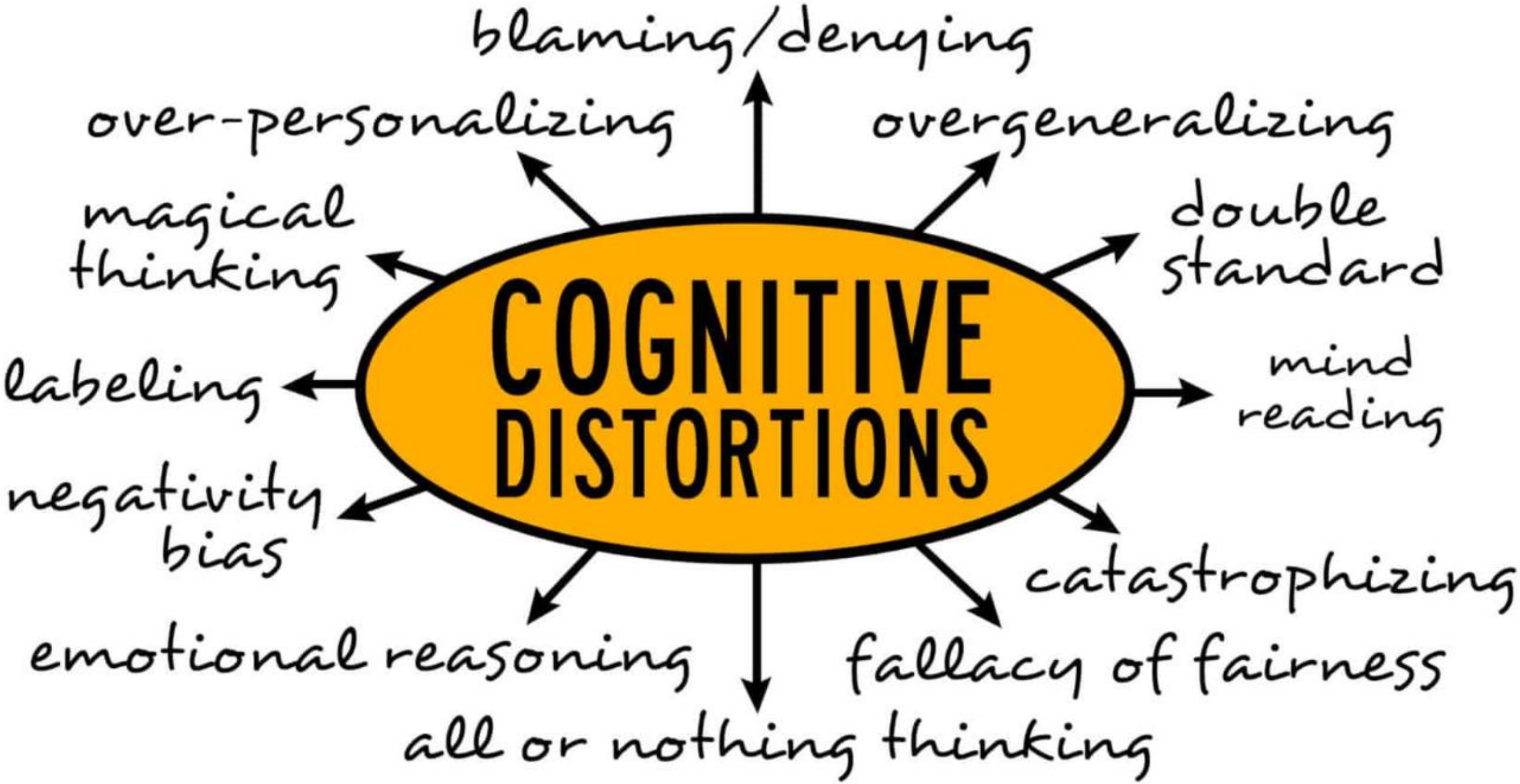


Escape room

Timed clinical skills

Student led demonstrations

Timed group vitals


blaming/denying
over-personalizing
overgeneralizing
magical thinking
double standard
COGNITIVE DISTORTIONS
labeling
mind reading
negativity bias
catastrophizing
emotional reasoning
fallacy of fairness
all or nothing thinking

Duck, Duck, Goose
Bias -vs- Preference

Preference is a greater fondness or liking for one appropriate alternative over others.

Bias is a disproportionate emotional thinking that is in favor of or against a person, place, idea, or thing.

Catastrophizing is also thought of as making mountains out of molehills. When something negative happens, no matter how small, a person who catastrophizes blows the situation out of proportion and will view the situation as terrible or dreadful, even though the reality is that the problem itself is quite small.

Black And White Thinking is also known as all-or-nothing thinking, as people who use this distortion tend to see only one extreme or the other. They may view things as either right or wrong and good or bad without seeing the shades of grey in between.

CTE instructors must make sure preferences do not morph into biases by teaching more than one approach to meeting objectives and solving problems so students can learn situational decision making.

Computational Thinking Processes

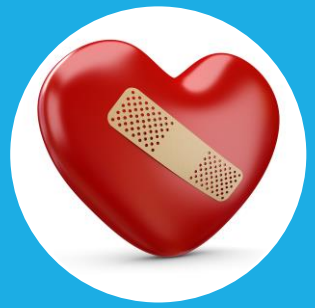
A cognitive skill that:

- **Uses problem-solving techniques** that imitates the process computer programmers go through when writing computer programs.
- CT encourages students to **approach ANY and ALL solutions to problems in a systematic manner.**
- **The approach is in simple terms**, simple enough to be understood and executed by a person without experience or with limited experience.

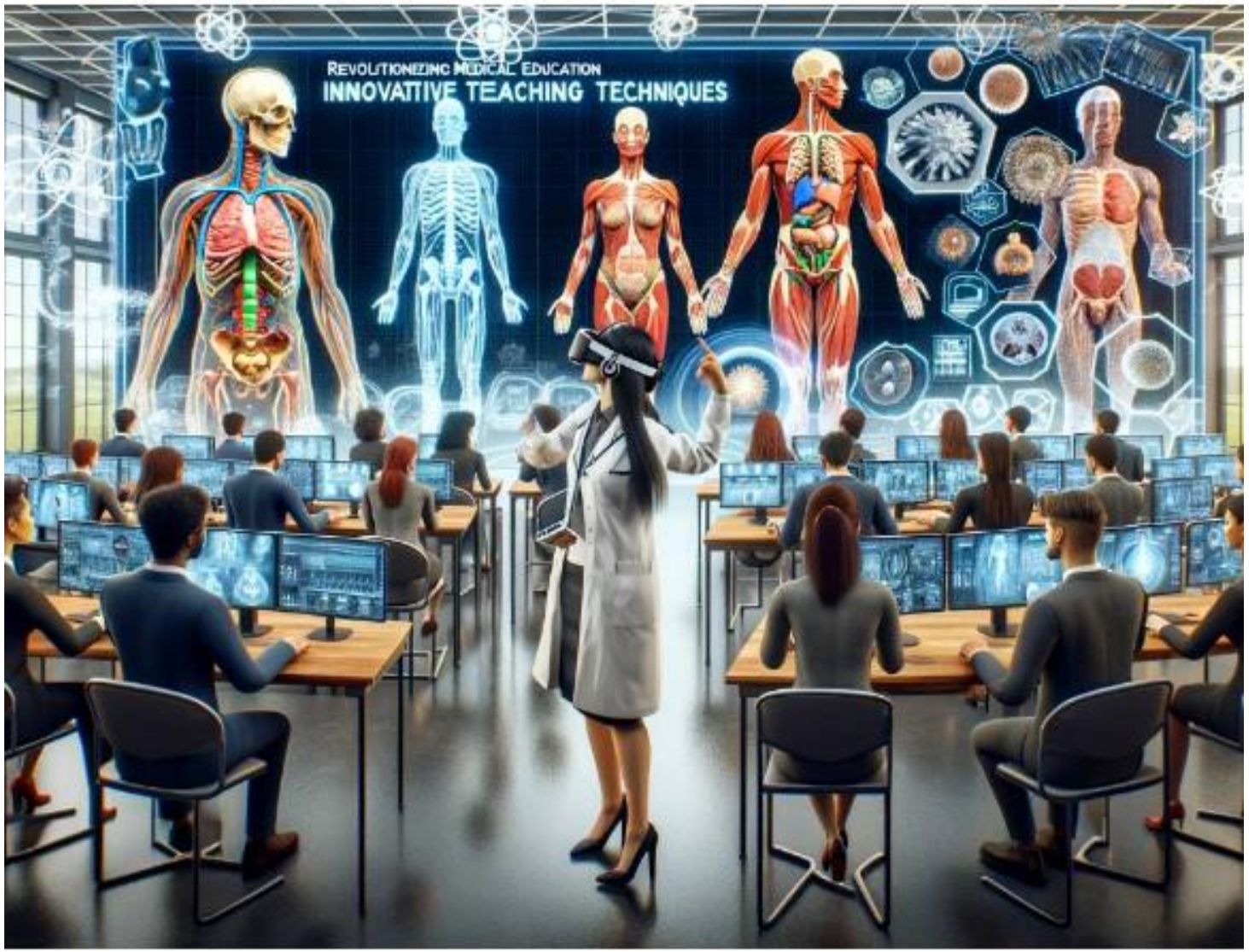
Exploring and analyzing problems thoroughly to fully understand them

Using precise and detailed language to outline both problems and solutions

Applying clear reasoning at every stage of the process



Testing and debugging can ensure that solutions remain fit for purpose or can be adjusted for the current situation.



Computational Thinking Vocabulary Review

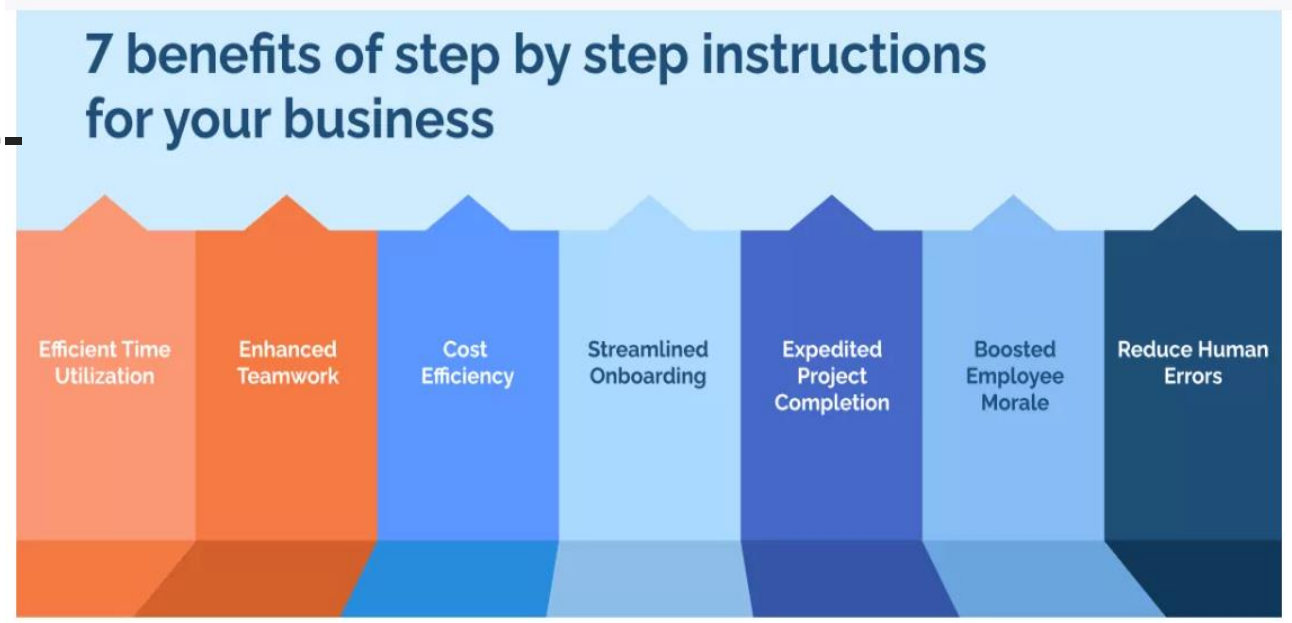
Computational Thinking Vocabulary

Abstraction- is **using general information to help select the most relevant, important, information** or elements of the problem

Algorithm- designing the process of defining a **precise step by step plan/ procedure** to achieve a particular outcome

Analytical phase is the second stage of understanding a topic. This phase is where the **instructor expands the topic and sub-topics to be learned, debugging**

Bias is a disproportionate emotional thinking that is **in favor of or against a person, place, idea, or thing**.



Computational Thinking Vocabulary

Computational Thinking (CT)- is a cognitive skill that uses **problem-solving techniques** that imitates the process computer programmers go through when writing computer programs (common sense)

Decomposition- the process **of breaking down a topic, task or system into the smaller parts**…sub tasks, sub problems, subgoals

Identification- **Naming the task, problem,** or goals to be addressed.

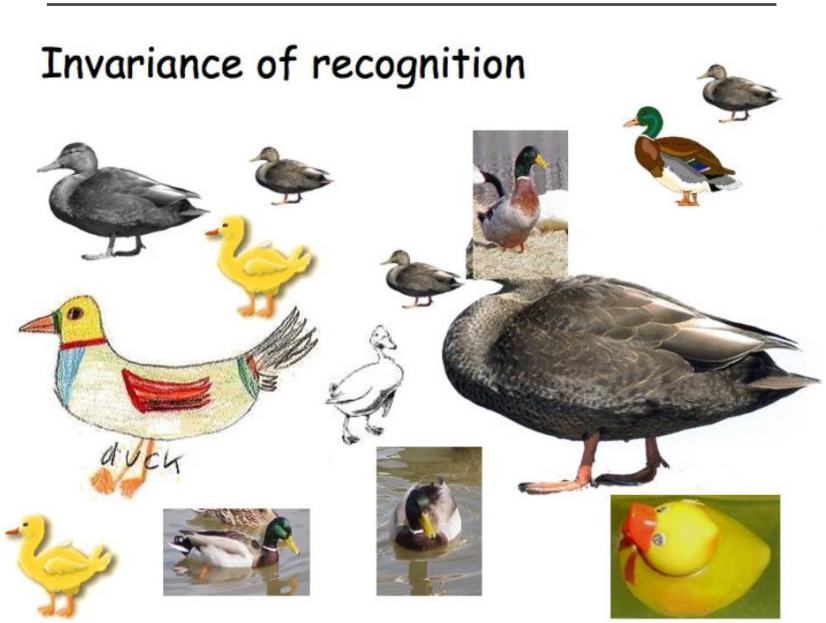
Preference is a **greater fondness or liking** for one appropriate alternative over others.

Computational Thinking Vocabulary

Post-analytical phase is the concluding stage that occurs last in the presentation of new topics. This phase is where the instructor **confirms what the students actually learned & ID's new problems.**

Pre-analytical phase is the preparatory stage that occurs first. This phase is where **the instructor opens and outlines the topic to be learned**.

Recognition- the ability to **collect and analyze data, realize patterns,** similarities, or connections between the different parts of the task and successful completion, preferences form



Final Tips & Takeaways
We're Not Ducking Around!

Pre-Analytical (PREP/ PLAN)

- Fun low stakes activities that spark thinking
- Sets the foundation

Analytical (PONDER)

- ID's solution options
- Misconceptions addressed
- **Abstraction, decomposition, recognition, identification**

Post- Analytical (PRACTICE)

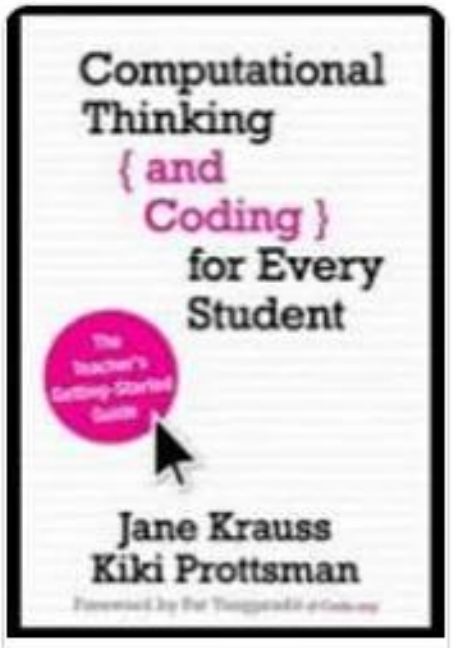
- Students have acquired some or all of topics covered
- Debugs solutions
- Effective loops
- Teach others

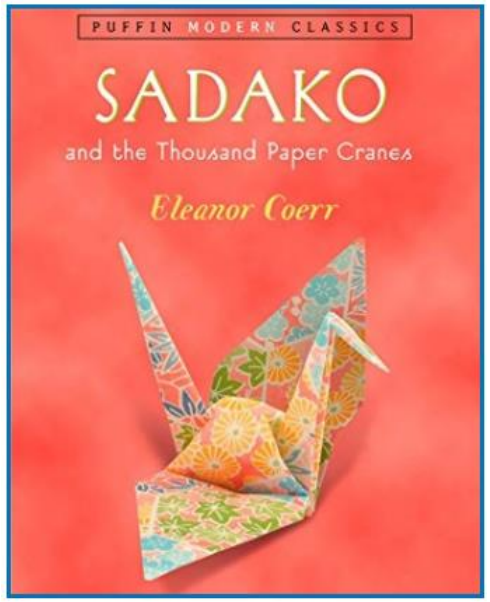
Cognitive Thinking Process

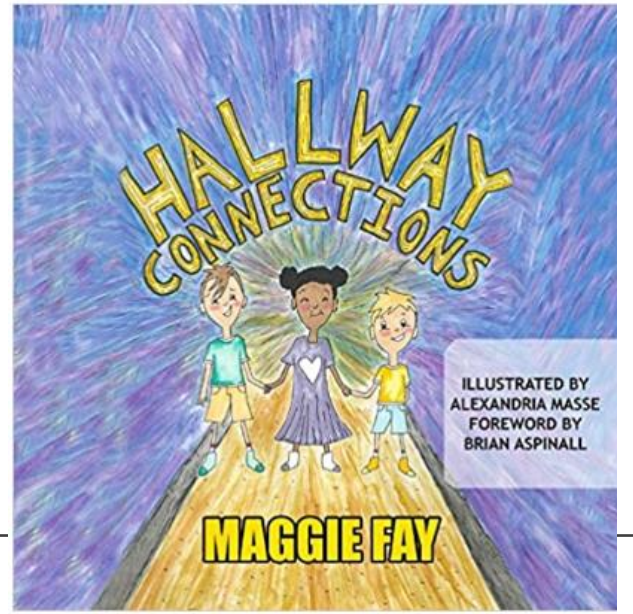
- Step by step process to solving problems & meeting objectives

Q&A

Reading List







1. Computational Thinking {and Coding} for Every Student, J. Krauss and K. Prottsman
2. Sadako, E. Coerr
3. Hallway Connections, M. Fay

Websites to Check Out:

CS UnpluggedLinks
https://classic.csunplugged.org/

Code.org
https://code.org/

Hello Ruby
https://www.helloruby.com/

Teaching London Computing
https://teachinglondoncomputing.org/

https://iste.org/standards/computational-thinking-competencies

University of York:

https://online.york.ac.uk/what-is-computational-thinking/

Boom

https://www.boommindset.com/blog/revolutionizing-medical-education-innovative-teaching-techniques

Websites to Check Out:

What Are Cognitive Distortions and What to Do About Them?
https://youthtimemag.com/what-are-cognitive-distortions-and-what-to-do-about-them/

Cognitive Bias: How We Are Wired To Misjudge
https://www.simplypsychology.org/cognitive-bias.html

Build a Duck
http://legoengineering.com/build-a-duck/

Blood flow Songs
https://www.youtube.com/watch?v=p-wilmN80XE

https://www.youtube.com/watch?v=AbmWLXpL0Aw

Thank you!

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