



# The Quest for Understanding

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and David Perkins



#PZ50th

## Session Overview

- Welcome and Framing
- A Provocation/Discussion About Our Minds and How We Seek Understanding
- Three Views from Project Zero's Past and Current Work on Understanding
- A Discussion in Small Groups: Looking to the Future
- Summing Up



# Essential Questions

- What is the nature of deep understanding and why does it matter?
- What are the challenges to developing deep understanding?
- What are the behaviors of learners who demonstrate adaptive expertise—knowing *how* to develop deep understanding?
- In what ways can education support the development of deep understanding and adaptive expertise?



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# Understanding Goals

- Depth of understanding is more empowering than broad, superficial coverage.
- Understanding is revealed through performances as opposed to what we know in our heads.
- Deeper understanding involves restructuring schemas that we hold and developing a broader repertoire of schemas.
- Learning how to learn new and challenging content—developing adaptive expertise—should be a central focus of education.



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# What are some of the things that our minds do as we seek understanding?

As you watch the film, try to make sense of what you are seeing. Pay attention to what you are doing to try to understand what is going on. Here are some questions to consider:

- What are some of the patterns in your thinking?
- Are there any implicit strategies that you are using?
- Are there times when you feel stuck or when the struggle feels unproductive? How did you respond?
- Are there times when the quest to understand felt particularly productive? What were you doing at those times?

# Reflections?

- Turn to a neighbor and briefly share your experience and your response to the questions.
- What are one or two headlines that capture your experiences?



[Colorful image  
of human brain]

## Some of what cognitive science and neuroscience tells us...

- We are more likely to see what we have seen in the past; our minds default to well-traveled connections.
- Once we think that we understand something, it can be hard to see information that is discrepant with that understanding (confirmation bias).
- Holding what we know in mind and reflecting upon it to assess what helps us to gain and/or what limits understanding is important but cognitively taxing (cognitive load).
- Developing deep understanding requires effort and strategic investment.
- Beyond cold cognition, affect is a critical aspect of our sense-making.



# Three Views About Understanding



*Understanding in Action:  
A Performance View*

*Understanding as  
Recognizing Greater  
Complexity: A  
Restructuring View.*

*Understanding as an  
Agentive Process: A Living  
Curriculum View*



## Examples of PZ Projects

Teaching for  
Understanding  
(TfU)

Practical  
Intelligence for  
Schools (PIFs)

Making Learning  
Visible (MLV)



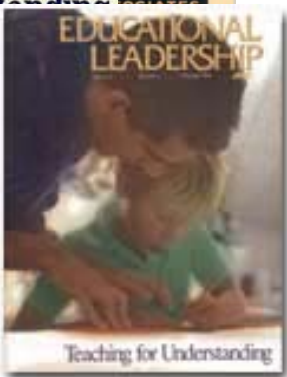
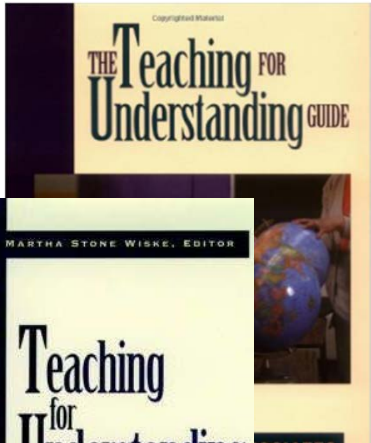
PROJECT ZERO  
FIFTY YEARS

## *Understanding in Action: A Performance View*

- A shift from a content-based notion of understanding to a performance-based one. Active processing is key. Understandings should be actionable.
- A focus on depth and generativity—that deep understanding enables better transfer and the ability to generate new understandings.
- A focus on Understanding Performances (such as explanation, exemplification, justification, etc.)
- A framework for instructional design that puts Understanding Goals at the center of the curriculum design process (backwards design).

# The TfU Framework

- Generative Topics
- Essential Questions and Throughlines
- Understanding Goals
- Understanding Performances
- On-Going Assessment

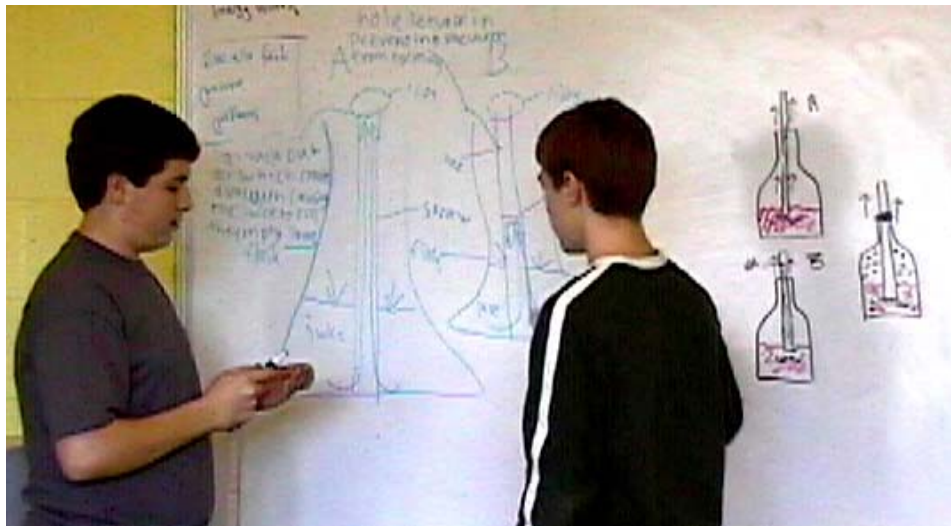
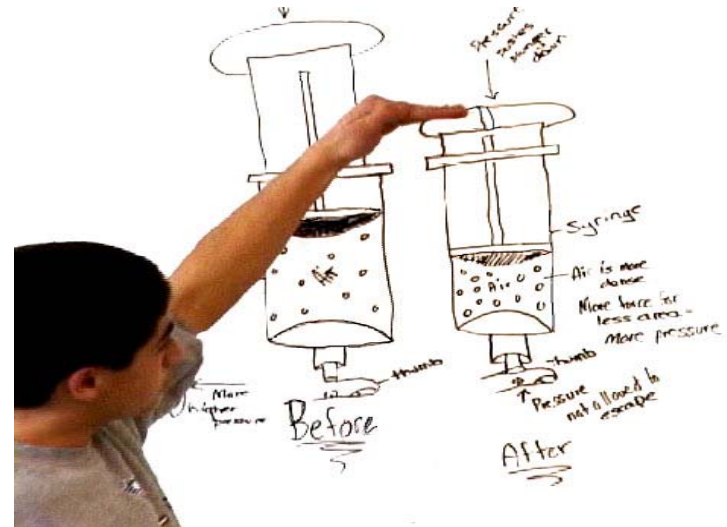


TfU Project (Funded by Spencer Foundation)

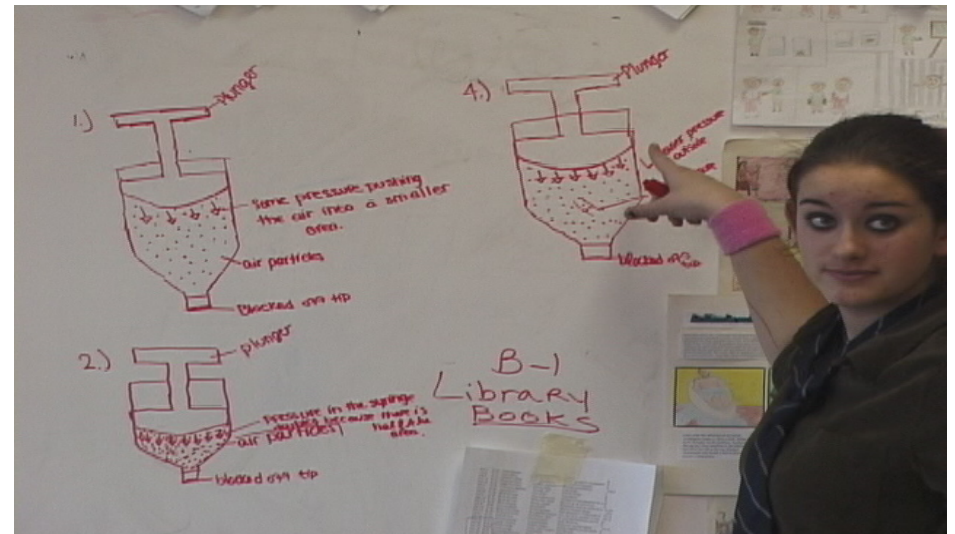
# Backward Design

- Works from Understanding Goals and develops instruction aimed specifically at those goals. It has a very well developed road map.
- The designer develops very explicit statements of what the learner is expected to come to understand. For instance: “Students will understand that mass divided by volume equals density.”
- UGs are different from objectives: “Students will understand density.” There are many different ways to understand density (a “dots per box model” that shows how much matter is distributed across how much space or they might understand it as a formula “ $M/V = D$ ”)

# Making Understanding Visible



UC Project (Funded by NSF)



A few words/anecdotes about how a focus on Teaching for Understanding has been historically important and how it changes the game in the classroom....

Dr. Stone Wiske, Former faculty member at HGSE  
and collaborator on the TfU Project

## Examples of PZ Projects

Understandings  
of Consequence  
(UC)

ReCAST Teacher  
Professional  
Development

Causal Learning  
in the Classroom  
(CLiC)



PROJECT ZERO  
FIFTY YEARS

## *Understanding as Recognizing Greater Complexity: A Restructuring View*

A focus on...

- ...how knowledge/understanding is structured—on structural in addition to conceptual and procedural knowledge.
- ...how earlier understandings can distort and limit the ability to build more sophisticated understandings.
- ...generative concepts that can serve as bottlenecks if not deeply understood.
- ...how fundamental constructs such as causality, numerosity, categorization impact understanding.

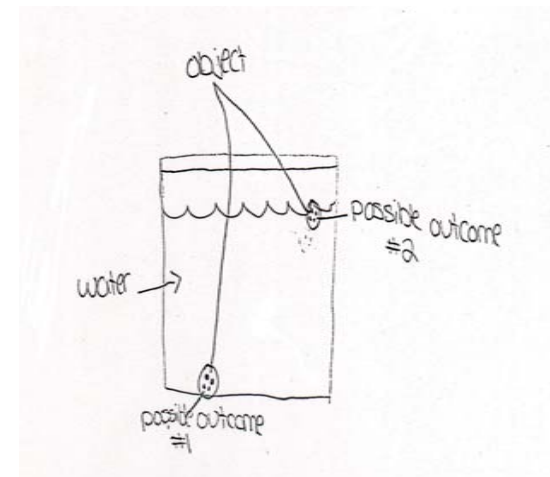
## What is a RECAST Activity?

- It is designed to REveal CAusal STructure or help students RECAST their understandings so that they fit with more expert structures.
- It pushes the students' attention to the underlying causal structure.
- It reveals the structural knowledge or “bones” of the concept.

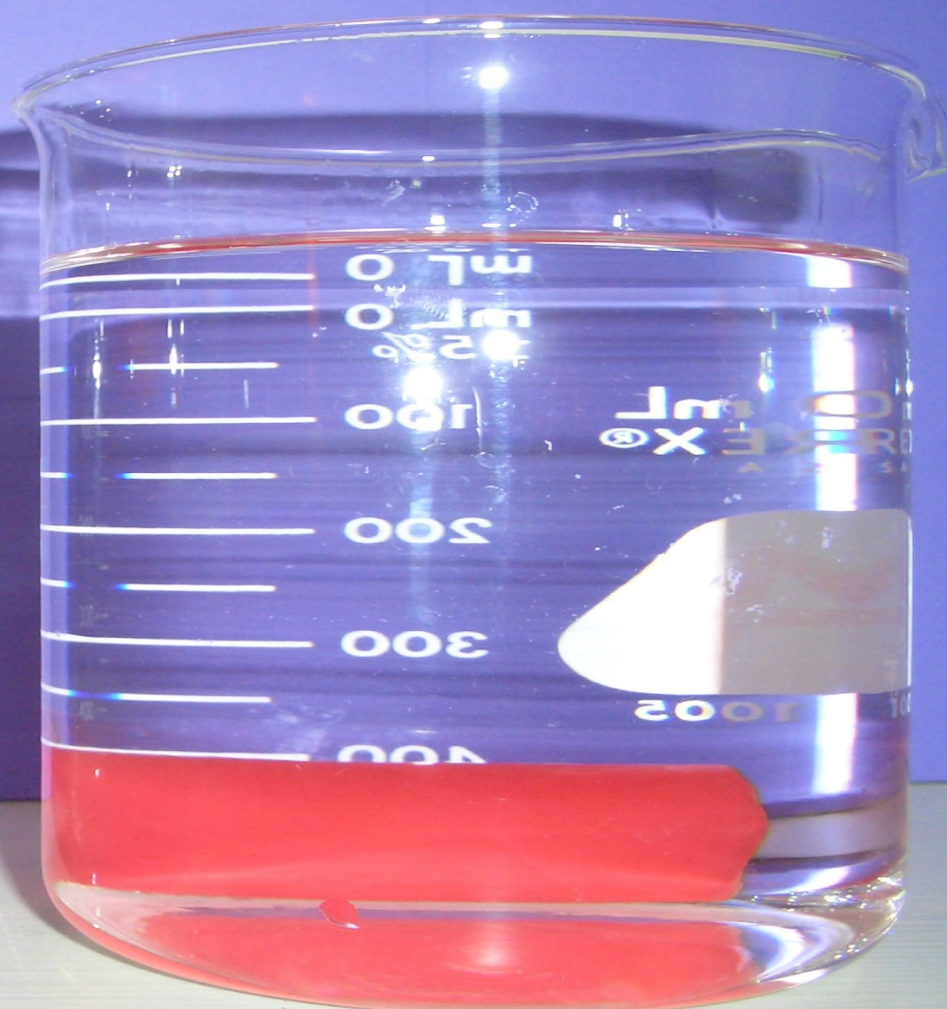
UC and ReCAST Projects (Funded by NSF)

## What is going on when an object sinks or floats?

“The weight makes things sink, so my diagram shows that the heavier one sinks and the lighter one floats.”











# “Sinkers and Floaters”

## Relational Causality

A relationship (typically one of balance or imbalance) between two things causes the outcome.

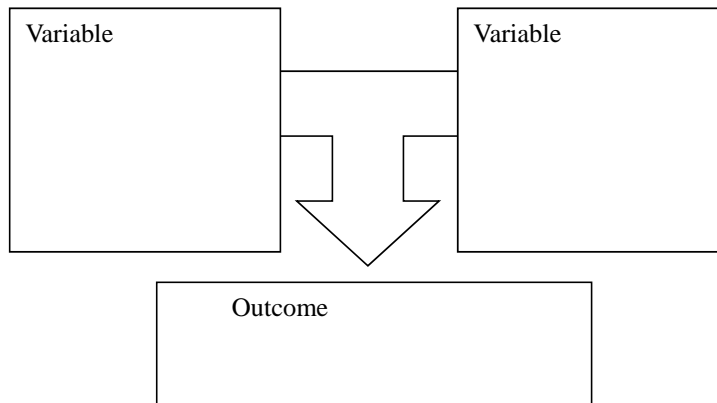


Image of Commonly Used Curriculum Book labeled “Floaters and Sinkers”



DON'T DUMP

DRAINS TO



CHARLES RIVER













## Examples of PZ Projects

The Living  
Curriculum at  
Tremont School

Agency by  
Design (AbD)

Pedagogy of Play  
(PoP)



PROJECT ZERO  
FIFTY YEARS

## *Understanding as an Agentive Process: A Living Curriculum View*

A focus on...

- ...the agency of the learner.
- ...on developing adaptive expertise more than classical expertise.
- ...on curriculum that is dynamic, changeable, and responsive to what is relevant at that time.
- ...on real world, authentic learning.
- ...on self-regulated learning.

Classical expertise means knowing a subject and domain very deeply.

Adaptive Expertise focuses on the skills involved in building new understandings.

Adaptive Experts....

- ...work at the edge of their competence.
- ...engage in progressive problem-solving.
- ...view failure or errors as steps in a process towards success.
- ...focus on techniques for upping their game/ process.
- ...set evolving and revisable paths towards learning.





“Backward Design,” considered the gold standard in instructional design processes, requires setting understanding goals for learners well in advance of their interaction with the curriculum.

Developing expertise requires being able to set learning goals at the edge of one’s competence; this is an important type of learning how to learn.

# The Power of Agency

Learning from and through agency is part of our core human cognition.

-Susan Carey, 2011

# Living Curriculum

*“A living curriculum is one that is dynamic and changeable; It responds to what is relevant at that time.”*

*“A living curriculum is about real world, authentic learning; It is about what one needs to know to live well in the world.”*

*“A living curriculum invites learner agency; It is developed by the one living it and is what life-long learners do.”*

## Living Curriculum at Tremont School A Work in Progress...

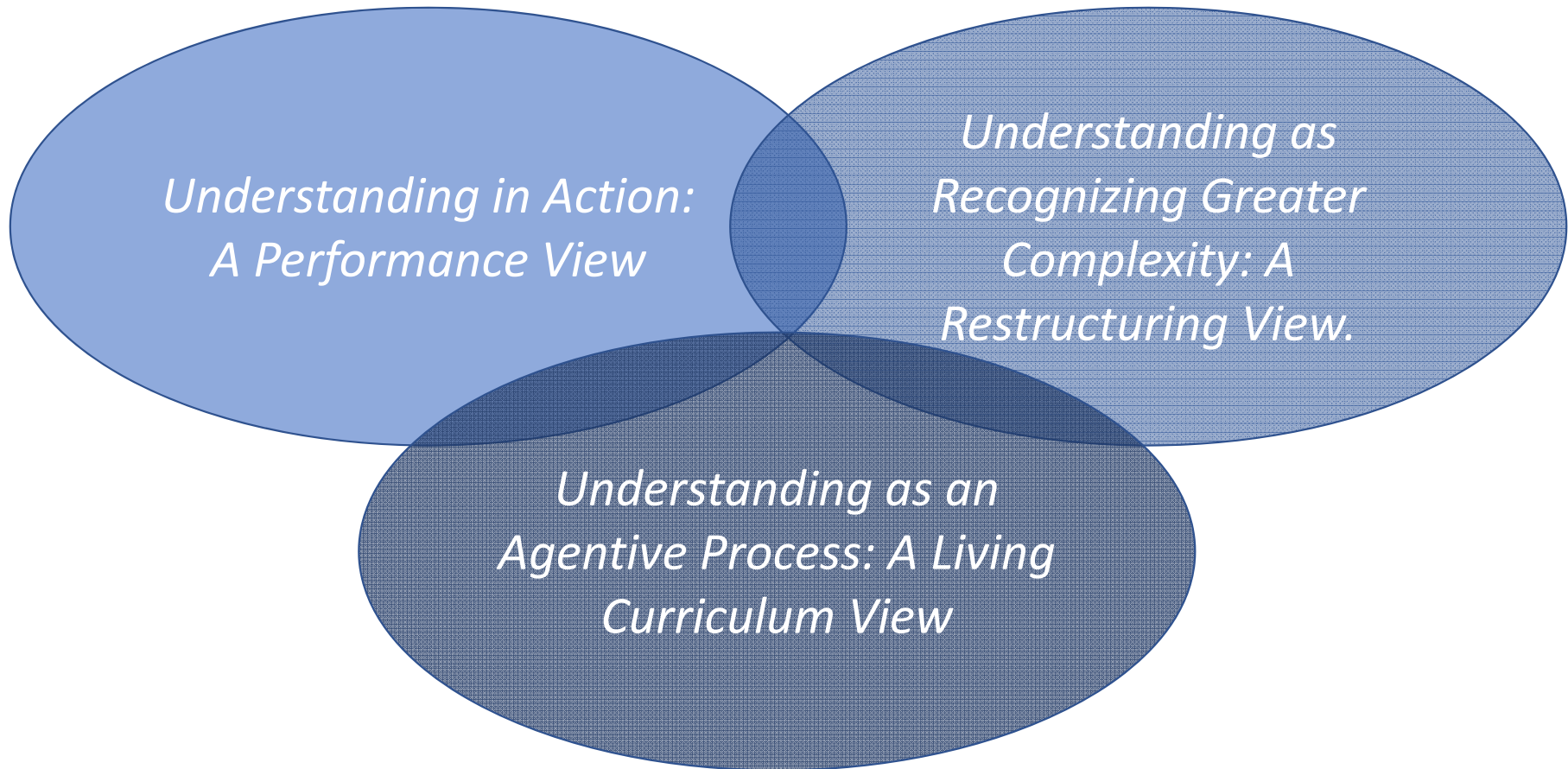
- Learners set learning paths.
- The curriculum is negotiated.
- Expertise is distributed across students and others in the school community.
- Educators take the role of interested and interesting adults who help learners figure out how to find resources and locate expertise.
- Students are given the opportunity to self-regulate—their minds, bodies, and learning spaces.



A few anecdotes of what Living Curriculum has enabled....

Bill Wilmot, Founding Head of the Tremont School

# An Analogy to Highlight Contrasts and Connections between the Three Approaches to Understanding



## Looking to the Future: Questions to Ponder...

- How do we develop understanding of other contemporary/future challenges that students need to understand (e.g. political understanding, ecological sensibility, global citizenship, etc.)?
- What are the implications of who decides *what* to understand and when they decide it? How are topics negotiated and chosen?
- How can we break down the barriers between school and real-world learning?
- How can we leverage the power of tacit knowledge/ understanding, (understanding that we are not aware of) to address complex problems?
- How should we think about misunderstanding? What are ways of thinking about it that are disabling? ...enabling?
- How might we balance the value of backward design with the importance of enabling learners to set their learning agendas and paths?
- How do we help learners gain societally important understandings while helping them learn how to learn in the executive, self-authoring sense?

## Small Group Discussions

Working with 3-4 others, discuss the following question:

What are a few of the features that one would expect to see in an educational institution that uses these three notions of understanding as central to the learning process? If you feel that you know an institution that is already doing this, what are some of the features that one can detect at those institutions?

Use the white boards around you to make your thinking visible to others! We will leave the ideas up during lunch so that you can take a gallery walk to see each others' thinking.





# Understanding Goals

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## Some additional resources...

- Research summary sheet on cognitive science research in support of teaching for deep understanding
- Resources on the Project Zero Website:  
<http://www.pz.harvard.edu/topics/cognition-thinking-understanding>
- Resources on the Causal Patterns and Causal Cognition in a Complex World Websites:  
<http://www.causalpatterns.org/>  
<https://clic.gse.harvard.edu/>



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