Deep Learning: What we know about the Brain, Active Reflection, and the Development of Agency

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Assistant Professor
My Perspectives and Background

The United States Air Force Academy

- Highly selective, ~4,500 cadets
- Academic, Military, and Athletic Mission
- Newly created division focused on advising undeclared students and administering the First-year programs.

Colorado College

- Small (~2000 students), highly selective, liberal arts
- Supplementary advisor for first-and second-year students
- Involvement with ACM

Doctoral Program

- George Washington University
- Dissertation: An Investigation of Self-Authorship, Hope, and Meaning in Life among Second-year College Students
Presentation Overview

• The Brain and Learning
• The Power of Reflection
  – Reflective Practices
• Hope, Agency, and Self-Authorship
• Applications
  – Academic Advising
  – FYE
Learning Objectives

• As a result of this interactive presentation, you should be able to:
  – Describe the functions of the Frontal Lobe and understand how lack of development may impact learning
  – Explain the connections between Kolb’s Learning Cycle and the Brain
  – Articulate why reflection leads to deep, transformative learning
  – Apply at least one reflective activity to your own teaching
  – Define “agency” and create at least one activity in your discipline that would increase students’ development of agency/self-authorship
  – Identify students’ various levels of intellectual development
  – Apply what you have learned to advance the work of the FACE grant
The Art of Changing The Brain

Enriching the Practice of Teaching by Exploring the Biology of Learning

James E. Zull

Learning Tree:
- Theory
- Practice

James E. Zull's conceptualization of learning as a process involving change, experience, and reflection.
Why do most 16-year-olds drive like they’re missing a part of their brain?

BECAUSE THEY ARE.

Even bright, mature teenagers sometimes do things that are “stupid.”

But when that happens, it’s not really their fault. It’s because their brain hasn’t finished developing. The underdeveloped area is called the dorsal lateral prefrontal cortex. It plays a critical role in decision making, problem solving, and understanding future consequences of today’s actions. Problem is, it won’t be fully mature until they’re into their 20s.

It’s one reason 16-year-old drivers have crash rates three times higher than 17-year-olds and five times higher than drivers in their late 20s. These laws restrict the more dangerous kinds of driving teens do, such as nighttime driving and driving with teen passengers. Since North Carolina implemented one of the most comprehensive GDL laws in the country, it has seen a 25% decline in crashes involving 16-year-olds.

To find out what the GDL laws are in your state, visit Allstate.com/teen. Help enforce them—and if they aren’t strong enough, ask your legislator to strengthen them.

Let’s help our teenagers not mis out on tomorrow just because their brain isn’t fully developed.
Teen Brains Are Not Fully Connected

- The brain's "white matter" enables nerve signals to flow freely between different parts of the brain.
- In teenagers, the part that governs judgment is the last to be fully connected. (Frontal Lobe)
Growing a Grown-up Brain

Scientists have long thought that the human brain was formed in early childhood. But by scanning children’s brains with an MRI year after year, they discovered that the brain undergoes radical changes in adolescence. Excess gray matter is pruned out, making brain connections more specialized and efficient. The parts of the brain that control physical movement, vision, and the senses mature first, while the regions in the front that control higher thinking don’t finish the pruning process until the early 20s.

Frontal Lobe Functions

- Focusing attention
- Organizing thoughts, problem solving
- Weighing consequences
- Considering the future, making predictions
- Forming strategies and planning
- Balancing short-term rewards with long term goals
- Adapting/Shifting/adjusting behavior when situations change
- Impulse control and delaying gratification
- Modulation of intense emotions
- Inhibiting inappropriate behavior, initiating appropriate behavior
- Simultaneously considering multiple streams of information when faced with complex and challenging information
Assessing Prior Knowledge
polleverywhere.com
Power of Reflection

- Zull (2002) points out that learning is deepest when it engages the most parts of the brain.
- Deep learning requires activation of all four areas of the cortex.
- Learning that consists only of memorizing and regurgitating facts fails to activate the frontal integrative area—remains in the back cortex.
Zull’s Model of the Connection Between Brain Function and Human Learning

1. **testing**
   - ultimate step in learning
   - for active learning, motor brain must be engaged
   - writing and talking are forms of testing

2. **gathering**
   - essential to learning
   - mistake to make it the only goal
   - does not always lead to understanding

3. **creating**
   - information flows for thought & planning
   - engages working memory
   - intentional associations selected and manipulated for a purpose

4. **reflecting**
   - where associations originate
   - merged data produces meaningful relationships

*adapted visually by Amy Leigh Johnson from descriptions in “Key Aspects of How the Brain Learns” by James Zull, 2002*
What is Reflection?

• Thinking by linking recent experiences to earlier ones in order to promote a more complex and interrelated framework of understanding.

• Building Connections, Processing Information

• Looking back on our actions some time after they have taken place
What is Reflection?

- Considering the process of our own learning: **metacognition**.
- **Critical** review of behavior or product.
- Building **theory leading to action based on observations**.
- Engaging in personal or **self assessment**.
- Making **decisions** or resolving **uncertainties**.
- Method of processing information in our own voice
- **Empowering** or emancipating ourselves as individuals.

Really?

“I forgot to make a back-up copy of my brain, so everything I learned last semester was lost.”
Reflection Activity

1) Form two concentric circles with equal numbers of in each circle, or one extra in one of the circles if numbers dictate.

2) Form pairs between individuals in the inner circle and individuals in the outer circle (with one triad, if numbers are unequal).

3) Show the photos.

Reflection Activity

• What?
  – **Descriptive**
  – Facts, details, what happened
    To whom, with whom

• So what?
  – **Shift from descriptive to interpretive**
  – Meaning of experience for the participants
  – Feelings involved, lessons learned

• Now what?
  – Contextual—see this situation’s place in the big picture
  – **How might we apply this model to our teaching?**
  – Apply lessons learned and insights gained to new situations
The Learning Pyramid

Average Retention Rates

- 5% Lecture
- 10% Reading
- 20% Audio-Visual
- 30% Demonstration
- 50% Group Discussion
- 75% Practice
- 90% Teaching Others

*Adapted from National Training Laboratories. Bethel, Maine
Role of Reflection in “Deep Learning”


Surface Knowledge (“neuronal networks”)

Changing Cognitive Structure
(“conceptualization/experimentation,” “plasticity,” “synaptic connections”)
(Active Learning, Experiential Learning, Problem-Based Learning, Collaborative/Cooperative/Team-Based Learning, Critical Thinking, Mentoring, Self-Assessment)

Deep Learning

Reflection

Experience

John Zubizarreta, Columbia College, SC
Think-Pair-Share

- Reflect on a strategy for reflection that you use with students.
- Pair with a colleague and share your approaches.
- Share with the large group.

Adapted from John Zubizarreta, Columbia College, SC
Types of Reflective Activities

• Journals
• Reflective Essays
• Oral Reflection
• Reading Reflections
  – What is the main point of the reading?
  – What information did you find surprising? Why?
  – What did you find confusing? Why?

• Electronic Forums, Blogs, Wikis, Discussion Boards
• Digital Storytelling, iMovies, Podcasts
• Exit Cards, One Minute Papers, Muddy Points
• Portfolios and E-Portfolios: 3 Types
  – Documentation
  – Process
  – Showcase
Digital Storytelling Example

- http://vimeo.com/27423355
- http://www.youtube.com/watch?v=IBGzlIlx05s

Download PhotoStory3:

Your Personal Context at USAFA
Metacognition is...

- a habit of mind through which we think about thinking
- is the ability of learners to be aware of, monitor, and evaluate their learning processes
- Metacognitive includes two skills:
  - *self-assessment*
  - *self-management*
What is Agency?

• “taking responsibility for and assuming active ownership of their own educational and life choices.” (Gummer, 2010)
• "the satisfying power to take meaningful action and see the results of our decisions and choices" (Murray, as cited in Kramsch, A'Ness, & Lam, 2000, p. 97).
• Self-awareness, self-regulation, metacognition (thinking about our own thinking), a “sense of self”
• Includes to ability to evaluate information critically, to form one’s own judgments
• Developing one’s own voice and a belief about ability to control an event
• Goal-directed energy, purposeful action
Adult Trait Hope Scale

- Cognitive Model of Hope; 2 Components
- "a positive motivational state that is based on an interactively derived sense of successful (a) agency (goal-directed energy), and (b) pathways (planning to meet goals)" (Snyder, et al., 1991, p. 287).
Adult Trait Hope Scale

- 12-item, 8-point Likert-type response instrument ranging from definitely false (1) to definitely true (8)
- Four items assessing Pathways
- Four items assessing Agency
- Four items serving as distracters
Adult Trait Hope Agency Examples

• I energetically pursue my goals.

• My past experiences have prepared me well for my future.

• I meet the goals that I have set for myself.
Declining Levels of Agency
End of the First to End of the Second year of College

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<tr>
<th>All Survey Respondents</th>
<th>Gain Score M</th>
<th>Gain Score SD</th>
<th>t-test</th>
<th>df</th>
<th>p</th>
<th>Cohen’s Effect Size, d</th>
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<tr>
<td>HOPE Agency subscale (AGEN)</td>
<td>-.924</td>
<td>3.13</td>
<td>-3.86</td>
<td>170</td>
<td>.000**</td>
<td>0.24</td>
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Why Hope Matters?

• Higher Hope positively related higher levels of student achievement and engagement
• Hope is positively related to self-efficacy, coping, problem solving, and self-actualization
  – Self-actualization is a “movement toward full human potential” including being “open to new experience, having a trust in themselves, an internal source of evaluation rather than through others, and a direction toward continued growth” (Sumerlin, 1997, p. 1108).
Why Does Agency Matter?

Holistic View of Development

Separate Domains  Related Domains  Integrated Domains

Cognitive  Interpersonal  Intrapersonal  Cognitive  Interpersonal  Intrapersonal

Cognitive  Personal Agency

Interpersonal  Intrapersonal

Figure 2. Separate, Related and Integrated Perspectives on Domains of Development.

What is Self-Authorship?

- The ability “to construct knowledge in a contextual world, an ability to construct an internal identity separate from external influences, and an ability to engage in relationships without losing one’s internal identity” (Baxter Magolda, 1999, p. 2).

- Students who self-author consider multiple perspectives, reflect on their goals, and make decisions based on internally defined goals and perspectives (Baxter Magolda, 2001; Kegan, 1994).
“How do I know?”

“Who am I?”

**Epistemological Foundation**
View knowledge as contextual
Develop an internal belief system via constructing, evaluating, and interpreting judgments in light of available frames of reference

**Intrapersonal Foundation**
Choose own values and identity in crafting an internally generated sense of self that regulates interpretation of experience and choices

**Interpersonal Foundation**
Capacity to engage in authentic, interdependent relationships with diverse others in which self is not overshadowed by a need for others' approval, mutually negotiating needs, and genuinely taking others' perspectives into account without being consumed by them

**Self-Authorship**
Capacity to internally define a coherent belief system and identity that coordinates mutual relations with others

“How do I want to construct relationships with others?”
Why is Self-Authorship Important?

• Mental Demands of Modern Life, Kegan (1994)
  – “Taking on adult responsibilities, managing one’s own life effectively, and making informed decisions as a member of a community requires something beyond learning particular skills and acquiring particular behaviors.” (Baxter Magolda, 1998, p.143).

• Calls from various agencies and the public for measures of student learning outcomes including:
  – Autonomy, respect for others, problem-solving, responsible citizenship

• Self-Authorship, a holistic model “stands at the core of the contemporary college outcomes” (Baxter Magolda & King, 2004, p. 29)

• Reality: Students are leaving college without the ability to self-author
Journey toward Self-Authorship: From Externally Focused to Internally Focused
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<th>Epistemological Development Models</th>
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<td><strong>Dualism:</strong> world viewed in absolute either-or terms; truth is assumed to be known; info is processed into one of two categories (right/wrong, good/bad, etc); authorities hold truth, so rely on authorities/experts instead of one’s own ideas; tasks that require thinking about options or many points of view are confusing.</td>
<td><strong>Received Knowing:</strong> knowledge comes from “experts” and authority figures; truth is absolute, concrete, factual (good/bad, right/wrong, true/false); learners receive knowledge from authorities; listening/observing is a way to learn; learner not source of learning.</td>
<td><strong>Absolute Knowing:</strong> knowledge is certain or absolute; obtained from authority (instructor); instructor’s role is to communicate knowledge appropriately, ensure students understand it; evaluation used as a tool to show teacher what students learned; content emphasized; teacher-centered.</td>
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<td><strong>Multiplicity:</strong> more tolerance for diverse viewpoints but temporary in areas where Authority “hasn’t found The Answer yet,” questions can legitimately have multiple answers; those who hold different beliefs are no longer seen as simply “wrong”; unable to adequately evaluate points of view, and question the legitimacy of doing so.</td>
<td><strong>Subjective Knowing:</strong> begin to develop unique vision of world; look inside self for knowledge; truth comes from firsthand experience, from intuition; everyone has right to own opinion—all opinions equally valid; there is no absolute authority; actively explore opinions, new sense of autonomy; can hold contradictory beliefs.</td>
<td><strong>Transitional Knowing:</strong> knowledge is partially certain/partially uncertain; students’ role is to understand (less emphasis on acquiring knowledge); students expected to take more responsibility; application emphasized; evaluation focuses on student understanding of material.</td>
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<td><strong>Relativism:</strong> knowledge is relative; uncertainty replaces absolutism; begin to have more faith in own experiences and ideas; begin to differentiate between an unconsidered belief and a considered judgment; Authorities are no longer resisted, but can be valued for their expertise; differing perspectives are not merely acknowledged, but seen as pieces of a larger whole.</td>
<td><strong>Procedural Knowing:</strong> describes two forms: separate focuses on evaluating/judging different points of view, is abstract and analytic; focus is on proving, disproving, convincing (objectivism); connected focuses on others’ experiences/reality; is narrative, holistic, objectivism achieved through other’s perspective; goal is to understand and be understood (constructivism).</td>
<td><strong>Independent Knowing:</strong> knowledge is uncertain - everyone has his/her own beliefs; independent thinking is valued - goal is to get students to think for themselves and to promote independent thinking; peers serve as a source of knowledge; teaching more student-centered.</td>
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<td><strong>Relativism in Commitment:</strong> knowledge and authorities are viewed in much the same way, but students have deliberately - through critical reflection - chosen a particular viewpoint, value, or belief as their own. The difference between this position and the Dualistic position is that the Committed Relativism recognizes that other perspectives may have validity; differing viewpoints are tolerated as long as such</td>
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<td><strong>Constructed Knowing:</strong> integration of knowledge gained from external and internal sources (personal experience and procedural knowledge); emotion and intellect are viewed as unified whole; knowledge is contextual - answers vary due to context in which the question is asked; self and others are on a joint journey to discover/construct knowledge - competence, not role, defines authority.</td>
<td><strong>Contextual Knowing:</strong> knowledge judged on basis of evidence in context; instructor promotes application of knowledge in context; but also evaluative discussion of perspectives; emphasis on exchanging and comparing ideas, thinking through problems, integrating/applying knowledge.</td>
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**Epistemology**
Self-Authorship requires...

• ...transformational learning [DEEP LEARNING] that helps students “learn to negotiate and act on [their] own purposes, values, feelings, and meanings rather than those [they] have uncritically assimilated from others” (Mezirow 2000, 8).
What we really want is...

• “An evolving, growing learner who can...
  – engage with the world of ideas and learn from experience
  – examine and challenge assumptions
  – arrive at commitments through self-reflection
  – relate to others from a place of mutual enhancement rather than need.”

Toward Reflective Conversations: An Advising Approach that Promotes Self-Authorship

By Marcia B. Baxter Magolda, distinguished professor of educational leadership, Miami University; and Patricia M. King, professor, Center for the Study of Higher and Postsecondary Education, University of Michigan

Academic advisers can play a special role in students’ lives, as they are in positions to brainstorm possible futures with their advisees and map out paths to get there. In partnership with other faculty and staff, they can use this opportunity to promote students’ self-authorship, the capacity to internally generate beliefs, values, identity, and social relations (Baxter Magolda 2001; Kegan 1994). Jane Pizzolato writes that “if students were self-authored, they would be more likely to choose majors that were appropriate and interesting to them, engage in critical thinking about their choices, and develop healthy relationships with diverse others” (2008, 19). Becoming self-authored requires transformational learning that helps students “learn to negotiate and act on [their] own purposes, values, feelings, and meanings rather than those [they] have uncritically assimilated from others” (Mezirow 2000, 8). Unfortunately, most traditional-age college students have not yet developed these capacities, both because many enter college having been socialized to uncritically accept knowledge from authorities (including well-meaning faculty) (Mezirow 2000, 8).
FYE
FIRST YEAR EXPERIENCE

Closing the Loop

Using Data for Improvement
Setting Goals and Objectives

Assessment Cycle
Analyzing and Discussing Results

Mapping Learning Opportunities
Assessing Goals and Objectives
Let’s continue to conversations tomorrow...

Thanks for inviting me to join you!

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Presentation References

Other Resources for Advising


