



Developing Fast Fish Learners: A New Way to Think about the Teaching of Thinking and Learning

Project Zero Classroom
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HARVARD
GRADUATE SCHOOL OF EDUCATION



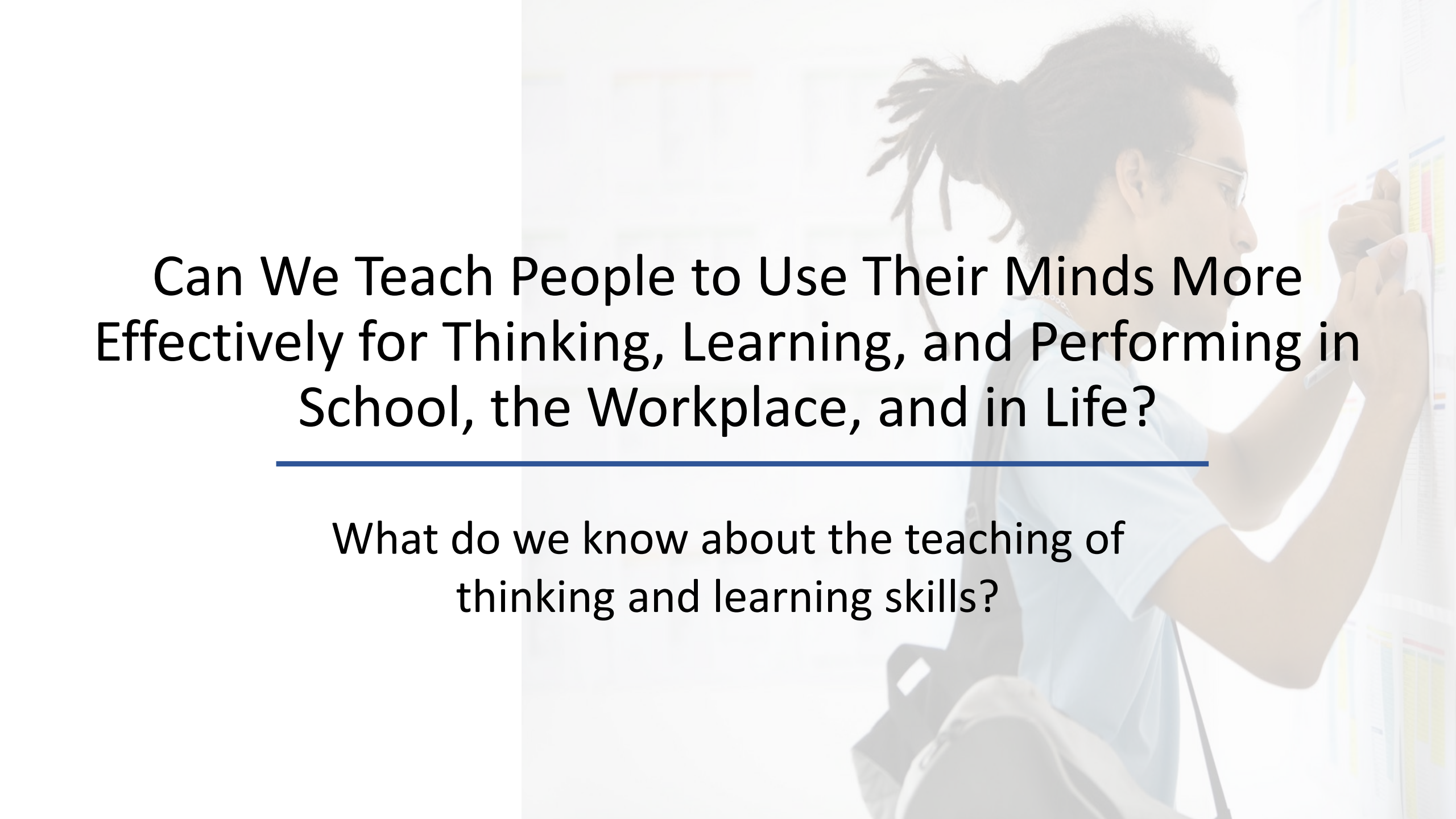
NEXT LEVEL
LAB

Session Overview

- Introductions/ Surfacing Our Conceptions (pair share)
- Session Framing: Introducing a New Vision for the Teaching of Thinking and Learning (whole group)
- Digging into the Details: Amygdala Hijack Example (individual or in pairs)
- Digging into the Details: Attending to Attention Example (Individual or in pairs)
- Comparing and Contrasting to Explore the Features (in small groups)
- What Does This Mean for my own Classroom? (in small groups)
- Debrief, Discussion, and Wonderings (whole group)
- Resources to Share (whole group)

Surfacing Our Own Conceptions of the Teaching of Thinking and Learning (10 min.)

- Take a few moments to reflect upon your own conceptions of what it means to teach thinking and learning. What are the common practices that you engage in? What are two to three things that stand out as most important?
- Turn to someone nearby. Introduce yourselves and then share your thoughts.
- What are some similarities in your conceptions? What are some differences? What are some realizations and wonderings based upon your conversation?



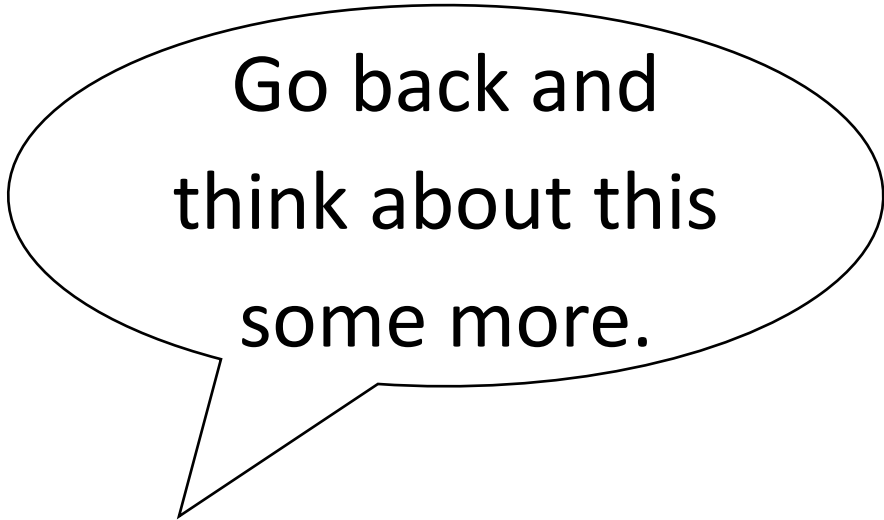
Can We Teach People to Use Their Minds More Effectively for Thinking, Learning, and Performing in School, the Workplace, and in Life?

What do we know about the teaching of thinking and learning skills?

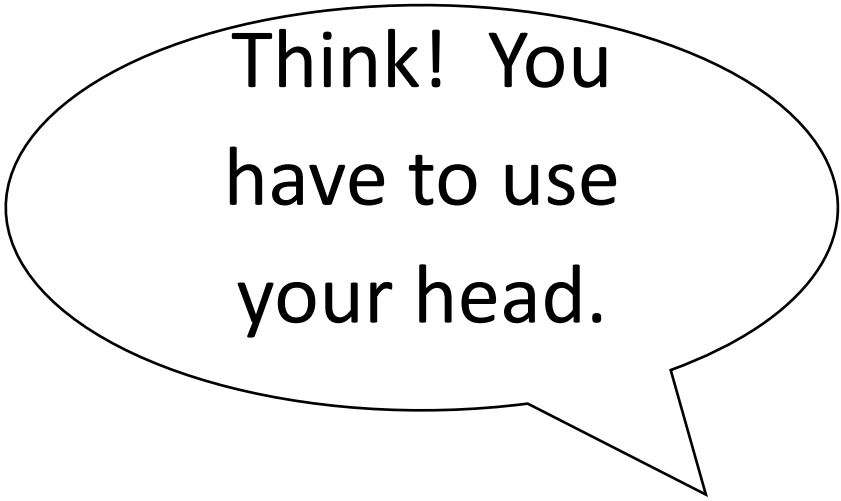
A young boy with dark hair, wearing a light blue shirt, is sitting at a desk in a classroom. He is leaning forward, focused on writing in a notebook with a pen. His left hand is resting on the notebook. In the background, other students are visible at their desks, but they are out of focus. The overall scene is brightly lit, suggesting a sunny day.

A Long History of Research on the Teaching of Thinking and Metacognition Informs Our Efforts in Helping People to Use Their Minds Well.

What have we learned from this work?

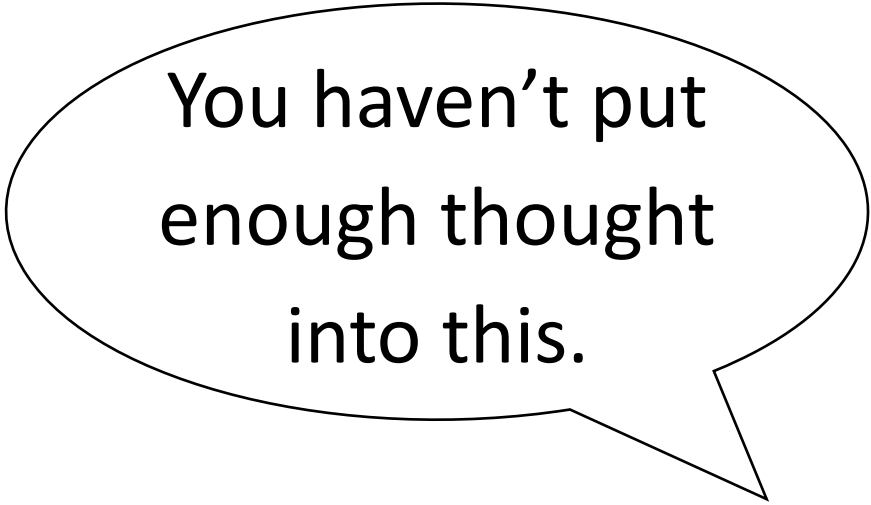


Go back and
think about this
some more.

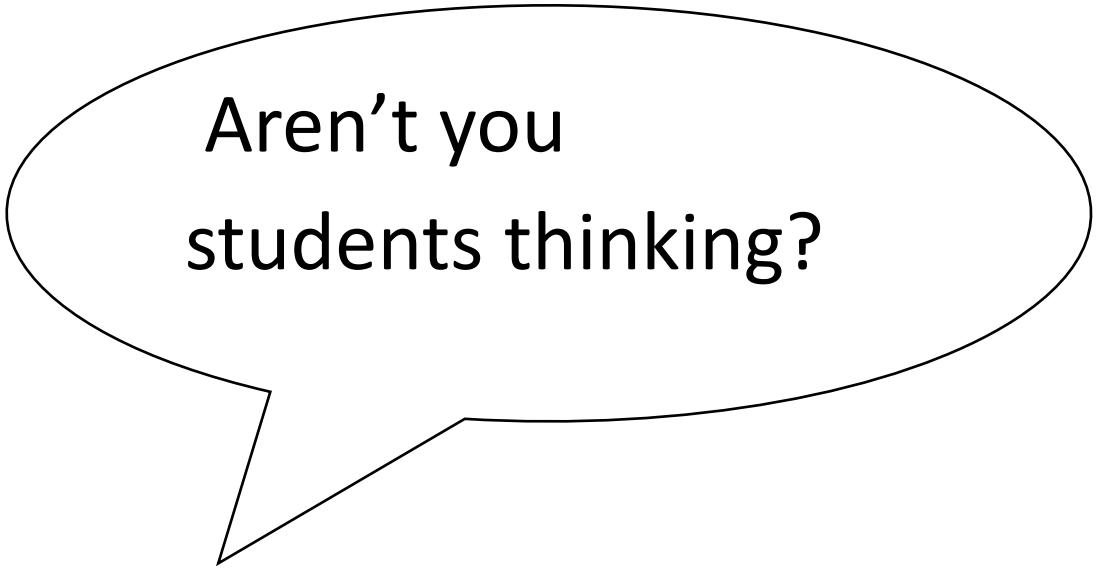


Think! You
have to use
your head.

Much of what students learn about the nature of thinking is gained from what they hear around them. These “everyday theories” can lead to misconceptions about what powerful learning and thinking entails.



You haven't put
enough thought
into this.



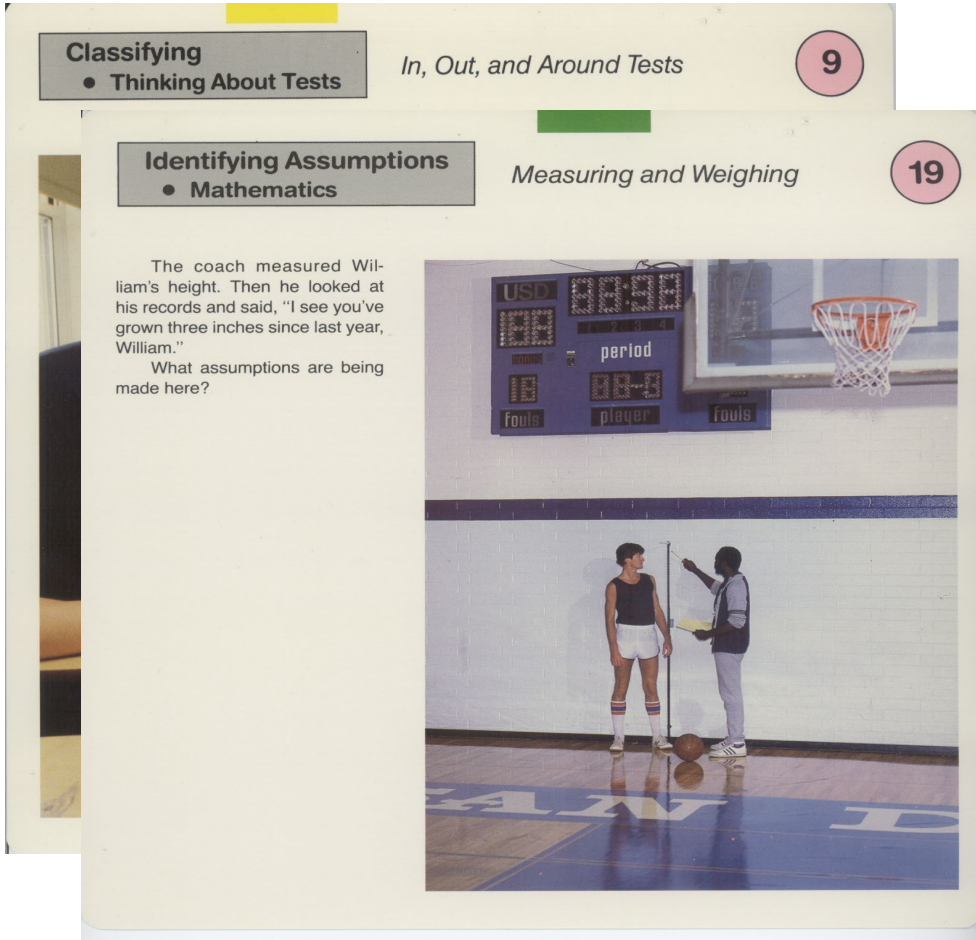
Aren't you
students thinking?

Some Challenges for Learners: You can't see thinking...

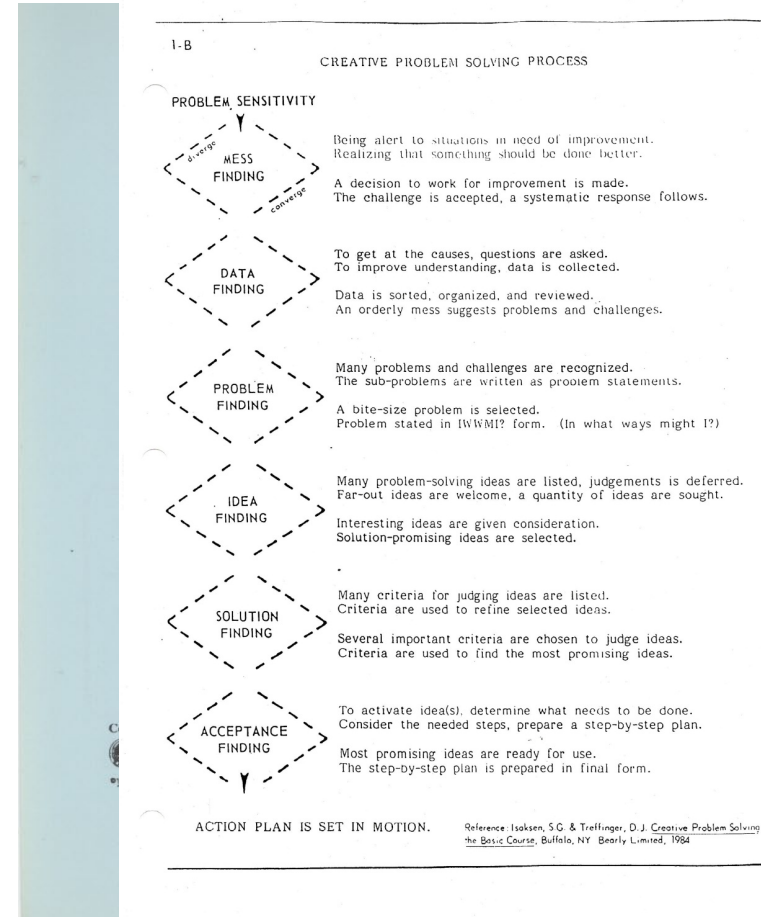
- More than looking like you are thinking
- A “force and focus” conception
- Lack of understanding of the task
 - Reading for comprehension
- Lack of strategies
 - Not knowing what good thinkers do
 - Not knowing how minds work (and misconceptions about how minds work)
- Cognitive load



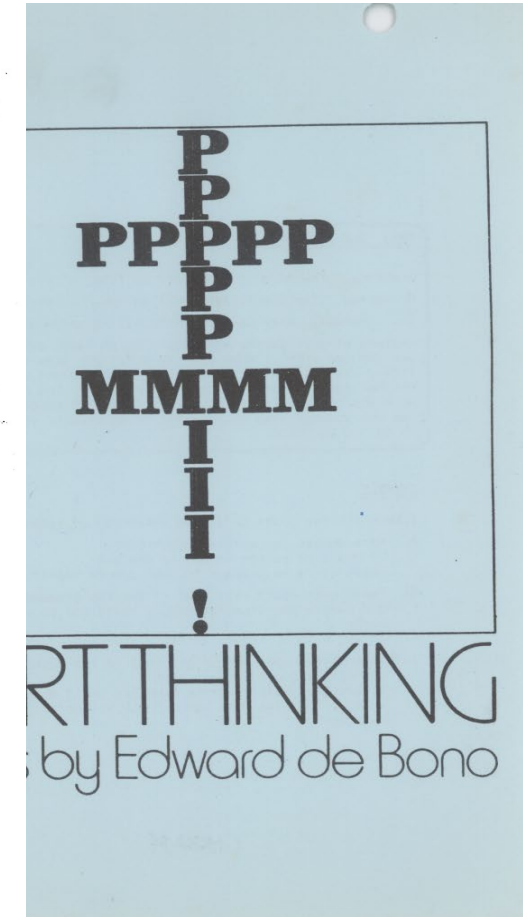
Early Attempts to Teach Thinking and Learning Skills...



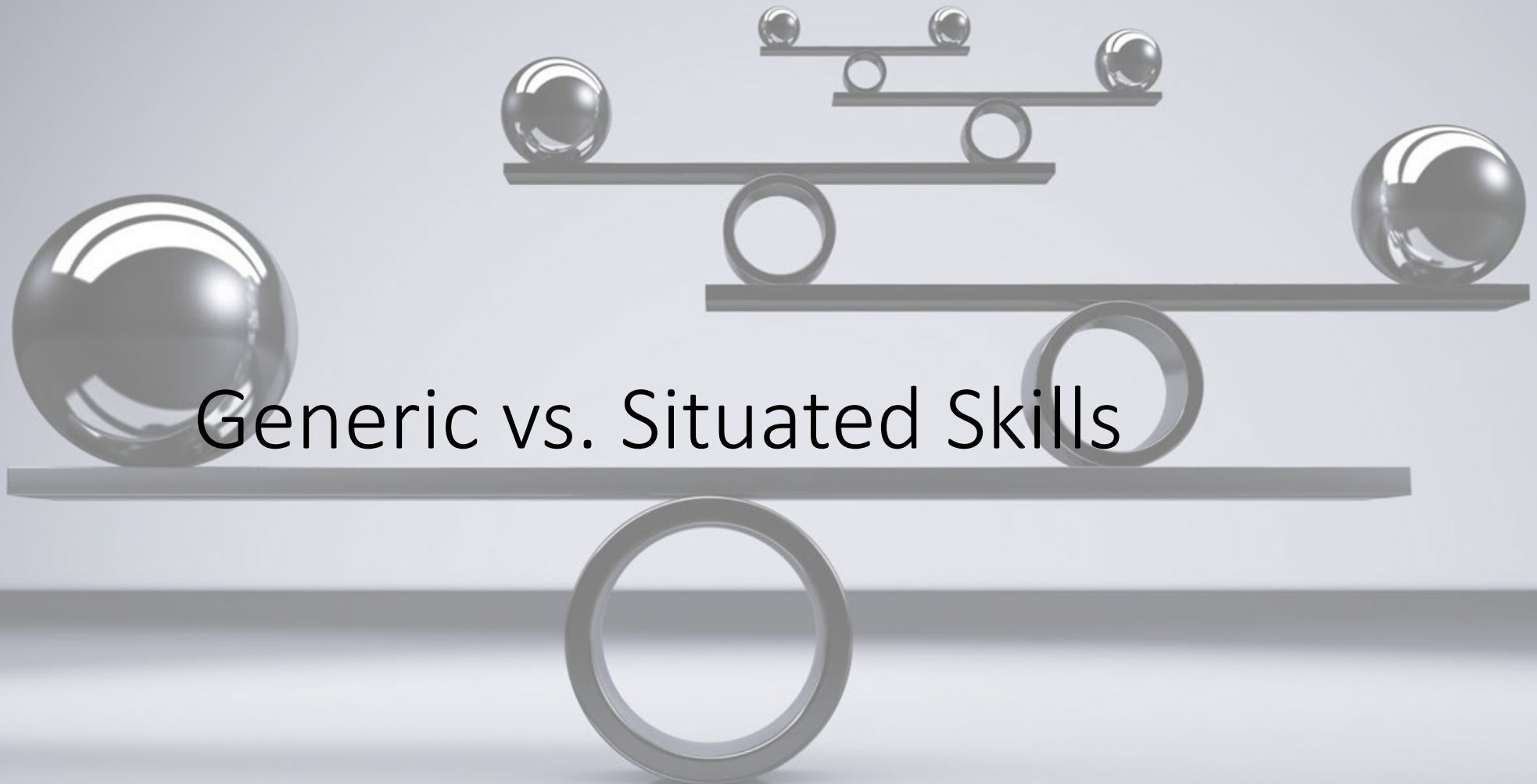
The Teaching of Embedded Thinking
(without particular attention to dis-embedding it)



Stand-Alone Thinking Skills Programs
(without specific attention to transfer)



How do you make the skills transferable?



Generic vs. Situated Skills

How do you make the skills contextually relevant?

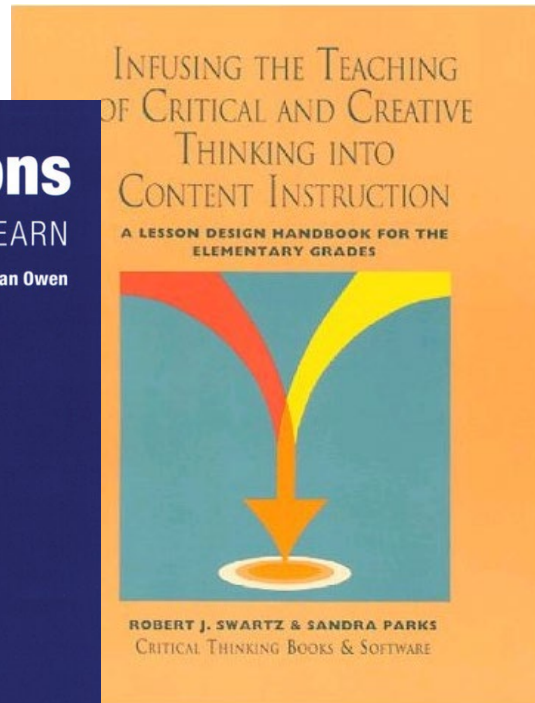
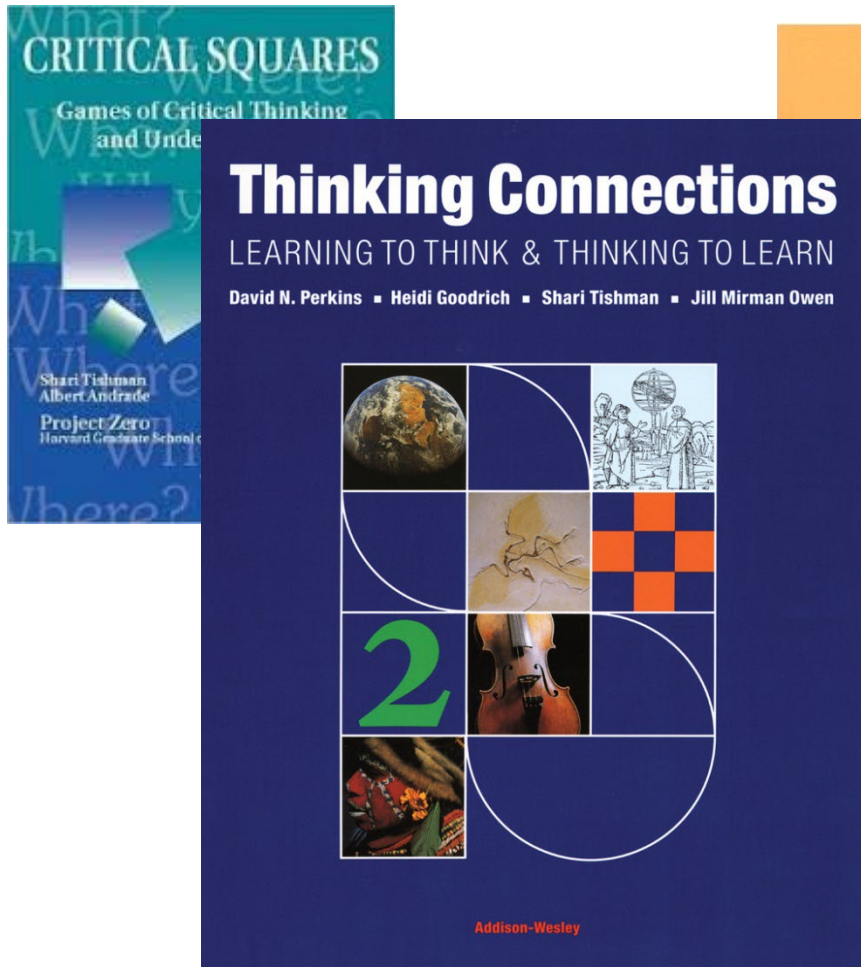
Generic Skills

- Students learn the “Big Ideas” (what good thinkers do).
- Skills are typically made explicit.
- Novices can typically apply them.
- Do all students get to learn them?
- The contexts for transfer are less likely to be noticed, but the skills are often generic enough that students can apply them if they notice the opportunity to use them.

Situated Skills

- Students learn skills that hold the nuance of the contexts.
- These often require opportunistic teaching and therefore very skilled instruction.
- How explicit are the skills? It depends upon instruction.
- Situated skills can be more challenging for novices.
- The skills are often wedded to the contexts in which they are taught, though are applicable when cued by specific contexts.

Infusion Approaches to Balance Generic vs. Situated Contexts



PATTERN SEEKING

Looking for patterns can help you to notice relationships between different parts of a system. Ecosystem scientists study patterns to **understand the connections** in a system.

QUESTIONS TO ASK YOURSELF:

- When I look at the numbers or graphs, what patterns do I see?
- Do I see any patterns across time or over space?
- Do the patterns change in a different way (days, weeks, years)?

TRY THIS:
When you find something unusual, time travel before and after it to see if there is a pattern.

Consider patterns of evidence that **MIGHT** be general.

CONSTRUCTING EXPLANATIONS

Scientists try to **develop explanations** that account for as much of the evidence as possible.

They try to **explain the patterns** and they check carefully to make sure that there are no gaps (unexplained connections) in their explanation.

QUESTIONS TO ASK YOURSELF:

- Have I made sure there is evidence for all of the connections in my story?
- Have I considered whether there are other possible stories?
- Have I supported each claim with reasoning that includes evidence and logic?

TRY THIS:
Tell your explanation to someone else and have them ask questions about it to help you find gaps.

Consider other possible explanations with an open mind.

Make sure there is evidence linked with each part of your explanation.

Learners are taught the thinking skill in the context of the curriculum, for example, an historical decision point or consideration of political viewpoints or a scientific choice.

In this way, the thinking skill is taught at the same time as the curriculum matter and the learner has at least one contextualized example of how to apply the skills.

The teacher can choose to teach many more examples over time thus helping learners learn the skills and how to transfer them in more nuanced ways.

The Decision-Making Strategy

The Decision Point

Take a minute to GET READY.

Ask the powerful questions!

Use the yardsticks!

1 What are the options?

- List the obvious options
- ... and several other options
- ... including some creative ones.

2 What are the complete reasons for the most promising options?

PRO	CON	PRO	CON	PRO	CON

- List some reasons—both pro AND con.
- Have you thought of different kinds of reasons?
- Have you included any hidden reasons?

3 What is the best choice?

Consider the reasons carefully.
Be realistic!
Support your final choice with the most important reasons.

Take time to MAKE CONNECTIONS...

CHOOSE!

or THINK ABOUT THINKING...

or BOTH!

Generic  Situated

Instead of treating the approaches as dichotomous, infusion approaches invite viewing them as on a continuum and supporting novices in learning transferable skills within situated learning tasks.

Research from Project Zero Researchers also repositioned the teaching of thinking and learning as “Dispositional” instead of merely skill-based.

Thinking Dispositions

Triadic Notion of Thinking: Thinking Dispositions

- Sensitivity
- Ability
- Inclination

Tishman, Perkins, and Jay, 1993



A Set of Seven Thinking Dispositions

The disposition...

1. ...towards broad and adventurous thinking.
2. ...towards wondering, problem finding, and investigating.
3. ...to build explanations and understandings
4. ...to make plans and be strategic.
5. ...to be intellectually careful.
6. ...to ask for and evaluate reasons.
7. ...to be metacognitive.

-Tishman et al.

Metacognition As Key to Successful Thinking and Learning

- Metacognition enhances all other thinking and learning; it truly is the icing on the cake.
- We need to make time for metacognition; thinking and metacognition cannot timeshare!

Levels of Thinking and Metacognition

- thinking
- awareness of thinking
- describing thinking
- evaluating thinking
- monitoring thinking
- reflecting upon the nature of thinking (generically and disciplinary moves)

So good information exists about the teaching of thinking and how to be a more expert learner.....

Why are we calling for new
visions for thinking and learning?

Can people learn to use their minds more effectively? Can they become better students, learners, and workers?

Yes, the research on thinking skills has shown persuasively that the skills of good thinking can be taught.

But the promise of doing so has not been fully realized in schools or the workplace.

Why not?

- Often people don't use the skills later. The skills often are not nuanced or individualized enough to be helpful. They may help in getting started but are less helpful as one gains knowledge of specific domains.
- Too often, the skills are taught only in privileged contexts and fail to reach vulnerable and underserved populations.
- Programs to teach thinking are often treated as an "add-on" not as an attempt to fundamentally shift the ways that people think about their minds and themselves as learners.
- The skills don't necessarily build upon what we know about how minds work—the cognitive neuroscience of embodied minds.
- People seldom are taught the rationale for why they matter—how they fit with what we know about how minds work.

What is Next Level Learning and How Does it Shift the
Teaching of Thinking, Learning, and Performance?:
Three Core Concepts

Next Level Learning: Three Core Concepts



Cognitive Neuroscience Rationale Revealed: A Research-Based Users' Manual to the Mind: *When learners understand the rationale behind learning and thinking moves, they are more likely to use the strategies and apply them flexibly as needed.*



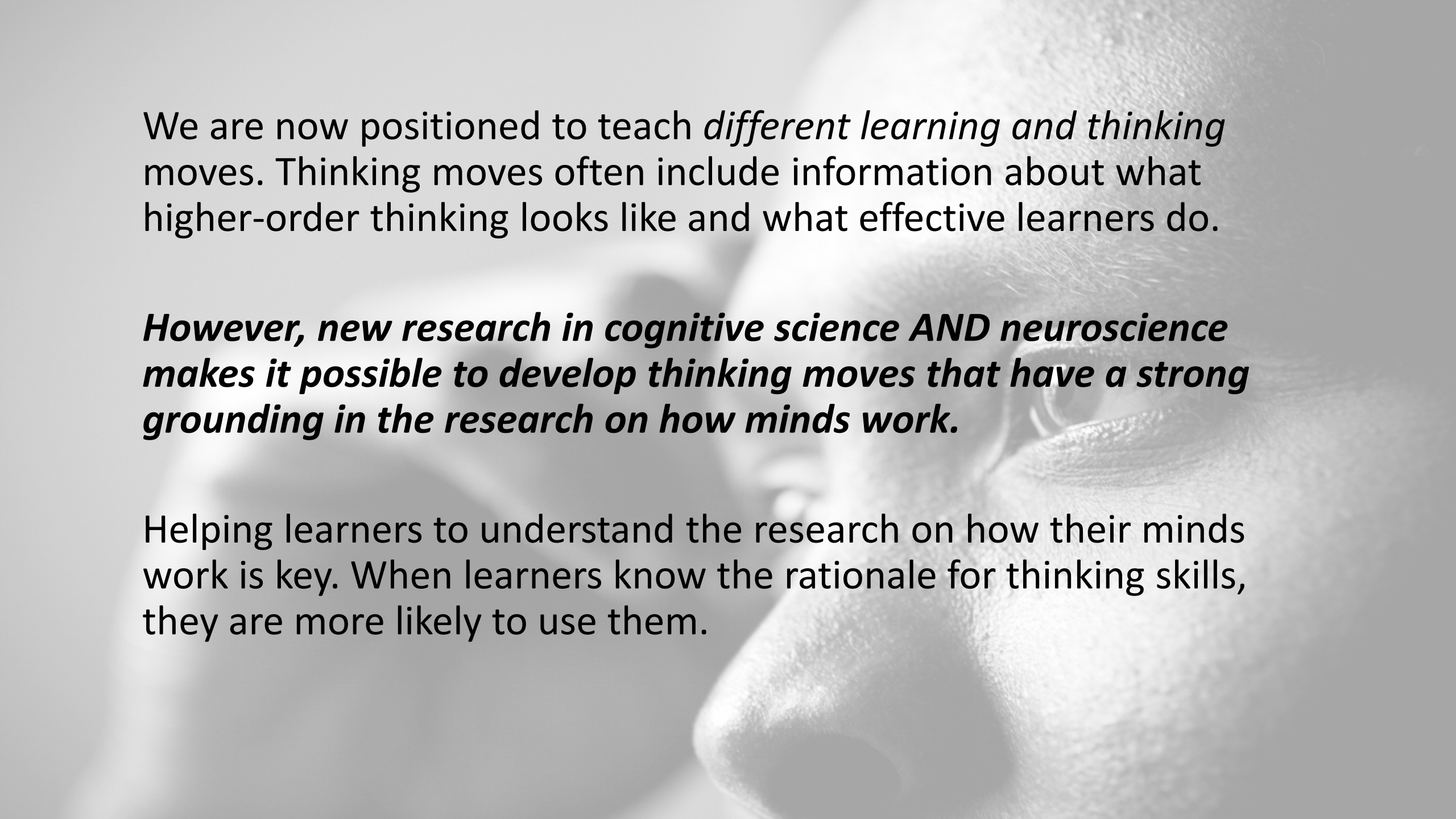
Generative Moves: Transfer to One's Own Situation: *Instead of teaching one approach that loses nuance and applicability as problem levels change, learners are invited into a process of generating specific, contextualized strategies as apply to their own circumstances.*



Contextualized Agency: Behaving Like Fast Fish: *Learning and performing effectively is accomplished by modifying our contexts to support our best work just as fish create vortices in water to push off from to swim their fastest.*

Teaching “what good thinkers do” →

Helping learners develop a user’s manual to their mind based upon neuroscience and cognitive science research/Helping them to understand the mechanisms/rationale for how their minds work



We are now positioned to teach *different learning and thinking* moves. Thinking moves often include information about what higher-order thinking looks like and what effective learners do.

However, new research in cognitive science AND neuroscience makes it possible to develop thinking moves that have a strong grounding in the research on how minds work.

Helping learners to understand the research on how their minds work is key. When learners know the rationale for thinking skills, they are more likely to use them.

What if you had a user's manual for your mind? How might you do things differently?

In what ways might your perception of your failures and your successes change?

How might the ways in which you account for them shift and how might you build new successes?

How might you change the ways that you view learning and performance—in life, at school, and on the job?

Self-Guided Courses for Next Level Learning:

1. Attending to Attention
2. Memory Moves
3. Integrating Emotion, Cognition, and Body Knowledge
4. Active and Deep Processing
5. Building Learning Paths
6. Facing and Leveraging Feedback
7. Maximizing Transfer

Course Content Example: Integrating Emotion, Cognition, and Body Knowledge

A User's Manual that Builds on New Understandings About What It
Means to be a Whole Being in a Human Body

Four Main Themes (A Module Focused on Each):

Engaging Epistemic Emotions

Calming for Concentration

Benefitting from Body Knowledge

Avoiding the Amygdala Hijack

Course Level Understanding Goals:

- Early views of cool rationality have been shown to be misguided. While there are certainly times when “setting emotion aside” can be helpful, in general emotion is essential to effective thinking and problem-solving.
- Understanding the ways in which emotion operates and how it impacts our bodies supports our ability to benefit from our emotions and mitigate the downsides.
- Educating Embodied Learners is a different process than teaching to “just the brain.” As learners, we can seek out ways to engage our whole selves in learning even when instruction doesn’t focus on integrated selves.
- Engaging in Moves requires *sensitivity* to the occasion to use them, the *ability* to deploy them, and the *inclination* to do so.

Engaging Epistemic Emotions: Understanding Goals

- The “finding out” emotions can be powerful motivators for learning and performance. On the flip side, aspects of them can be intimidating. It is important to attend to both sides.
- The “finding out” emotions include interest, curiosity, puzzlement, exciting uncertainty, awe, engaged excitement/motivation.
- It also includes social aspects such as contagion (excitement that spreads in a branching way from and to others) and escalation (excitement that spirals or increases in intensity and motivation as one works with others).
- The “other side” of the epistemic emotions include uncomfortable uncertainty, anxiety, feeling intimidated by the size of puzzle, and avoidance/demotivation. These also have social dimensions that result in avoidance and shifting of responsibility.
- Leveraging and managing these emotions is a part of what expert learners do. This involves recognizing the emotions, taking the time to reflect upon them, and to plan forward on how to work with them.
- We can learn moves that support us in leveraging and managing the epistemic emotions.

Calming for Concentration: Understanding Goals

- In order to focus well, we need to balance vigilance, alertness, excitement, etc. for what neuroscience calls “long-term potentiation.” Good focus hinges on the right balance between excitement and de-motivation.
- There are techniques for managing our focus. Some focus on physical aspects of what our bodies are doing, others on managing our thoughts. Some relate to suppression of intruding thoughts as in the “Attending to Attention” Module.
- A racing mind is not usually a productive one, so it is important to have moves that support calming and downloading of ideas.
- A racing body can make it hard to sit still and focus, so it is important to have moves that support physical calming.
- Flow is a highly engaged and productive state that can be desirable for learning and performance. It also has significant attentional costs to what is going on around us.
- Finding ways to support the benefits of flow and minimize the downsides is key to being an expert learner and a productive worker.

Benefitting From Body Knowledge: Understanding Goals

- Our bodies often hold tacit knowledge that we are not explicitly aware of.
- This knowledge can relate to our emotional, cognitive, and social actions and reactions.
- This knowledge can limit or support deepening expertise.
- Expert learners find ways to become sensitive to our body knowledge and to incorporate it in learning.
- Expert learners interrogate learning opportunities for how they might be informed by and impacted by body knowledge.

Avoiding the Amygdala Hijack: Understanding Goals

- The amygdala is a part of our brain involved in emotional processing. It is known for our fight or flight response and for tagging memories with emotional salience to enable very quick response.
- It acts on “emotional memories.” These are different from “memories of emotion” (which have a reflective component and involve higher-order processes).
- A reaction driven by the amygdala can flood our bodies with adrenaline and trigger anxiety before we have a chance to think about what is going on. This is especially so for anyone who has dealt with trauma.
- Our amygdala can be quickly triggered in a pattern that does not readily involve the higher-order portions of the brain, so we have little control over them.
- These emotional shortcuts can be a source of intuition, but they can also reinforce limiting ideas through a process of confirmation bias.
- We can, however, manage the consequences of our amygdala by a series of moves:
 - 1) recognizing the potential for amygdala hijack before it happens;
 - 2) realizing instances when we have been hijacked and having “moves” that enable us to manage it;
 - 3) adjusting our environments so that we are less likely to be triggered in a way that results in an amygdala hijack.

Here's what a Thinking Skills Approach might sound like:

“When making a decision, list the pros, cons, and neutral points. Then rank each one in terms of how important it feels.”

“Brainstorm a list of possible responses. When you feel like you are ready to stop, keep going for at least another minute or so.”

Thinking Skills → Generative Moves

Here's what Generative Moves might sound like:

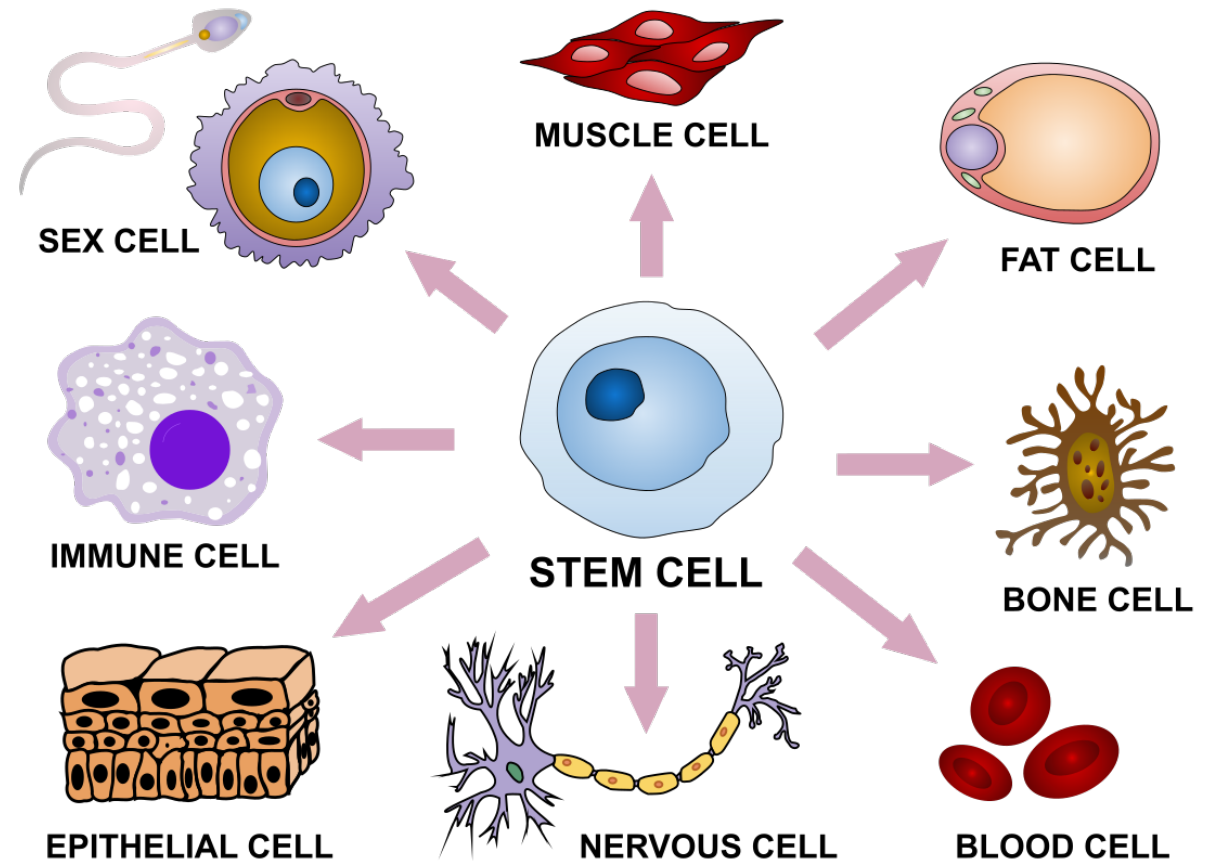
“It is easy to default to my old habits when I am making a decision because our brains are wired to use well-traveled (synaptic) pathways. If I pause to consider at least two choices that are very different from my usual response, it will help me start to think more broadly.”

“It would help me to create ways to make space and time for the things that trigger me. If I create space to step back and think about feedback in a safe space, I will respond to it better.”

Generative Moves

A Generative Move is a high-level move, from which learners can derive personalized moves for their own context.

Generative moves are like stem cells with the potential to grow into many possibilities.



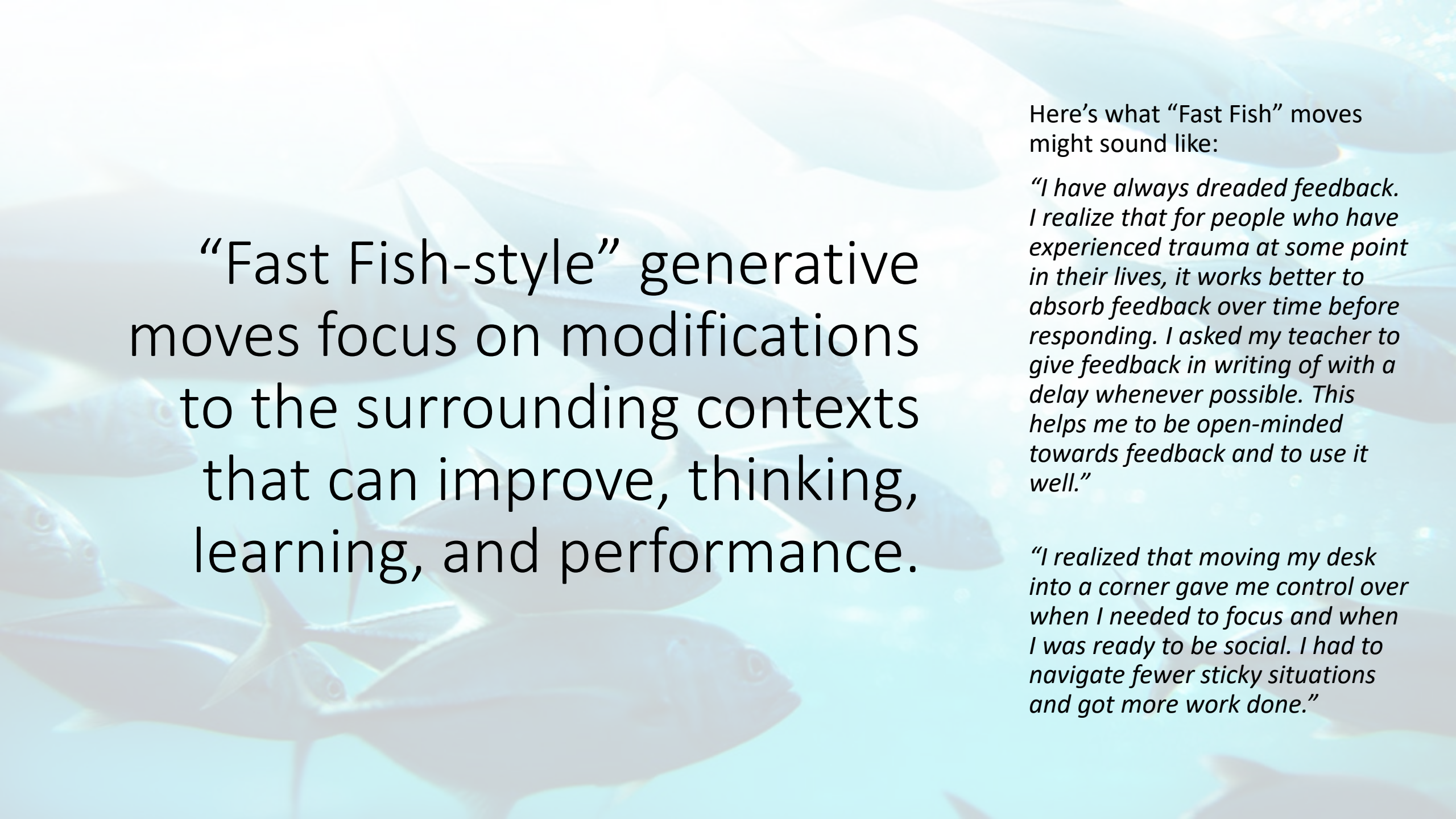
“Agentive, Situated Cognition”

Focusing on what skills learners have →
What learners do to modify their actions *and*
their context to support good learning and
performance

“Fast Fish Learners”



For years, scientists studying fish were puzzled. Fish could actually swim much faster and more efficiently than any of their fish models could explain. It wasn't until they put the model into water and studied the interaction between the fish and the water that things made sense. They came to realize that fish create vortices as they move to push off from. Suddenly the performance of fish made sense. Scientists understood how fish and their environment interact to enable "fast fish"!



“Fast Fish-style” generative moves focus on modifications to the surrounding contexts that can improve, thinking, learning, and performance.

Here’s what “Fast Fish” moves might sound like:

“I have always dreaded feedback. I realize that for people who have experienced trauma at some point in their lives, it works better to absorb feedback over time before responding. I asked my teacher to give feedback in writing of with a delay whenever possible. This helps me to be open-minded towards feedback and to use it well.”

“I realized that moving my desk into a corner gave me control over when I needed to focus and when I was ready to be social. I had to navigate fewer sticky situations and got more work done.”

Next Level Learning: Three Core Concepts



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- Two Module Examples:
1. Avoiding Amygdala Hijack
 2. Attending to Attention
-

Amygdala Hijack Module

- Log into the module and progress through it working individually.
- Jot down any notes that you would like as you progress through it.
- When you finish, we'll take few minutes for a turn and talk focused on this particular module.
- Then we'll collect a few headlines.

Attending to Attention Module

- Log into the module and progress through it working individually.
- Jot down any notes that you would like as you progress through it.
- When you finish, we'll take few minutes for a turn and talk focused on this particular module.
- Then we'll compare and contrast in small groups to consider the features of the two examples; how they are similar and different from one another; and how this approach to teaching thinking and learning is similar and different to past approaches.

What does this mean for your classroom?

- Are there ways in which you already encourage your learners to behave like fast fish?
- Are there other ways that you might infuse this approach into what you are already doing?
- In what ways is the social, emotional, physical, and cognitive contexts of your classroom malleable?
- What are some of the messages that you might use to support learning and teaching in this way?

Share out and Debrief

Resources

- Hand-outs
- On-Line Readings
- Study Results
- Points for Practice
- Work in Progress/Look for More Modules Soon!



Putting Learning Sciences to Work for Access, Innovation, and Mastery



Resources on the Next Level Lab Website:

How Fast Fish Sink or Swim: Adopting an Agentic View of Learners

*Applying Learning Sciences Research to
Learning and Workforce Development for
Next Level Learning Brief Series*

Tina Grotzer, Emily Gonzalez, and Tessa Forshaw



Developing Adaptive Expertise for Navigating New Terrain:

**An Essential Element of Success
in Learning and the Workplace**

*Applying Learning Sciences Research to
Learning and Workforce Development for
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[What is Next Level Learning and Why does it Matter?](#)



[From Engaged to Agentive: Why is it Time to Raise Learning to the Next Level?](#)



[Leveraging Epistemic Emotions to Cultivate Intrinsic Motivation](#)



[Deeper Learning Towards What?: The Nature of Deep Understanding](#)



[Preparing Students to Augment Artificial Intelligence Rather than to be Replaced by Machine Learning](#)



[Dripping Water Wears Through Stones: Small Changes to Bring Your Teaching to the Next Level](#)



[The Icing on the Cake: How Metacognition Enhances Learning](#)



[Leveraging Learners' Agency for Enhancing the Process of Feedback](#)