

Science in the Public Interest: CCAS Annual Meeting



Karen Kashmanian Oates
Worcester Polytechnic Institute
Dean of Arts & Sciences
Sigma Xi Distinguished Lecturer
2015-2016
koates@wpi.edu

Ellen Faszewski
Wheelock College
Co-Chair of Math and Science
Professor of Biology
efaszewski@Wheelock.edu

DonnaJean Freeden
Rider University
Provost
dfreeden@rider.edu

WHEELOCK
COLLEGE



November 2015 | Washington D.C.

Goals:

- ▶ Connect and explore current research on how students learn that support science in the public interest
- ▶ Provide examples of active learning-participatory learning with civic and public interest dimensions
- ▶ Develop strategies to change from an inert to active learning environment by leading organizational change.



The Science in the Public Interest



- ▶ Why should we put resources into creating a scientific literate society?
- ▶ What do we want them to know?
- ▶ How can we teach for learning?

Why

- ▶ Our generation cannot afford to invest in and educate a generation of students that merely acquire knowledge without understanding how knowledge can benefit society, their communities, and their nations. In fact we must teach the content *and* skills *and* values of our society by creating many diverse opportunities for our students to practice the work of being an engaged citizen. That is what we need to do every on our campuses in and outside the classroom. (Campus Compact)



WHEELLOCK
COLLEGE

Why

- ▶ We must look at the mission of colleges and universities as agents of change- to prepare the next generation of involved citizens capable of advancing our culture, technology and society. It is our responsibility to provide them with multiple opportunities to do the work of citizenship. No longer can we say someone is liberly educated because they have reach the credits leading to graduation. Our overall mission is to provide the *opportunity* for students to use their many talents throughout their lives for the greater good of society.



WHEELOCK
COLLEGE

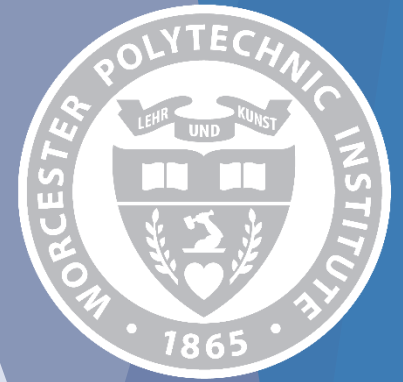
We need to educate for Civic Engagement because...

- ▶ **When we do**, the responsibility for learning shifts from faculty and textbooks alone to the students themselves who engage knowledge for understanding by putting knowledge into practice to solve that problem.
- ▶ For me, and I believe my faculty, we have an obligation to prepare the next generation for life as citizens and members of their community that can look towards evidence to solve problems.



How do we teach for learning

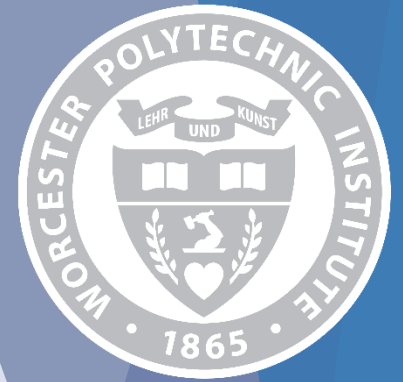
- ▶ The future of science education and democracy is a *form following function*—democracy and a liberating learning experience go hand in hand. Our responsibility is to facilitate this transition by creating opportunities; many opportunities to work across campus and in our communities and to enable all learning in and outside of the classroom as authentic, relevant, and challenging; to assess what we do and to provide evidence of success.



WHEELOCK
COLLEGE

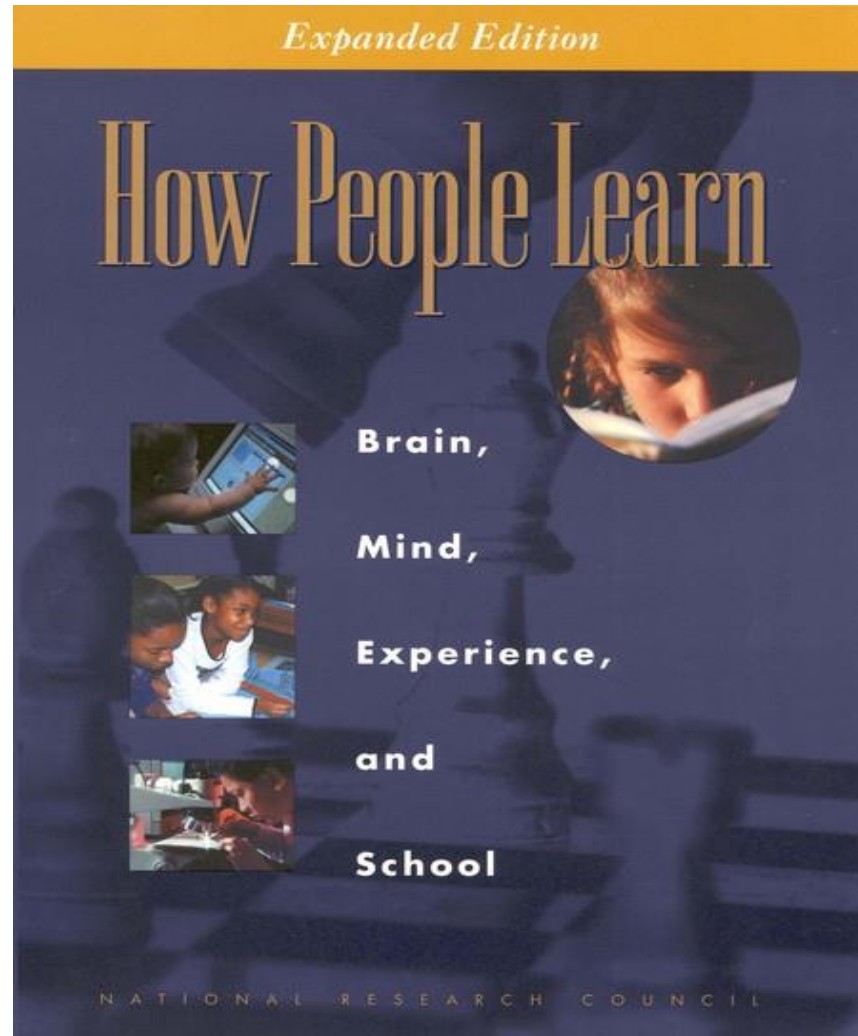
How do we teach for learning

- ▶ This also means that the **power of science education for our democracy requires a shift from inert learning**— inert means to memorize definitions and facts with little freedom for the students to choose topics or innovative learning environments to include their community.
- ▶ **To Liberating** which is a more challenging. Students will need command both the subject knowledge and the skills needed to seek out new information. Along with the power to make decisions as to how to use knowledge for public policy, social engagement, and support our democracy.



WHEELLOCK
COLLEGE

How People Learn Three Major Principles



WHEELOCK
COLLEGE

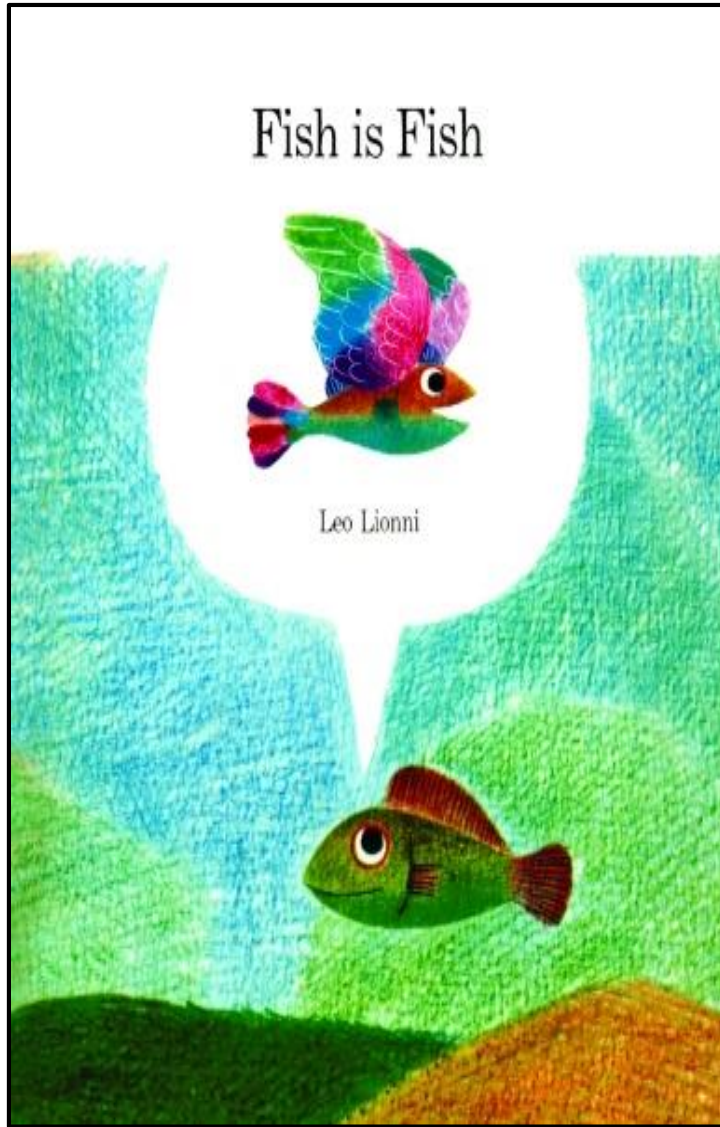
Three Major National Research Council Findings: Simplified Greatly

#1 Students come to the classroom with preconceptions and revert back to them when the class is over (they are not empty vessels), unless a powerful learning event takes place (an experience).

IMPLICATIONS:

- ▶ Find out what students know
 - ▶ Prior knowledge is the most important link to new information. Use prior knowledge as a hook to attach new ideas and concepts.
- ▶ Learning is cumulative, unlearning is harder than learning new information
 - ▶ Get to previous knowledge through seminars, reflection, practice, dialogs. Student voice (without stress).





WHEELOCK
COLLEGE

Example: Experiential learning can be active, collaborative, cooperative and powerful

The Peanut

Take 5 minutes to explore the peanut in front of you.

Independent of others, write down all that characteristics that describe the peanut;

Next at your table share the description with others. Identify shared and unique descriptors.



WHEELOCK
COLLEGE

peanut (p' nut')n.

1. Native to tropical America and widely cultivated in semitropical regions, having yellow flowers on stalks that bend over so the seed pods ripen underground.
2. The edible nut like oily seed of a peanut, used for food and a source of oil.
3. A small or insignificant person.

American Heritage Dictionary



WHEELOCK
COLLEGE

Three Major National Research Council Findings:



#2 To Develop Competency & Expertise

▶ IMPLICATIONS:

- ▶ A deep foundation is needed. Depth begets breadth (cover less, go deeper).
- ▶ A context and conceptual framework is needed. Test for understanding, linking to knowledge and what is relevant to the students.
- ▶ Knowledge needs to be organized to facilitate retrieval and application (provide experiences to link theory and practice and challenge students to find different applications for material (link to writing, aesthetic response, effective citizenship)).

WHEELLOCK
COLLEGE

To demonstrate how this complexity relates to learning, we will start with a test . . .

- ▶ You will be shown a series of questions, each followed by a word
- ▶ Apply the question to the word and answer yes (Y) or no (N) on the response sheet

Ready? . . . **GO!**



WHEELOCK
COLLEGE



1. Does the following word mean the same as **OUT-GOING**?

RESERVED

WHEELLOCK
COLLEGE



2. Does the following word contain the letter **A**?

SPONTANEOUS

WHEELOCK
COLLEGE



3. Does the following word describe you?

FRIENDLY

WHEELOCK
COLLEGE



4. Does the following word contain the letter **S**?

REALISTIC

WHEELOCK
COLLEGE



5. Does the following word mean the same as **CARING**?

WARM-HEARTED



6. Does the following word contain the letter **C**?

PRACTICAL

WHEELOCK
COLLEGE



7. Does the following word describe you?

SENSITIVE

WHEELOCK
COLLEGE



8. Does the following word
mean the same as
STUPID?

INTELLIGENT

WHEELOCK
COLLEGE



9. Does the following word contain the letter **D**?

IMPROMPTU

WHEELOCK
COLLEGE



10. Does the following word contain the letter **K**?

TRUSTING

WHEELOCK
COLLEGE



11. Does the following word contain the letter **M**?

CAUTIOUS

WHEELOCK
COLLEGE



12. Does the following word describe you?

SUSPICIOUS

WHEELOCK
COLLEGE



13. Does the following word describe you?

OBVIOUS

WHEELOCK
COLLEGE



14. Does the following word contain the letter **O**?

LOYAL

WHEELOCK
COLLEGE



15. Does the following word
mean the same as
ADULT?

MATURE

WHEELOCK
COLLEGE



16. Does the following word
contain the letter **B**?

PRAGMATIC



17. Does the following word
mean the same as
CREATIVE?

IMAGINATIVE

WHEELLOCK
COLLEGE



18. Does the following word
mean the same as
HONEST?

TRUSTWORTHY

WHEELOCK
COLLEGE



19. Does the following word describe you?

SHREWD

WHEELOCK
COLLEGE



20. Does the following word contain the letter **N**?

ATTENTIVE

WHEELOCK
COLLEGE



21. Does the following word describe you?

CALCULATING

WHEELOCK
COLLEGE



22. Does the following word
mean the same as
FLIGHTY?

SERIOUS

WHEELOCK
COLLEGE



23. Does the following word contain the letter **H**?

SENSIBLE

WHEELOCK
COLLEGE



24. Does the following word describe you?

RESTRAINED



25. Does the following word
mean the same as
PROUD?

HUMBLE



26. Does the following word describe you?

QUIET



27. Does the following word describe you?

CRAFTY



28. Does the following word
mean the same as
ASSERTIVE?

COMMANDING



29. Does the following word
mean the same as
IMPULSIVE?

INTROVERTED



30. Does the following word describe you?

SOBER

Now, turn over your answer sheet . . .

- ▶ write down as many of the **TARGET** words as you can remember in 2 minutes

Finished?

Now we'll score the test



Score number of words remembered
from this list:

spontaneous
realistic
practical
impromptu
trusting

cautious
loyal
pragmatic
attentive
sensible

—> **LETTER score**



Score number of words remembered
from this list:

reserved

warm-hearted

intelligent

mature

imaginative

trustworthy

serious

humble

commanding

introverted

—> **WORD score**



Score number of words remembered
from this list:

friendly

sensitive

suspicious

obvious

shrewd

calculating

restrained

quiet

crafty

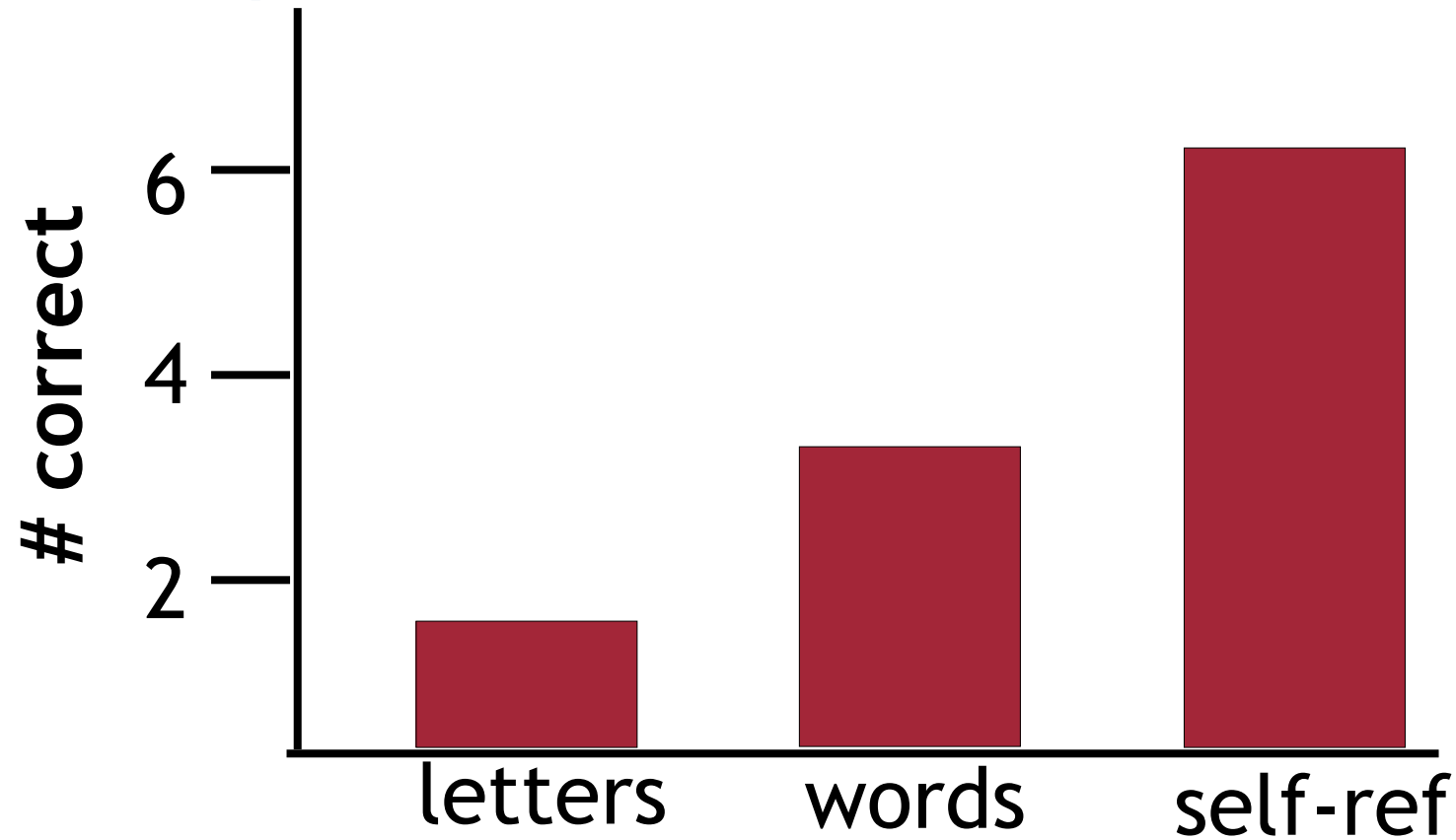
sober

—> **SELF-REFERENCE score**



Levels of Processing Test*

– *typical results*



* Craik, F. I. M., & Lockhart, R. S. (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671-684.



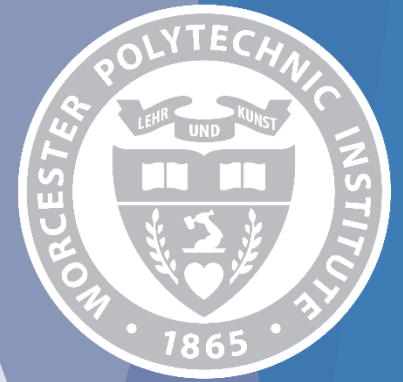
What does this test mean for understanding the process of learning?

Letters: shallow analysis
—> low retention

Words: intermediate analysis
—> better retention

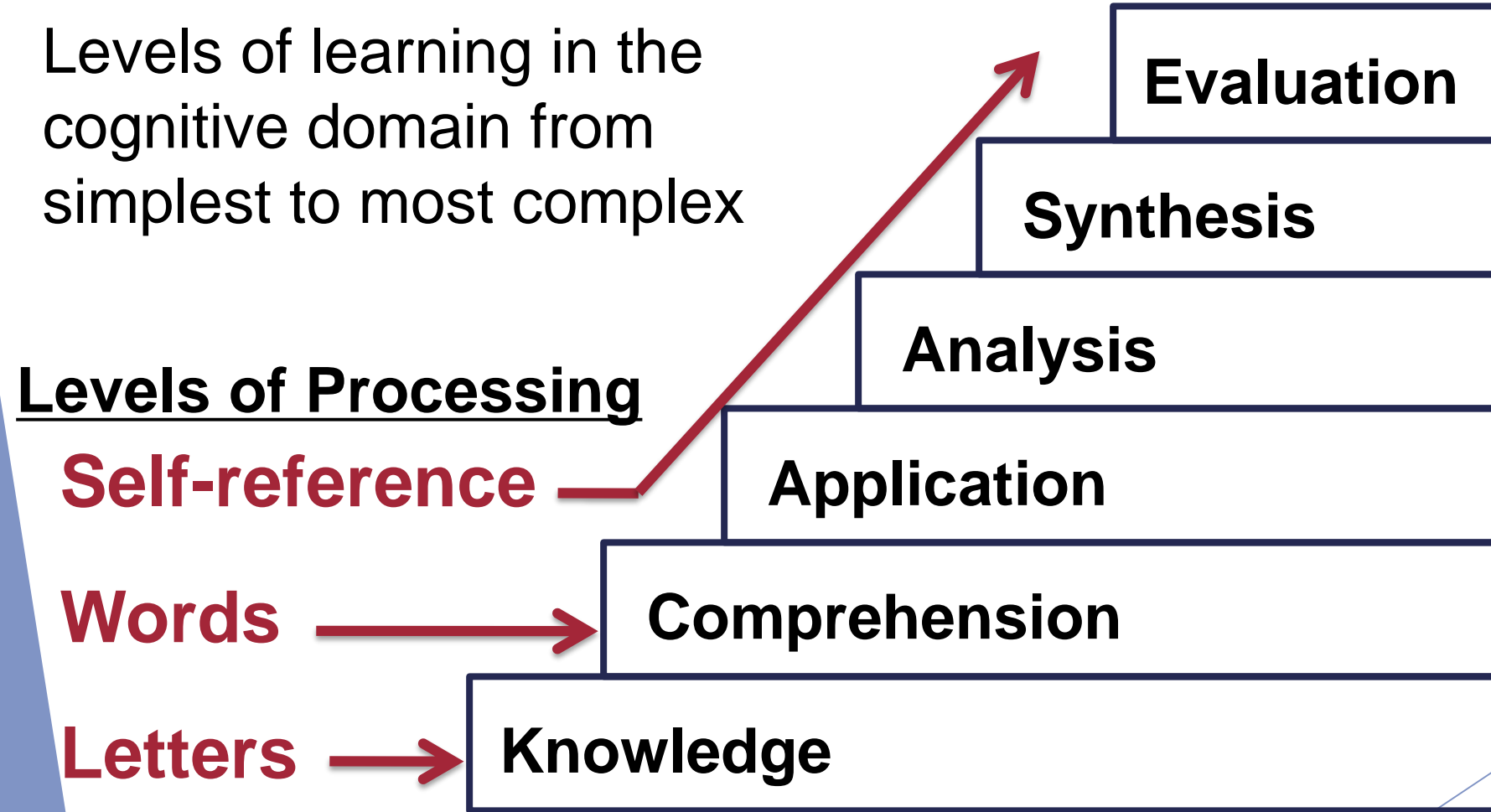
Self-reference: deeper analysis
—> highest retention

The processing of information influences learning & memory.



There are parallels to the levels of Bloom's Taxonomy*

Levels of learning in the cognitive domain from simplest to most complex



*Bloom B. S. (1956). *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*.



Three Major National Research Council Findings

#3

A Mega Cognitive Approach is Needed to Help Students Take Control of their Learning and Promote Independent Thinking:

► IMPLICATIONS:

Provide insight into you internal dialog, tell them why you do what you do.

How this is important?

What are your goals?

Reflection and self inquiry are a practiced skill.

Often we need to help ourselves and our students practice these goals.

Mega Cognition and the Reflective Practice



“Understanding of learning is what oscillates between the inward and outward: An experience, often social, is reflected upon; the record of that reflection receives feedback, which leads to improvement. That combination of personal reflection and social feedback is the reflective practice.” (Pat Hutching)



Higher order thinking will be required of our students as they enter today's job market

This country cannot afford to educate a generation that acquires knowledge without ever understanding how that knowledge can benefit society or how to influence democratic decision making. We must teach the skills and values of democracy, creating innumerable opportunities for our students to practice and reap and the results of the real, hard work of citizenship.

-College and University Campus Compact
President's Fourth of July Declaration on the
Civic Responsibility of Higher Education

Theory and Practice

WHEELLOCK
COLLEGE

So how does this
translate into the
collegiate experience?



COF Center for Sustainability and the Environment

- ▶ Speaker series
- ▶ Earth Day events
- ▶ Community service
- ▶ Research symposium
- ▶ Career events/networking
- ▶ Teach-ins
- ▶ Research and travel grants
- ▶ *Environmental Forum* course**

Environmental Forum

- ▶ Developed in 2004 in collaboration with SENCER (Science Education for New Civic Engagement and Responsibilities)
- ▶ Examination of current issues:
 - ▶ Climate Change
 - ▶ Environmental Health
 - ▶ Sustainable Energy
 - ▶ Water Resources
 - ▶ Urban Ecology
 - ▶ Environmental Health

Service Learning

“... offers a unique opportunity for America's young peopleto get involved with their communities in a tangible way

....engages students in the educational process, using what they learn in the classroom to solve real-life problems.

...they become actively contributing citizens and community members through the service they perform.”

Corporation for National and Community Service (www.learnandserve.org)

Environmental Forum

“Environmental Health”

- ▶ Ecology and Human Health
- ▶ How Human Health Depends on Nature
- ▶ Mercury in the Ocean and Fish
- ▶ Food-borne illness
- ▶ Poisoned water
- ▶ Environmental Justice
- ▶ Occupational Health
- ▶ Public Health Assessment and Public Policy
- ▶ Climate Change and Public Health

Environmental Health Grading

- ▶ 25% Attendance
- ▶ 20% Class participation
- ▶ 30% Written papers (3)
- ▶ 25% Service learning project

Simmons - Scott Ross Center

- ▶ Established in 2000
- ▶ 400 student placements per year
- ▶ Assists student placements in community
- ▶ Assists faculty with “framework”
- ▶ Trains students with “service-learning”
- ▶ Stresses “reflection”

Service-Learning Placements for Environmental Health

- ▶ **Earthworks**
 - ▶ Greening of urban spaces and primary schools in Boston
- ▶ **Healthy Resources in Action**
 - ▶ Lead paint inspections
- ▶ **Jamaica Plain Asthma/Environmental Initiative**
 - ▶ Asthma control for children
- ▶ **Boston Public Health Commission**
 - ▶ Website development
- ▶ **YMCA International Learning Center**
 - ▶ Interviews of immigrant families
- ▶ **Bright Horizons Family Center**
 - ▶ Greening of low income daycare center

Reflection Questions

- ▶ Was this your first service-learning experience?
- ▶ How was this experience for you?
- ▶ How did the work you did with the community partner contribute to your learning in this class?
- ▶ Would you do another service-learning project for another class after this experience?
- ▶ What skills did you learn that you think you will be to use in the future?
- ▶ Do you think you could have gained the learning from your project in another way besides service-learning?
- ▶ Why do think service-learning is used with this course?
- ▶ What did you notice about the communities that you were working with for this project?
- ▶ Did anything surprise you about your placement?

Nicole - *Boston Asthma Initiative*

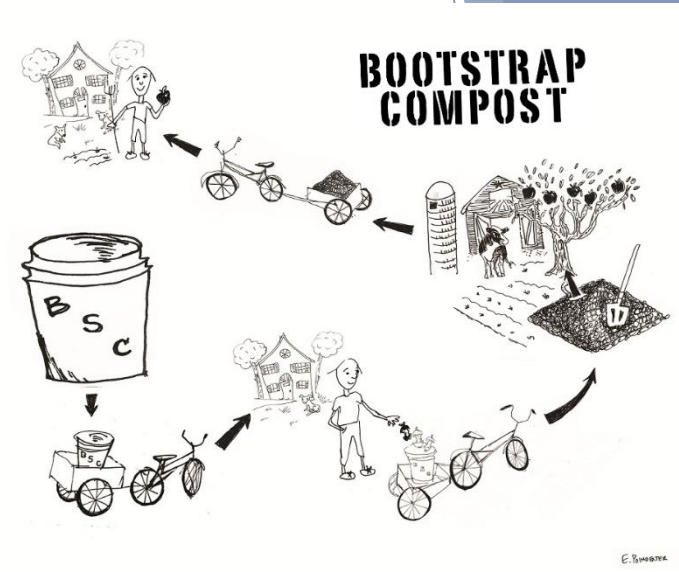
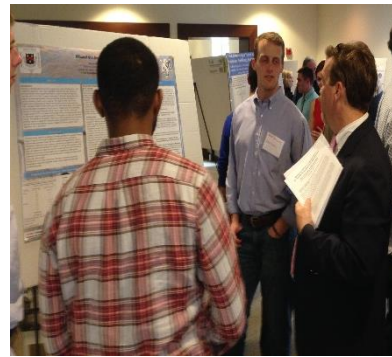
- ▶ “For the project we went to the Jamaica Plain community center from 4 to 6 on Tuesdays and Thursdays, with the goal of improving the asthma of participating children. For the first hour we had the kids sit in a classroom so we could teach them about their condition. That they could gain a better understanding and learn how to control their symptoms. Specifically, we taught them what is happening inside their bodies when they experience symptoms, and what kinds of environmental factors trigger these symptoms. Then we spent the second hour swimming in the pool with the children, assisting them in exercises specifically designed to help their breathing.”
- ▶ “I think it is very important that we students take an active role in the communities around us and I hope to continue my part of this throughout the summer.”

Shenal - *Earthworks*

- ▶ “On Saturday, May 24, I worked at the Hennigan Elementary School. We spent the day weeding, turning over soil, clearing out brush, and laying down compost and fertilizer. Soon that small lot will be a fully functioning garden and it will be a place where anyone can come and enjoy the locally grown produce.”
- ▶ “This was the first service-learning project of this nature that I have participated in, and I was very pleasantly surprised. Working with young children was a simple yet profound way to employ my developing knowledge and understanding of environmental studies. I admire the concept of Earthworks, and I plan on continuing to be involved with them in the future.”

Brenden- *Lead Action Collaborative*

- ▶ “We set out on the streets of East Boston with the program coordinator and surveyed over a hundred houses where the inhabitants could be exposed to lead paint. It was satisfying to see the work we had done with the LAC reinforced key objectives from our Environmental Health class, such as identifying chemical and physical agents that can impact human health.”
- ▶ “Following the completion of this service-learning project, I believe I would partake in another project in the future.”



FRANKLIN
PARK
COALITION

ACE
alternatives for
community &
environment

Building Power for Environmental Justice



Environmental Forum

“Sustainability and Food”

- ▶ Food Creation
- ▶ Food Consumption
- ▶ Food and Health
- ▶ Food and Politics
- ▶ Food and Climate Change



BOYS & GIRLS CLUBS

Students taught elementary students vegetable card games, colored pots, planted herbs and designed a recyclable relay race.



**THE
CAMPUS
KITCHENS
PROJECT™**

The mission of Campus Kitchens is to engage young leaders in working to combat hunger and food scarcity (partnering with local farms and using volunteers)

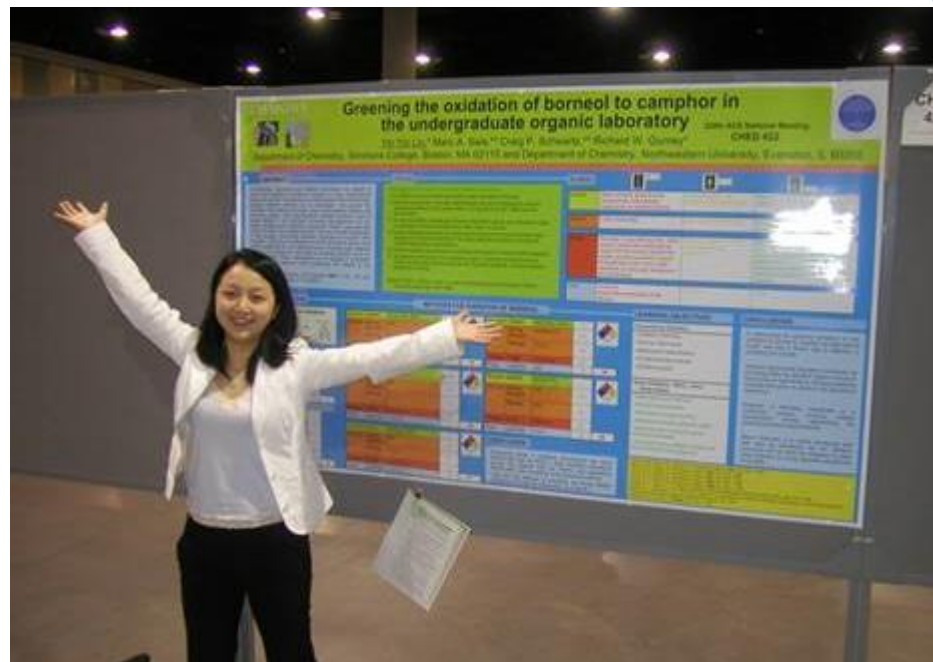
Students plan, cook, and deliver meals in addition to providing outreach support such as teaching nutrition lessons to young mothers and families.

Summary - Integration of Service Learning

- ▶ Increases student involvement in the course subject matter (student reflection)
- ▶ Increases integration of course content (student reflection)
- ▶ Key role of Scott-Ross Center for training and facilitation of community contacts

Student Reflections

- ▶ “Learned creative ways to recycle food and reduce food waste”
- ▶ “Seeing waste reduction in action”
- ▶ “Take knowledge from classroom to community”
- ▶ “Teaching plant growth and where food comes from”
- ▶ “Education is the Key to awareness of sustainability”
- ▶ “Learned how organizations manage sustainability”



How can deans and other academic leaders collaborate with faculty to encourage and support a new pedagogical approach in the classroom?

People resist the personal and organization change that must be made to alter a reality. Leaders capture the natural energy that comes from holding a picture of what might be.

The Eight-Stage Process of Creating Major Change

Modified from Kotter: Leading Change



Thank You