HUMAN FACTORS & ERGONOMICS

STUDENT LESSON PLANS

University of Rhode Island

COGNITIVE PROCESSING

University of Rhode Island

COGNITIVE PROCCESSING

PURPOSE

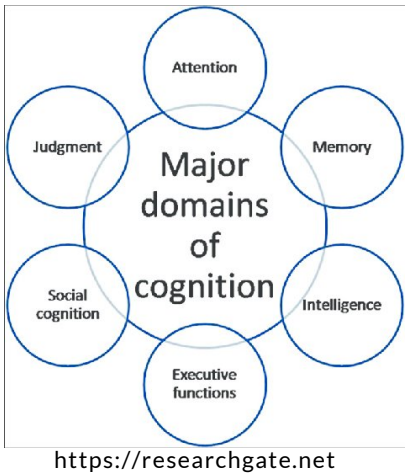
To understand how to quantify and establish values for human cognitive processing. This interactive activity helps students understand how cognitive processing impacts how a person outputs productivity, decisions, and performance.

BACKGROUND INFORMATION

Cognitive processing is an important piece to the puzzle in understanding how humans mentally process information and then react upon receiving it. This branch of ergonomics influences how people interact with objects, their environment, and even other people.

https://sites.google.com/site/barrykort/home/cognition-affect-and-learning

The topic of cognitive processing can be broken down into many cognitive abilities, provided in the attached list (Reference A). These abilities are the basis of human function when it comes to the brain. In understanding the various defined capabilities we have as humans, the students will reach a deeper understanding of the important role that cognition plays in simple, daily activities.



https://researchgate.net

APPLICATION TO HF&E

Imagine you are a famous musician and your manager just told you that you need to learn 10 new songs in the next 2 days! Is it even possible to cognitively process that level of information in time? How will this level of stress effect a person's mental health? Understanding the abilities and limits of the human brain can help students remain aware of these boundaries, which have a wide range of applications whether you are playing an instrument or talking with a friend.

LESSON PLAN
GRADES K - 3

University of Rhode Island

COGNITIVE PROCCESSING
TEACHER MATERIALS

YOUTUBE LINK

"Use Your Brain!"
https://www.youtube.com/watch?v=b79xio8qgiY

KEY TAKEAWAYS

- The brain is the main part of the body's nervous system, which carries messages back and forth to different parts of the body.
- The brain acts as the "headquarters", it receives messages from the nervous system and decides what to do with the messages.
- The brain is what gives us senses: seeing, hearing, touching, smelling, and tasting.

REFLECTION

1. After watching the "Use Your Brain!" video, how big is your brain?
2. How much do you think Lang Lang has to practice for his brain to memorize the song?
3. What we see and what we remember aren't always the same. After completing the activity, why do you think the end movement wasn't always the same as what the first movement was?
4. Why was it harder when more movements were added to the activity?

COGNITIVE PROCCESSING
TEACHER MATERIALS

LENGTH OF COMPLETION

45 minutes

MATERIALS

YouTube video - Rachmaninoff's Piano Concerto No. 2 *(free)*
https://www.youtube.com/watch?v=S29wlq6J0iY
From 17:00 to 20:00
From 27:00 to 29:00
From 34:00 to 35:00

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11. Have fun with it! If the class does well with one, add more movements or more complex movements. Provide the students with the opportunity to start the chain with their own movements.
12. Reflect! Answer the reflection questions provided with this activity.

COGNITIVE PROCCESSING
TEACHER MATERIALS - REFERENCE A

COGNITIVE ABILITIES: MEASURABLE FACTORS

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Associative Memory
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Expressional Fluency
Definition: The ability to think rapidly of appropriate wording for ideas.

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STUDENT HANDOUT

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REFLECTION

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LESSON PLAN
GRADES 4 - 6

University of Rhode Island

COGNITIVE PROCCESSING
TEACHER MATERIALS

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COGNITIVE PROCCESSING
TEACHER MATERIALS

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COGNITIVE PROCCESSING
STUDENT HANDOUT

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LESSON PLAN
GRADES 7 - 9

University of Rhode Island

COGNITIVE PROCCESSING
TEACHER MATERIALS

YOUTUBE LINK

"Cognition - How Your Mind Can Amaze and Betray You: Crash Course Psychology #15"
https://www.youtube.com/watch?v=R-sVnmmw6WY

KEY TAKEAWAYS

- Cognition involves knowing, remembering, understanding, communicating, and learning.
- Humans form concepts to make sense of the world. Concepts are mental groupings of similar objects, people, ideas, or events.
- We use cognition to solve problems through strategies such as: trial and error, algorithms, and heuristics.

REFLECTION

1. After watching the Crash Course video, name two examples of instances in which you use cognitive abilities everyday and how?
2. After watching Lang Lang play the piano, use Reference A to identify the cognitive abilities he is using to play the song.
3. After completing the activity, what role do you think cognition plays in the translations that occur between the beginning and end result movements?
4. Adding more movements and more complex movements proved to be a challenge. What areas of cognition were challenged in doing this and why?

COGNITIVE PROCCESSING
TEACHER MATERIALS

LENGTH OF COMPLETION

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COGNITIVE PROCCESSING
TEACHER MATERIALS - REFERENCE A

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LESSON PLAN
GRADES 10 - 12

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"Cognition - How Your Mind Can Amaze and Betray You: Crash Course Psychology #15"
https://www.youtube.com/watch?v=R-sVnmmw6WY

KEY TAKEAWAYS

- Cognition involves knowing, remembering, understanding, communicating, and learning.
- Humans form concepts to make sense of the world. Concepts are mental groupings of similar objects, people, ideas, or events.
- We use cognition to solve problems through strategies such as: trial and error, algorithms, and heuristics.

REFLECTION

1. After watching the Crash Course video, in what ways does cognition play a role in our everyday activities? Provide examples.
2. Identify the cognitive abilities from Reference A that Lang Lang uses while playing the piano. Explain how the identified abilities relate to the concepts from the Crash Course video.
3. After completing the activity, what role do you think cognition plays in the translations that occur between the beginning and end result movements?
4. Understanding cognition is an important aspect of ergonomics. Knowing the definition of ergonomics, why do you think it is so important? Provide examples.

COGNITIVE PROCCESSING
TEACHER MATERIALS

LENGTH OF COMPLETION

45 minutes

MATERIALS

YouTube video - Rachmaninoff's Piano Concerto No. 2 *(free)*
https://www.youtube.com/watch?v=S29wlq6J0iY
From 17:00 to 20:00
From 27:00 to 29:00
From 34:00 to 35:00

PROCEDURE

1. Show students the video from the previous page of the introduction to cognitive processing.
2. Show students the video using the link in the Bill of Materials following the timestamps provided.
3. Have a discussion with the students about cognitive processing. You can use the questions below as a guide:
    a. What are your thoughts on the video of the pianist?
    b. Look how quickly the pianist moved his hands to different keys. Think about how fast his brain had to send messages to his body to play the song.
    c. One area of cognition is memory. How long do you think it took the pianist to memorize the song to play it that fast?
4. Activity! Let's test our *memory cognition*. All students stand up in a line, all facing in the same direction.
5. The teacher will stand at the back of the line, facing the backs of the students.
6. The first student will turn around towards the teacher, and the teacher will do one movement.
7. The first student will then turn around, poke the shoulder of the second student, and the second student will turn around towards them.
8. The first student has to mirror the same exact movement the teacher just did.
9. This will continue on down the line, until it reaches the very last student.
10. The last student will walk to the front of the classroom and show the entire class the movement that they saw, and the teacher will show the class the movement they started with.
11. Have fun with it! If the class does well with one, add more movements or more complex movements. Provide the students with the opportunity to start the chain with their own movements.
12. Reflect! Answer the reflection questions provided with this activity.

COGNITIVE PROCCESSING
TEACHER MATERIALS - REFERENCE A

COGNITIVE ABILITIES: MEASURABLE FACTORS

Associational Fluency
Definition: The ability to produce words from a restricted area of meaning.

Associative Memory
Definition: The ability to recall one part of a previously learned but otherwise unrelated pair of items when the other part of the parts is presented.

Expressional Fluency
Definition: The ability to think rapidly of appropriate wording for ideas.

Figural Flexibility
Definition: The ability to change set in order to generate new and different solutions to figural problems.

Figural Fluency
Definition: The ability to draw quickly a number of examples, elaborations, or restructuring based on a given visual or descriptive stimulus.

Flexibility of Closure
Definition: The ability to hold a given visual percept or configuration in mind so as to dissemble it from other well-defined perceptual material.
Context: When you see an image are you able to break it down into what it's supposed to be.

Flexibility of Use
Definition: The mental set necessary to think of different uses for objects.

General Reasoning
Definition: The ability to select and organize relevant information for the solution of a problem.

Ideational Fluency
Definition: The facility to write a number of ideas about a given topic or exemplars of a given class of objects.

Induction
Definition: Identifies the kinds of reasoning abilities involved in forming and trying out hypotheses that will fit a set of data.
Context: It's impossible to have a complete inductive procedure. Philosophical thought.

Logical Reasoning
Definition: The ability to reason from premise to conclusion, or to evaluate the correctness of a conclusion.
Context: Deductive reasoning, able to break it down to something more tangible.

Memory Span
Definition: The ability to recall a number of distinct elements for immediate reproduction.

Number Facility
Definition: The ability to perform basic arithmetic operations with speed and accuracy; this is not a major component in mathematical reasoning or higher mathematical skills.

Perceptual Speed
Definition: Speed in comparing figures or symbols, scanning to find figures or symbols, or carrying out other very simple tasks involving visual perception.

Spatial Orientation
Definition: The ability to perceive spatial patterns or to maintain orientation with respect to objects in space.

Spatial Scanning
Definition: Speed in exploring visually a wide or complicated spatial field.

Speed of Closure
Definition: The ability to unify an apparently disparate perceptual field into a single concept.

Verbal Closure
Definition: The ability to solve problems requiring the identification of visually presented words when some of the letters are missing, scrambled or embedded among letters.
Context: The way to manipulate words and letters.

Verbal Comprehension
Definition: The ability to understand the English language.

Visual Memory
Definition: The ability to remember the configuration, location, and orientation of figural material.

Visualization
Definition: The ability to manipulate or transform the image of spatial patterns into other arrangements.

Word Fluency
Definition: The facility to produce words that fit one or more structural, phonetic or orthographic restrictions that are not relevant to the meaning of the words.

COGNITIVE PROCCESSING
STUDENT HANDOUT

LENGTH OF COMPLETION

45 minutes

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STUDENT HANDOUT

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