Nurturing Critical Thinking through Brain Compatible Learning Environments

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Wikipedia generation is lazy and unprepared for university’s rigours, survey of faculty says

Toronto Star, April 6, 2009

The evidence is strong that they [Net Geners] are the smartest generation ever. [They have] been given the opportunity to fulfill their inherent human intellectual potential as no other generation.

What is meant by a Brain-Compatible Learning Environment?

Brain Compatible versus Brain Antagonistic
The case for critical thinking as the central learning target

“Although thinking is innate, skillful thinking must be cultivated”
Art Costa, 2008

“Students who passively receive information are far less likely to understand what they have heard or read about than are students who have critically scrutinized, interpreted, applied or tested this information.”
Roland Case, 2005

“We are into the age of synthesis, with a real empirical bite to it. Therefore, sapere aude. Dare to think on your own.”

“Any subject—be it physics, art, or auto repair—can promote critical thinking as long as teachers teach in intellectually challenging ways.”
Nel Noddings
Evidence of the Myths
from a study by Richard Paul (1997) of 66 post-secondary institutions in California (including Stanford, USC, UCLA, Berkeley)

- 89% of faculty view critical thinking as a primary educational objective, yet only 19% could clearly explain its meaning.
- 78% of faculty acknowledged students’ lack of appropriate criteria to assess their thinking, yet only 8% could enumerate any intellectual criteria required of their students.
- 82% of faculty involved students in thinking critically at least once a class, yet only 15% required this in writing.
- 77% of faculty had little or no conception of how to reconcile content coverage with the fostering of critical thinking.

Criteria:
inconsistent with other claims
limited relevance to my argument

2. Detect the anomalous claim
A reason to marry critical thinking and teaching of content

“If the mind of the child when learning, remains merely passive, merely receiving knowledge as a vessel receives water which is poured into it, little good can be expected to accrue. It is as if food were introduced into the stomach which there is no room to digest or assimilate, and which will therefore be rejected from the system, or [sit] like a useless and oppressive load upon its energies.”

Edgerton Ryerson, 1847
So, what is critical thinking?

- A complex activity, not a set of generic skills,
- Concerned with judging or assessing what is reasonable or sensible in a situation,
- Focuses on *quality of reasoning*,
- Depends on the possession of relevant knowledge
- Can be done in endless contexts and is required whenever the situation is problematic
- Is effortful but not necessarily negative
Powerful Headline

✓ Four Medals and a Funeral

National Post February 27, 2006

Criteria for Judgment

• Informative
• Relevant
• Concise
• Engaging
Which is the most powerful headline?

- “Britney Shears”
- “The Buzz on Britney”
- “Oops, She Did it Again!”
- “Britney Spears Shaves Head, Gets Two Tattoos”
Five people were injured and 15 were arrested Saturday night after police responded to a stabbing at a San Bernardino punk-rock concert and ultimately clashed with concert-goers, San Bernardino authorities said.

The stabbing victim, whose name has not been released, remained in the hospital Sunday, said Sgt. Dale Blackwell of the city’s police department. Four officers and another concert-goer also suffered injuries, Blackwell said. The officers were treated at the hospital and released, he added.

Two police cars were destroyed, Blackwell said, and four others had minor damage. Nearby businesses also experienced “significant damage,” he said, as concert-goers smashed windows and ransacked some establishments.

Officers arrested people for offences ranging from public drunkenness to assault with a weapon and burglary, Blackwell said. The concert featured several popular bands, including The Addicts, Vice Squad and GBH.

From the Los Angles Times in the Edmonton Journal March 6, 2006
When is someone thinking critically?

A person is thinking critically only if she is attempting to **assess or judge** the merits of **possible options** in light of **relevant factors or criteria**.

**Critical thinking is criterial thinking**—thinking in the face of criteria.
Comparing teaching methods

- In a critical thinking approach . . .
  - students figure out a reasonable answer
  - we help them develop the tools to do this successfully

- In a “traditional” approach . . . .
  - we teach the answer
  - students try to remember it
A Definition of Critical Thinking

TC2 defines critical thinking as the thinking through of a problematic situation about what to believe or how to act where the thinker makes a reasoned judgment that reflects competent use of the intellectual tools for quality thinking.
TC² Model of Critical Thinking

Teach and Assess the Intellectual Tools

Community of Thinkers

Critical Challenges

Background Knowledge

Criteria for Judgment

Critical Thinking Vocabulary

Thinking Strategies

Habits of Mind
<table>
<thead>
<tr>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the ingredients in Bertie Bott’s Every Flavor Beans?</td>
<td>What is your favourite flavour of Bertie Bott’s Every Flavour Beans?</td>
<td>Should Bertie Bott’s Every Flavour Beans be sold in school cafeterias?</td>
</tr>
<tr>
<td>What are three activities in Stoney Creek?</td>
<td>Would you like to move to Stoney Creek?</td>
<td>Would your family’s needs be better met in Hamilton or Stoney Creek?</td>
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<tr>
<td>Identify several natural disasters that impact on the environment?</td>
<td>Which natural disaster creates the most fear for you?</td>
<td>Which natural disaster poses the great threat to the Ontario economy?</td>
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<td>List three types of exercise.</td>
<td>What is your favourite type of exercise?</td>
<td>Which sport would best meet the needs of someone with asthma – diving, soccer or tennis?</td>
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<tr>
<td>What did the Inuit use to make tools?</td>
<td>What geographic feature of Nunavut do you like the most?</td>
<td>Which natural resource – diamonds or fish – are most important to northern society?</td>
</tr>
</tbody>
</table>
Come up with your own examples!

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<tr>
<th>Type 1</th>
<th>Type 2</th>
<th>Type 3</th>
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</thead>
<tbody>
<tr>
<td>Why do people go shopping?</td>
<td>Do you like shopping?</td>
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<td>What is your favourite genre of movie?</td>
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Criteria for Effective Critical Questions/Challenges

- Does the question or task require reasoned judgment? (i.e., involve assessment among plausible options/possibilities based on criteria)
- Is the challenge likely to be perceived as meaningful by students?
- Will significant curricular understanding be uncovered as students work through the challenge?
- Is the challenge focused so as to limit the required background knowledge?
How would your students respond to the following task?

Which lifestyle would you have preferred - that of the habitants, priests or nuns, or the coureurs des bois?

From Bain, Colin M., Canadian History 7, Pearson, 2007
Who had the best life?

<table>
<thead>
<tr>
<th>People in New France</th>
<th>Pluses</th>
<th>Minuses</th>
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<th>Rating</th>
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<td>Priests and Nuns</td>
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<td>1 2 3 4 5</td>
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<tr>
<td>Coureurs des bois</td>
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Working with Critical Challenges

Critical Challenges defined:
Critical Challenges are problematic situations which require learners to consider evidence in light of criteria to arrive at a reasoned judgment or decision.
Designing Critical Challenges

Critical challenges may take one of the following six forms:

- Critique the piece
- Judge the better or best
- Rework the piece
- Decode the puzzle
- Design to specs
- Perform to specs
Can you help out Lou Costello?

A. Uncover the conceptual error in Lou’s mathematical thinking

B. Design a learning activity that would help Lou in understanding this conceptual error by providing an alternative solution to the math problem being discussed.

What kinds of prompts are these two critical challenges?
Which is the most powerful image of the Underground Railroad?
Which is the most powerful image of the Underground Railroad?

* informative * provocative * evocative
QuickTime™ and a TIFF (LZW) decompressor are needed to see this picture.
Working with Historical Sources

Begin by Deciphering the message:
- What is the dominant perspective – Aboriginal, European, or is it balanced?
- What evidence supports your conclusion?

Then… reinterpret the drawing:
- What changes would you make to change the dominant focus of the drawing?
- Why would you make these changes?