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# Teaching characteristic ways of thinking in your field

Kathleen M. Quinlan

Reader in Higher Education and Director

Centre for the Study of Higher Education

# Objectives

- articulate the big ideas and characteristic habits of mind and heart of your field
- consider the key challenges students face in learning your discipline
- explore how you can scaffold students’ practice of core habits to overcome those challenges

# Research-teaching nexus - one dimension

Students as participants

Students as audience

(Griffiths, 2004,
cited in Healey, 2005)

# Research-teaching nexus – first dimension

Emphasis on research content

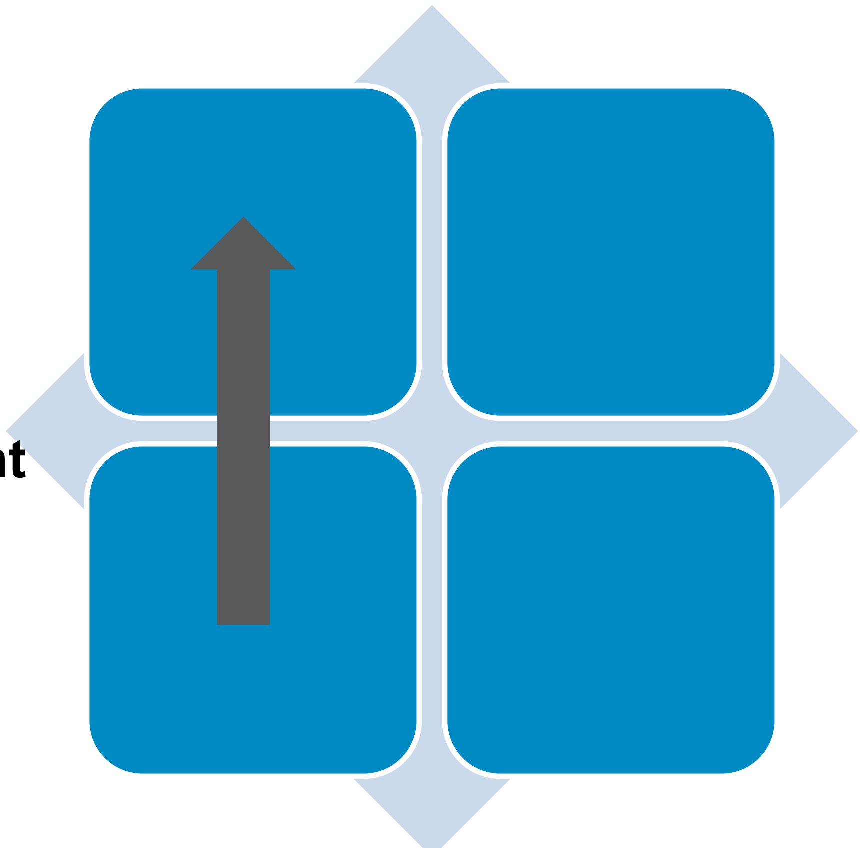
Emphasis on research process or problems

(Healey, 2005, p. 70)

# Research-teaching nexus – involving students with content

Students as participants

**Emphasis on research content**

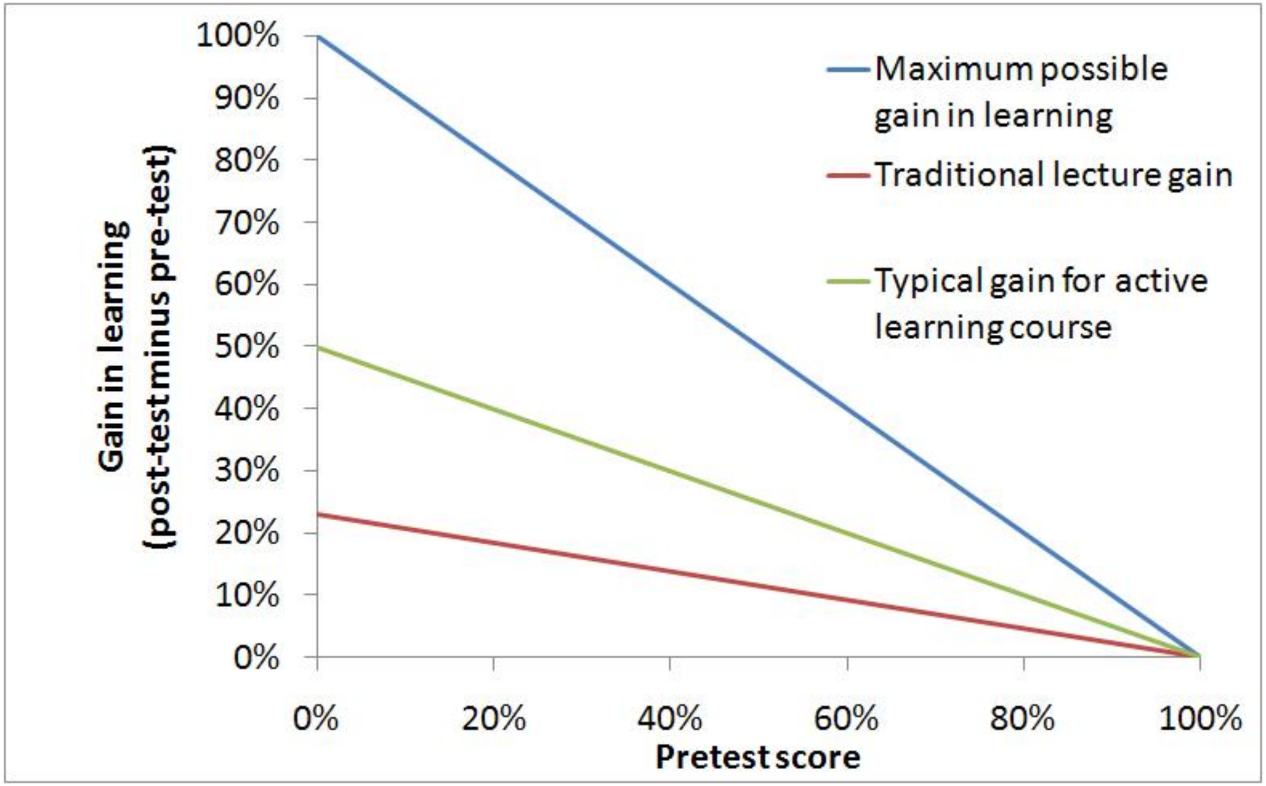


Emphasis on research process or problems

Students as audience

(Healey, 2005, p. 70)

# Students Learn More as Active Participants




Adapted from Hake, R.R., 1998. Interactive-engagement versus traditional methods: A six-thousand student survey of mechanics test data for introductory physics courses. *American Journal of Physics* **66**, pp. 64–74.

# e.g. Threshold concepts

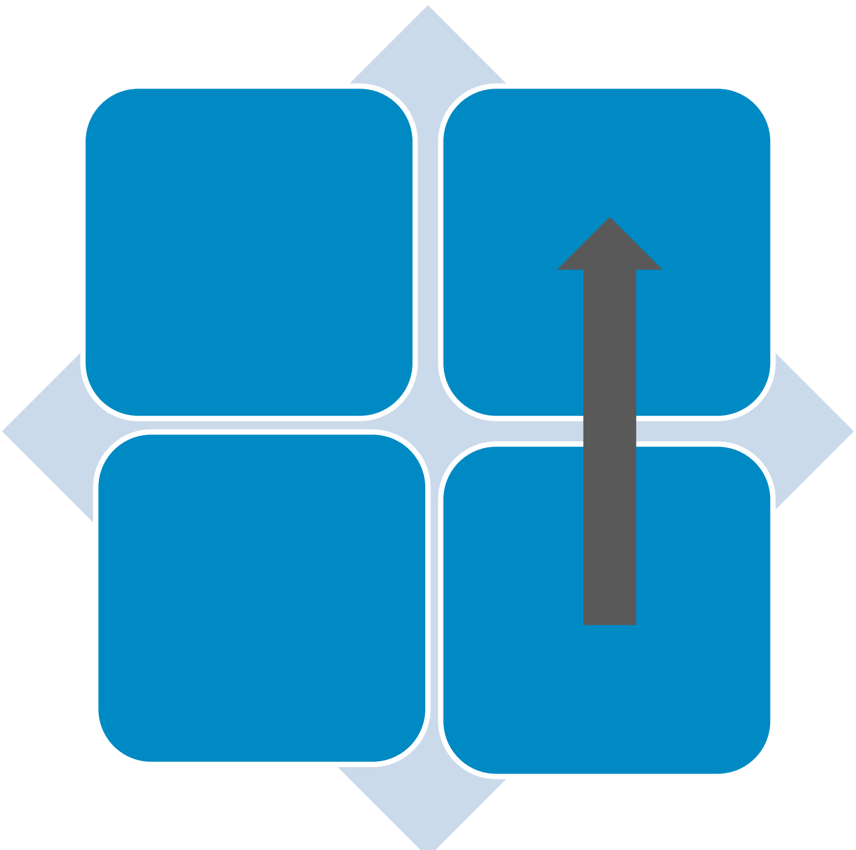
# “Big ideas” in your discipline

- What do students *need* to know in your discipline?
  - If you met a graduate of your programme one year after graduation, what is the one “big idea” you would hope they’d have taken away?
- What big ideas, concepts or content do students find particularly “troublesome” in your discipline?
- How are these emphasised in your objectives?

# Research-teaching nexus

Students as participants

Emphasis on research content



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(Healey, 2005, p. 70)

# Cognitive apprenticeship as a framework assumes:

- experts have particular ways of reasoning about a subject
- University offers an apprenticeship in THINKING
- students are not just learning content, but ways of thinking, reasoning and problem solving
- Learning happens in a community of practice

(Collins, A. 2006. Cognitive apprenticeship. In R.K. Sawyer (ed) The Cambridge Handbook of the Learning Sciences. Cambridge Univ. Press.)

# Cognitive apprenticeship: Two dimensions

- The nature of the instructional tasks and processes
- The social environment: communities of practice

# e.g. Thinking like an historian

- Imagine a typical historical question and how YOU reason about it.
- How would you approach answering that question? What do you attend to first? Second? Third? What are your thought processes? What mental ‘rules of thumb’ do you use?
- How do you want students to approach defining a problem or establishing a question? To interpreting primary sources? To crafting an historical argument?

# e.g. Thinking like a scientist

- Imagine a typical scientific problem and how YOU reason about it.
- How do you approach designing an experiment? What do you attend to first? Second? Third? What are your thought processes? What mental ‘rules of thumb’ do you use?
- How do you want students to approach defining a problem or establishing a question? the design of an experiment? The interpretation of results?

# Cognitive apprenticeship:  Teachers

- Model
- Coach
- Scaffold
- Fade


# Cognitive apprenticeship: Teachers help students to:

- **Articulate:** verbalize knowledge and thinking
- **Reflect:** identify strengths and weaknesses, see what is working and how well
- **Explore:** pose and solve their own problems

# Cognitive apprenticeship: Sequencing (ordering learning activities)

- Increasing complexity and difficulty gradually
- Increasing diversity: practice in a variety of situations
- Global to local skills: conceptualise the whole task before executing the parts

# Cognitive apprenticeship: social characteristics of learning environments

- **Situated learning:** learning in the context of working on realistic tasks
- **Community of practice:** legitimate peripheral participation in a community of scientists, learning communication skills
- **Intrinsic motivation:** students set personal goals to seek skills and solutions
- **Cooperation:** students work together to accomplish their goals

# Social practices: how do you WORK in a your academic community?

- How do people work together to build knowledge?
- How is a research team constructed (if at all)?
- How do different research teams or individuals interact?
- How do junior staff/students get integrated into the community?

# Research-teaching nexus

Students as participants

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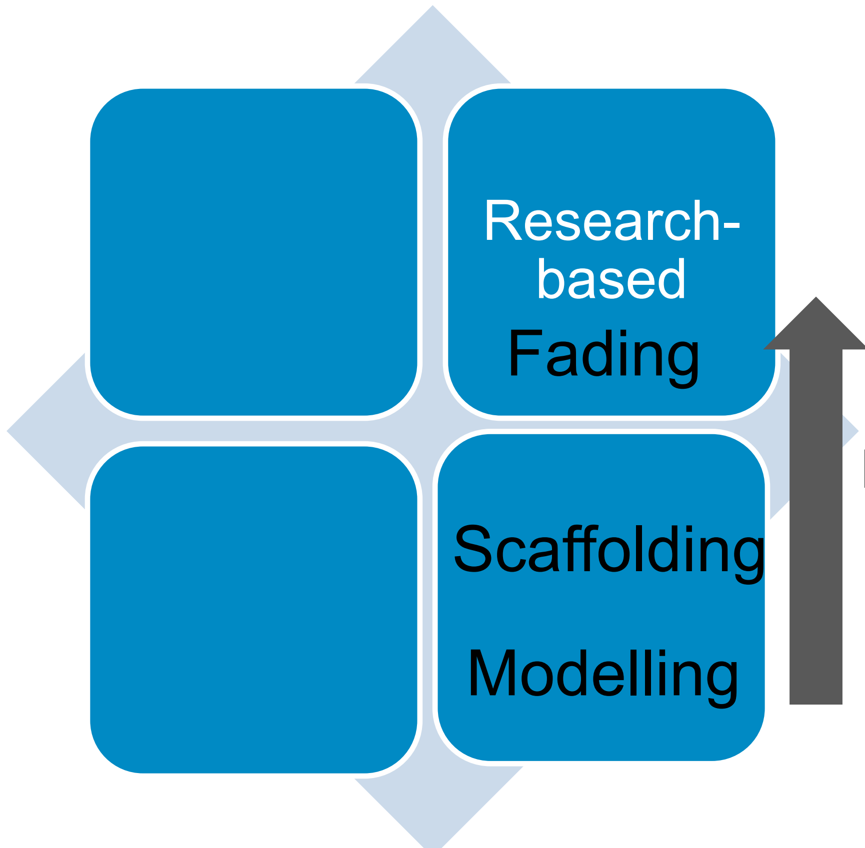


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Students as audience

# Discussion: Thinking in your discipline

1. What are the habits of mind (and heart) at the heart of your discipline? What does it mean to be an (e.g.) historian or a pharmacist or a social scientist?
2. Which aspects of *thinking* (in your discipline) are you asking student to practice? (i.e. which are you modelling, which are you coaching, scaffolding and fading?)
3. How? Through what activities?
4. Which aspects of this thinking process do students struggle with the most? How might you further scaffold it to enable them to practice steps along the way?

# Example: learning objectives for a lab practical in the sciences

1. **formulate hypotheses**
2. solve problems
3. use knowledge and skills in unfamiliar situations
4. **design simple experiments to test hypotheses**
5. use laboratory skills in performing experiments
6. **interpret experimental data**
7. describe clearly the experiment
8. remember the critical idea of an experiment over a significantly long period of time.

(Kirschner & Meester, 1988).

# Example in Science Labs: Different types of laboratories by degree of guidance

| Style of lab | Outcome | Approach | Procedure |
|---|---|---|---|
| Expository | Predetermined | Deductive | Given |
| Problem-based | Predetermined | Deductive | Student-generated |
| Discovery | Predetermined | Inductive | Given |
| Inquiry | Undetermined | Inductive | Student-generated |

From Domin, D.S. 1999. A review of laboratory instruction styles *Chemical Education Research*.

# Example in first year classics

- Learning objective: Students use multiple source types to interpret the ancient past

1. Model finding sources, interpreting sources
2. Recommend one or two core sources for a thematically based seminar, expect students to bring one
3. Collaboratively interpret multiple sources
4. Over time, depend more and more on students

# Example in psychology programme

- Learning objective: conduct a research study
- Year 1 –
  - being a participant in a research project.
  - Doing structured statistics labs with “clean” datasets.
  - Seminars with templates of guided questions for reading journal articles
- Year 2 –
  - Research Experience Scheme option working with “real data”
  - Continuing statistics labs
  - Presenting papers in seminars, learning to write an introduction
- Final year –
  - Individual research project – analyse and write one’s own study

# Discussion – in disciplinary clusters

1. What are the typical pedagogies in your field?
2. How well do those typical pedagogies help students engage in the thinking process that characterise their disciplines?
3. How can teaching be enhanced to engage students in those key thinking processes?

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# How to engage students as participants with content?

- Think-pair-share and other peer learning
- Predict-observe-explain (White & Gunstone, 1992)
- (e.g. Erik Mazur, Harvard and examples and examples at UBC e.g.
- http://blogs.ubc.ca/wpvc/video-05-an-active-maths-class/
- Concept mapping (Novak,1990)

# Typical Concept Mapping Activity

- Introduce a concept
- Brainstorm related concepts (5-20)
- Identify which are the most important or most inclusive concepts (i.e. Ranking) – put most important concept at the top of the page.
- Connect concepts with directional links (arrows and linking words)
- Share the maps
- Suggest ways of improving the maps

  - Several variations: See Michael Zeilik handout

# Sample concept map

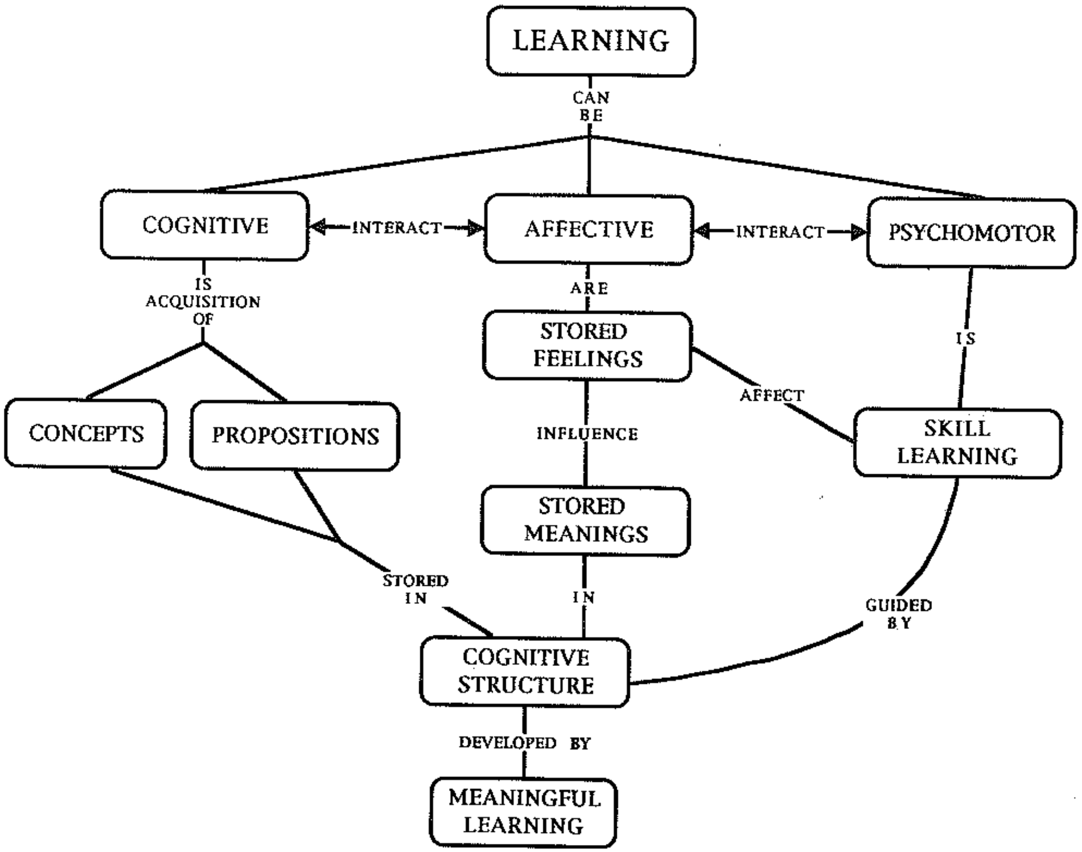


FIG. 3.5. Humans have three distinct but interacting systems for learning, each of which has its own forms of information storage. Meaningful learning underlies development of cognitive structure, which strongly influences our affective and psychomotor learning.

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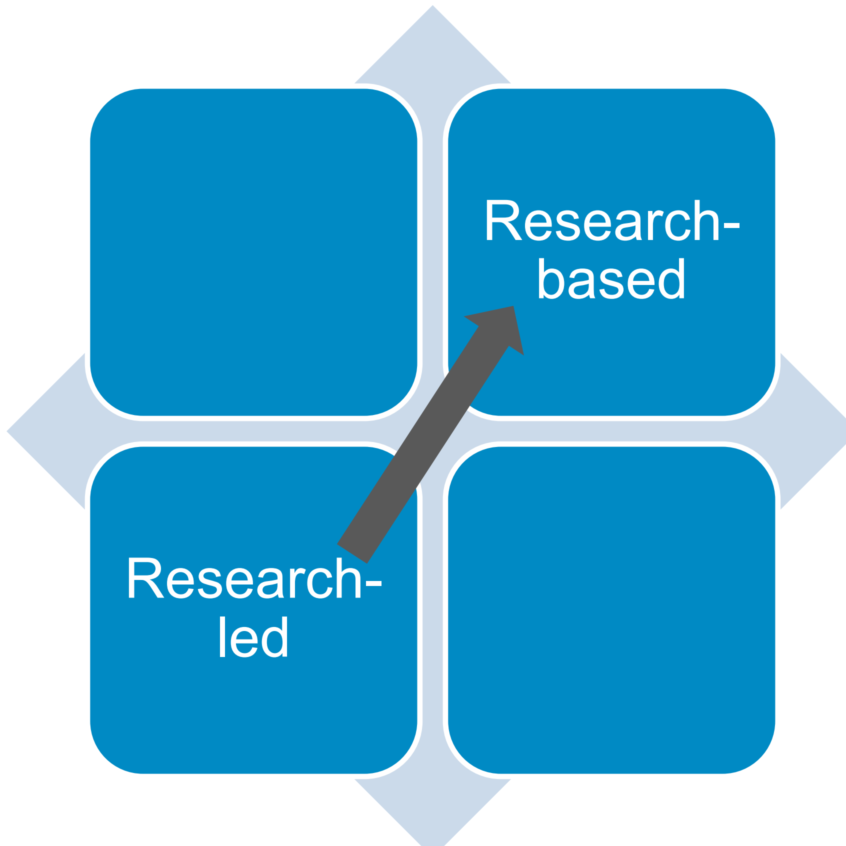


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