Learning to Think in College: Insights about Metacognition and Student Learning

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Overview for Tonight

- What is metacognition?
  - Learning sciences perspective
  - Self-Authorship perspective
- How is metacognition different from other kinds of cognition?
- How does it develop?
- Implications for Teaching and Research

Goals of Higher Education

For students to become socially responsible autonomous thinkers.

(Mezirow)

➢This requires developing the understanding, skills, and dispositions to become critically reflective of one's own assumptions.

Mezirow, J. (1997). Transformative learning: Theory to practice. In New Directions for Adult and Continuing Education, 74, 5-12.

Goals of Higher Education-2

"We foster the transformation of thought into action, but we also strive to educate for delay, self-criticism, and reflection."   (Shulman, 2002)

"We do not make transformative changes in the way we learn as long as what we learn fits comfortably in our existing frames of reference."

Mezirow (1997). Transformative learning: Theory to practice. In New Directions for Adult and Continuing Education, 74, 5-12.

Metacognition-Hacker and Dunlosky (2003)

- Knowledge about thought processes
- Individual monitoring and control of one's own thinking

Hacker & Dunlosky (2003). Not all metacognition is created equal. *Problem-based learning in the information age*. New Directions for Teaching and Learning, 95, 73-79.

Metacognition (Son, Kenna, Pfirman, 2006)

- Awareness of one's own thinking, learning, knowledge states
- Monitoring one's own learning
- Control over subsequent strategies and reactions
- Knowing about knowing

Son, L. K., Kenna, T. C. & Pfirman, S. (2006). A metacognitive pedagogy: The River Summer Project. Teagle Foundation White Paper.

Metacognition-Sperling et al. (2004)

- *Knowledge of cognition*: understanding of one's own memories and the way one learns

- *Regulation of cognition*: how well one can regulate one's own memories and learning (Brown, 1987)

  - ➢ Knowledge of one's general processing abilities

  - ➢ How to successfully solve problems

  - ➢ When to employ specific strategies

Sperling, R. A., Howard, B. C., Staley, R., DuBois. L. (2004). Metacognition and self-regulated learning constructs. *Educational Research and Evaluation, 10* (2), 117-139.

Cognitive Processing-Levels 1, 2

- 1) **Cognition**: memorizing, reading
- 2) **Metacognition**: Processes invoked to monitor level 1 cognitive processes
  - Knowledge about tasks: how to memorize a list of words
  - Knowledge about strategies: saying the word out loud
  - When to apply the strategy: when memorizing the state capitals
  - Success of failure of these processes: which states did I miss?

Kitchener, K. S. (1983). Cognition, metacognition and epistemic cognition: A three-level model of cognitive processing. *Human Development, 4*, 222-232.

Applying Metacognitive Concepts-All

1) What are the task demands (e.g., memorize, contrast, integrate, apply)?
2) What strategies could you use to approach this task?
3) Which strategies have you mastered?
4) Which would fit this problem/task demand?
5) How successful was this strategy?
6) What would you do differently next time?

Applying Metacognitive Concepts[-1,2]

What are task demands (e.g., memorize, contrast)?

- What am I being asked to do?
- Exs: "How exactly do I write a rhetorical analysis?" "Would you like the paper to be a structured summary? Analysis? My view? Or can I mix them up in some way?"

What strategies could you use to approach this task?

- Help students become aware of options

Applying Metacognitive Concepts-[3,4]

Which have you mastered? How do you know this?

- If asked to summarize a text; how do you know if you accurately identified the important facts and concepts?

Which strategies fit this problem/task demand?

- Ask students to <u>explain</u> the content of their thoughts, strategies, and choices

Winne & Hadwin (1998). Studying as self-regulated learning. In D. J. Hacker, J. Dunlosky, A C. Graesser (Eds.), *Metacognition in educational theory and practice*. Mahway, JN: Erlbaum, pp. 277-304.

Hacker & Dunlosky (2003). Not all metacognition is created equal. NDTL, 95, 73-79.

Applying Metacognitive Concepts[5,6]

How successful was this strategy?

What did you <u>learn</u> from the feedback?

What would you do differently next time?

- Review of exams after the fact
  - Relative to how student prepared
  - Type and source of question
  - Plans to change strategies in light of feedback
- Opportunities to revise papers?

Achacoso, M. (2004). Post-test analysis: A tool for developing students' metacognitive awareness and self-regulation. NDTL, 100, 115-119.

Applying Metacognitive Concepts-Summary

- Help students gain awareness of their own "typical" or default processes
- Help students learn about other processes and strategies
- Help students monitor and be more intentional about choice of strategies
- Commonly applied to "well-structured" problems

Well- & Ill-Structured Problems

Can be described with a high degree of completeness	Cannot be described with a high degree of completeness
Can be solved with a high degree of certainty	Cannot be solved with a high degree of certainty
Experts usually agree on the correct solution	Experts often disagree about the best solution, even when the problem can be considered solved
Goal: Learn to reason to correct solutions	Learn to construct and defend reasonable solutions
King & Kitchener (1994). *Developing*	*Reflective Judgment.* San Francisco: Jossey-Bass.

Cognitive Processing-Level 3

- 3) **Epistemic Cognition**: Processes invoked to monitor the epistemic nature of problems and the truth value of alternative solutions
  - ◦ Limits of knowing
  - ◦ Certainty of knowing   Reflective Judgment
  - ◦ Criteria for knowing
  - ◦ Strategies used to identify different problem types (well- and ill-structured) and choose the appropriate form of solution

Meta- and Epistemic Cognition

- **Metacognition**: leads one to use different level 1 and 2 strategies (1-facts; 2-knowledge of tasks, strategies, when to apply them, success in doing so)
- **Epistemic** cognition leads one to interpret the nature of a problem and to define the limits of any strategy to solving it
- Deep learning requires both.

Cognitive Processes, Mental Models, Schemas, Meaning Making Structures

- Brain research shows how different schemas are activated in certain parts of the brain
- Students fit new facts and perspectives into existing mental models, schemas
- There is great educational value in examining these schemas

The *Development* of Metacognition

- Learning requires interpretation of evidence and experience
  - Learning can occur when new information or perspectives don't fit current schemas.
  - Development occurs when individual realizes that current mental models are not adequate for the task at hand
  - Educators can support the development of new ways of thinking and interpreting (new models/schemas/structures)

Development in Cognitive Complexity

Development as reflected in changes in cognitive structures
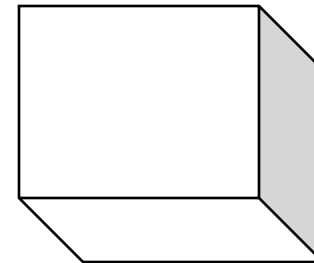
- <u>Early</u> RJ Levels

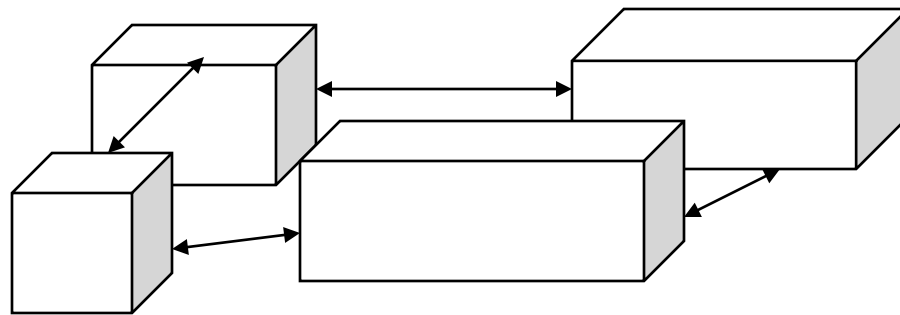Simplistic, one-dimensional reasoning

- <u>Middle</u> RJ Levels

Multifaceted reasoning

Development in Cognitive Complexity

- <u>Advanced</u> RJ Levels: Multifaceted from several perspectives

Makes connections across ideas, perspectives, and contexts.

Metacognition: Toward what?

Awareness of assumptions

--about knowledge (problem-solving)

--about self (purpose, direction, values)

--about relationships with others (independence, tolerance)

Views on Domains of Development
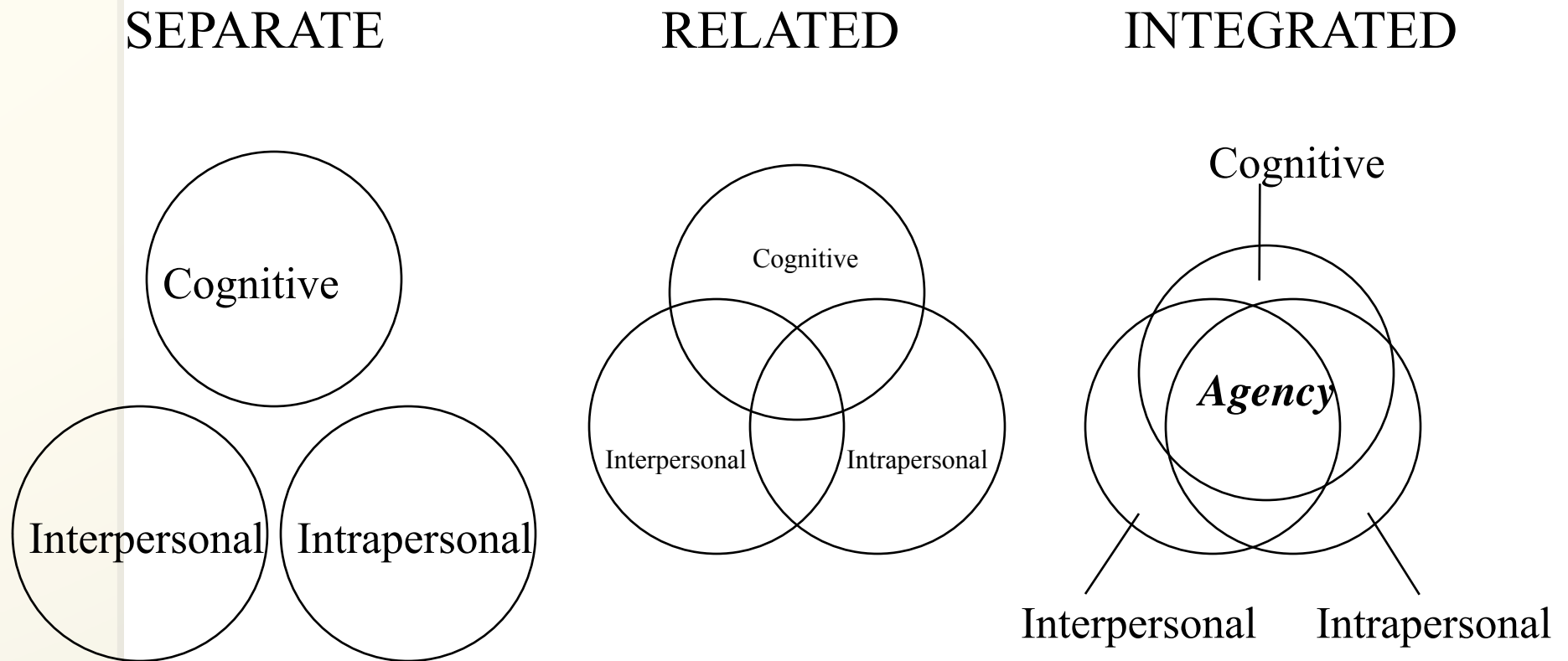
SEPARATE   RELATED   INTEGRATED

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

3 Dimensions of Self-Authorship

◦ Cognitive/Epistemological - what & how one knows (e.g., internal: Reflective Judgments)

◦ Intrapersonal - sense of identity, self-understanding

◦ Interpersonal - how one relates with others (e.g., external: acting to seek approval)

Journey toward Self-Authorship

- External Foundation
  - Follow formulas using absolutistic thinking
  - Rely on peers, parents, instructors for direction and decisions
- Beginning Self-Authorship
  - Begin to make and own one's own judgments
  - Experience tension between external formulas and internal voice
- Internal Foundation
  - Choose and define one's own values and beliefs
  - Strive to be true to oneself

Metacognition and Self-Authorship

- Students who follow external formulas cannot think about their own thinking (make it "object") because they are "subject" to it.

- Self-regulation requires the capacity to see oneself as capable of that kind of control (intrapersonal) and willing to embrace this as one's own responsibility (interpersonal).

Metacognition and Self-Authorship

- High level awareness of one's reasoning and self-regulation requires at least mid-level epistemic cognition.
- To fully employ metacognitive strategies requires self-authorship

Linking Learning and Development

1. What individuals learn and claim to know is grounded in how they construct their knowledge.

2. This closely tied to their sense of self.

3. Meaning making improves in a developmentally related fashion over time.

4. Students are better served when learning is defined to encompass cognitive <u>and</u> personal development and when instruction is sensitive to the developmental issues underlying educational processes.

King, P. M. & Baxter Magolda, M. B. (1996). A Developmental Perspective on Learning. *Journal of College Student Development, 37*(2), 163-173.

Educational Implications

- Invite students to reflect on their learning
  - Across classes
  - Between curricular and co-curricular experiences
- Scaffold deeper reflection
  - Examples: Wabash National Study Interview
  - Academic advising contexts

Baxter Magolda, M. B. and King, P. M. (2008). Toward reflective conversations: Promoting self-authorship through advising. *Peer Review, 10* (1) 8-11.

Wabash National Study – Sample Interview Protocol Questions

- You've talked about some of your important experiences and what they've meant to you. How do these collective experiences and the way you've interpreted them, *shape who you are* right now?

In-Depth Interview--Wabash National Study of Liberal Arts Education

Wabash National Study – Sample Interview Protocol Questions

- Has there been a time when what you wanted and what others wanted from you *conflicted*?

- Have you been in a situation where you struggled with doing the right thing?

In-Depth Interview--Wabash National Study of Liberal Arts Education

Wabash National Study – Sample Interview Protocol Questions

- How do you think coming to college has affected you?

- Thinking about your overall experience, what did you gain from college this year?

In-Depth Interview--Wabash National Study of Liberal Arts Education

John Dewey:

"We never educate directly, but indirectly by means of the environment. Whether we permit chance environments to do the work, or **whether we design environments for the purpose makes a great difference**."

Educational Implications

- Promote a culture of reflection
  - Where do opportunities for reflection build upon and reinforce each other?
  - How does what you learned in that class contribute to your understanding of your major? How will your experiences this year affect your goals for next year?
  - Artifacts that promote reflection

Ideas in Need of Data

- What kinds of reflective, metacognitive activities are offered on your campus?

- How are these actively encouraged (scaffolded)?

- How are the ways these are offered for first-year students different from the ways they are offered for juniors & seniors?

- How are disciplinary differences addressed?

Thank you!

- For thinking together about thinking!
- For reflecting on reflection!
- For cognitioning about metacognition!