From theory to practice: supporting the development of reflective judgment skills in the classroom

A workshop presented at the biennial meeting of IMBES, November, 2014
Theo L. Dawson, Ph.D.
The main points
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- To thrive in a complex, challenging, and changing world, we need well-educated brains.
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- Well-educated brains feature rich, integrated neural networks that are cultivated through action, reflection, and analysis.
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- Well-educated brains feature rich, integrated neural networks that are cultivated through action, reflection, and analysis.
- Educational assessments and instruction should support the development of robust knowledge networks.
The main points

› To thrive in a complex, challenging, and changing world, we need well-educated brains.

› Well-educated brains feature rich, integrated neural networks that are cultivated through action, reflection, and analysis.

› Educational assessments and instruction should support the development of robust knowledge networks.

› Equipped with a simple learning model and good diagnostic assessments, classroom teachers can support optimal learning for every student.
A model of learning
Neurons that fire together wire together.
Sort task
Conception of a good leader (entry level employee)

A good leader

10.5

has good people skills

New idea

Building block

recognizing good people

good work ethic

doing whatever it takes

knowing how to reward people

fair but not a pushover

knowing how to motivate people
A good leader

- creates dynamic teams
  - which requires
    - good people skills
      - valuing individual qualities of persons
        - recognizing talent
      - listening deeply
        - cultivating these skills in others
      - open lines of communication at every level
        - letting people know who you are
500 addicted babies
The dopamine/opioid cycle
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- It’s the cycle that gets hijacked in addiction.
The dopamine/opioid cycle

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Virtuous cycles of learning

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- When we get to feel the pleasure of learning/understanding something just often enough (in the “Goldilocks zone”), the dopamine/opioid cycle supports optimal learning.
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- We call these cycles virtuous (**dopamine/opioid**) cycles of learning (and yes, they are addictive)
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Virtuous cycles of learning

“Students don’t remember what they learned last year!”
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- There is a 5-7 year range of capability in a typical classroom.
“Students don’t remember what they learned last year!”

- There is a 5-7 year range of capability in a typical classroom.
- Students learn best when new information is in their Goldilocks Zone…
  - approximately 1/4 of a level above their level of performance
  - yet all students in a given classroom are expected to learn the same material.
“Students don’t remember what they learned last year!”

- There is a 5-7 year range of capability in a typical classroom.
- Students learn best when new information is in their **Goldilocks Zone**…
  - approximately 1/4 of a level above their level of performance
  - yet all students in a given classroom are expected to learn the same material.
- Students who are not in the zone are not able to effectively integrate new knowledge into their knowledge networks.
Poorly-connected networks grow slowly.

Developmental gains with and without good argumentation skills

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Poorly-connected networks grow slowly.

- On average, students grow 0.1 - 0.15 of a level per year in grades 4-13.
Poorly-connected networks grow slowly.

- On average, students grow 0.1 - 0.15 of a level per year in grades 4-13.
- Students with poorly-connected networks (observable in the coherence of their arguments) develop slower

Virtuous cycles of learning
Growing a robust knowledge base
Building robust knowledge

What is robust knowledge?
What is robust knowledge?

› Breadth
  - how much you know
  - facts and procedures
What is robust knowledge?

‣ **Breadth**
  - how much you know
  - facts and procedures

‣ **Depth**
  - how deeply you understand what you know
  - how well connected your conscious and unconscious neural networks are (whole self)
What is robust knowledge?

‣ **Breadth**
  - how much you know
  - facts and procedures

‣ **Depth**
  - how deeply you understand what you know
  - how well connected your conscious and unconscious neural networks are (whole self)

‣ **Quality**
  - the accuracy of your conscious and unconscious knowledge (valid intuitions)
  - how adequate your knowledge is (relative to task demands)
Building robust knowledge

How do you build it?
Building robust knowledge

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- **Breadth**—access to high-quality factual and procedural knowledge
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- **Depth**—frequent opportunities to apply new information (e.g., through action inquiry, problem-focused learning, collaborative learning)
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- **Quality**—regular feedback and reflective analysis of information, emotion, and outcomes
Building robust knowledge

How do you build it?

- **Breadth** — access to high-quality factual and procedural knowledge

- **Depth** — frequent opportunities to apply new information (e.g., through action inquiry, problem-focused learning, collaborative learning)

- **Quality** — regular feedback and reflective analysis of information, emotion, and outcomes

- When all of these ingredients are present (and we’re in the **Goldilocks Zone**), our neural networks develop optimally and “getting higher” takes care of itself.
The virtuous cycle of learning

set

reflect

seek

apply

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The virtuous cycle of learning

Virtuous cycle of learning

set

reflect

apply

seek (breadth)
The virtuous cycle of learning

set

reflect

seek (breadth)

apply (depth)
The virtuous cycle of learning

Virtuous cycle of learning

(set) seek (breadth)

(apply) reflect (quality)

TMD
Learning approaches that are virtuous cycles

- Action inquiry (Torbert)
- Problem-based learning (Barrows)
- Collaborative learning (Findley)
- Loop learning (Argyris)
- Bloom’s Taxonomy
- Kolb’s experiential learning cycle
- Freire’s dialogical action
- Mezirow’s transformative learning
Set learning goals.

- Based on
  - standards
  - curricular objectives
Gather new information.

- Didactic instruction (Yes, it has a legitimate role.)
- Reading
- Watching
- Listening
- “Library” research
- Perspective-seeking
- Self-monitoring
Virtuous cycle of learning: applying

Work with new information.
Work with new information.

- Applying it in practice
  - experimenting
  - building
  - teaching
Work with new information.

- Applying it in practice
  - experimenting
  - building
  - teaching
- Using it to solve problems
Virtuous cycle of learning: applying

Work with new information.

- Applying it in practice
  - experimenting
  - building
  - teaching
- Using it to solve problems
- Connecting it with what you already know through
  - writing
  - critical discourse
  - concept mapping
Work with new information.

- Applying it in practice
  - experimenting
  - building
  - teaching
- Using it to solve problems
- Connecting it with what you already know through
  - writing
  - critical discourse
  - concept mapping
- Formative testing
Practice reflective/analytic skills.
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- Skills for evaluating information and evidence
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- Skills for evaluating information and evidence
- Skills for seeking and making use of feedback
Practice reflective/analytic skills.

- Skills for evaluating information and evidence
- Skills for seeking and making use of feedback
- Skills for reflecting on outcomes
Practice reflective/analytic skills.

- Skills for evaluating information and evidence
- Skills for seeking and making use of feedback
- Skills for reflecting on outcomes
- Awareness of cognitive biases and skills for avoiding them
Virtuous cycle of learning: analysis

Practice reflective/analytic skills.

- Skills for evaluating information and evidence
- Skills for seeking and making use of feedback
- Skills for reflecting on outcomes
- Awareness of cognitive biases and skills for avoiding them
- Mindfulness and self monitoring
Recalibrate learning goals.

- Based on
  - standards
  - curricular objectives
  - the learner’s current level of performance
  - what comes next in the Goldilocks Zone
Ideal assessment in virtuous learning cycles
Measuring and supporting learning

Ideal assessment in virtuous learning cycles

- Support learning and development.
Ideal assessment in virtuous learning cycles

- Support learning and development.
  - Measure the depth and quality of knowledge networks and reflective/analytic skills.
Ideal assessment in virtuous learning cycles

- Support learning and development.
  - Measure the depth and quality of knowledge networks and reflective/analytic skills.
  - Support the development of robust knowledge networks and reflective/analytic skills by leveraging the natural learning cycle.
Support learning and development.

- Measure the depth and quality of knowledge networks and reflective/analytic skills.
- Support the development of robust knowledge networks and reflective/analytic skills by leveraging the natural learning cycle.
- Tell learners and educators what comes next, so learning always takes place in the Goldilocks Zone.
The RFJ001 examines students’ reasoning about inquiry and evidence, the quality of information and evidence, and the nature of knowledge. It includes questions like the following:

1. Some scientists think that violent TV shows are bad for children. Others think some violent TV shows are okay. Which group of scientists do you think is right? Please explain.

2. How would you decide which group of scientists was right? Please explain.

3. If you were one of the scientists who thought violent TV was bad for children, what could you do to convince the other group of scientists that you were right? Please explain.

4. How is it possible that the two groups of scientists have such different ideas? Please explain.

5. Is it possible to know for sure if violent television is bad for children? Please explain.
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<td>08d</td>
<td>(a) having in your brain and helps you figure out the right answer or remember [specific things] you have experienced</td>
<td>(i) telling someone to do something specific</td>
<td>(i) telling someone that [something specific] is bad or good (okay or not okay)</td>
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<td>(i) trying to [impress or] make [something] seem good or bad (okay or not okay)</td>
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<td>09a</td>
<td>(b) helps you figure out the best answer, can be better or worse, helps you remember or think about things you have learned or [experienced]</td>
<td>(i) getting [someone in particular] to talk to [opponent(s)], begging or bagging or keeping telling them something specific</td>
<td>(i) telling someone what is true, right, wrong, or okay, or that they bad or good ideas</td>
<td>(i) telling someone your opinion, what you know or [think] is bad or good, or that making something is not cool, explaining [something] or telling why [something] is good or bad or giving reasons why something is like that in (not) rude</td>
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<td>09b</td>
<td>(c) helps you figure out if you are right or wrong or what makes sense, may involve having ideas, paying attention, or understanding something you have learned, thought, or imagined</td>
<td>(i) telling one to another to tell your opinions or ideas</td>
<td>(i) doing, saying, or showing [something] that will make [an opponent] agree with you, or getting people to listen, getting someone to talk to [an opponent]</td>
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<td>(d) helps you figure out what makes the most sense, helps you make better choices or decisions, involves comparing [options] or thinking about facts, evidence, or ideas</td>
<td>(i) discussing a problem, finding out what people are thinking, or exploring your opinions or reasons</td>
<td>(i) getting people to think or do the right thing, see their mistake, or see someone else's mistake for themselves, getting them on your side, getting [someone] with experience to talk to them, getting someone to see or understand what you mean or are talking about, &quot;think about it&quot;, think about their choice, or think about what people want, asking &quot;what if&quot;</td>
<td>(i) getting your ideas across, persuading someone, telling them &quot;how it is&quot;, what you honestly think, or something that makes sense, making a suggestion, explaining well, explaining your choice, why you have your opinion, or why you are right, giving good or many reasons</td>
<td>(i) trying to [impress or] make [something] seem good or bad (okay or not okay)</td>
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<td>08t</td>
<td>(e) a [mental activity] that involves your ideas or knowledge, or helps you figure out why something makes sense (or not), involves skills like double-checking, permission or being reasonable</td>
<td>(i) being persuasive, giving an argument that will &quot;move people's minds&quot;, getting someone to see your point, making your judgment, think about their reasoning, or &quot;think twice&quot;, telling them something they will understand or that would convince you</td>
<td>(i) communicating, making an argument, recommendation, a good point, or true statement, explaining your reasoning, defending your [conclusion], being specific, pointing things out, saying something that is clearly true, backing up [evidence] with reasons</td>
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<td>(f) the thinking that is behind a position or argument, what it is based on, required for connecting ideas or making a sensible, realistic, or logical decision or claim, involves making an educated guess, thinking for yourself, processing things, or thinking scientifically, may be stronger or weaker</td>
<td>(i) sharing perspectives or a position, or giving everyone a chance to provide their perspective, get their point across, express themselves or their feelings, or provide reasons, perspectives, evidence, or perspective and come to another, a nonviolent way to do a disagreement</td>
<td>(i) reasoning with [an opponent], making your ideas understandable, getting people to see things through your eyes or from another perspective, getting them to see common sense or the other side of things, providing evidence or arguments [opponent(s)] can't ignore or deny, making it difficult to argue with you, overpowering the [opponent's] argument, or saying something that slots well</td>
<td>(i) making a case, getting your point across, making your idea understandable, getting people to see things through your eyes or from another perspective, explaining things in different ways, being logical or reasonable, allowing how [specific thing] relate, presenting a [certain] point of view, presenting organized information</td>
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<td>(g) a [mental activity] required for making valid or unbiased decisions or arguments, the logic or reasoning behind a position or argument, involves thinking about how things relate to one another, taking things into consideration, determining if something is probable, considering potential consequences, or being skeptical</td>
<td>(i) sharing or discussing the reasoning behind ideas, brainstorming to bounce around ideas, an [exchange] of ideas in which all [immediate], perspectives, evidence, or press and不管 are heard or understood</td>
<td>(i) getting someone to see reason or consider a possibility, using an argument that is likely to get an opponent to agree with you or &quot;win them over&quot; or overpowering their argument, or making it difficult to disagree with you</td>
<td>(i) communicating fully, showing how things relate or showing relationships, explaining the logic behind your position or explaining from different angles, making the most convincing or a realistic, effective, or valid argument, an argument &quot;without holes&quot;</td>
<td>(i) using an extreme example, telling [an opponent] something that [they] &quot;can't hard to understand&quot; [with easier], using an argument that will &quot;shake them up&quot; or get their sympathy</td>
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Putting the virtuous cycle of learning to work

Heat map

Distribution in grade 5 of a few themes related to persuasion

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<td>(d) getting [someone] that [something specific is] bad or (okay but not okay) or that [someone] should stop [specific activity]</td>
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<td>(e) trying to impressed an [opponent], getting [an opponent] to think about or imagine how other people would feel (or speaking) or their perspective or what they want (for people they care about), getting them to think positively or doing (or saying) something they can relate to</td>
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## Putting the virtuous cycle of learning to work

### Heat map

Distribution in grade 5 of a few themes related to persuasion

Percentage of students who “hit” a particular theme in each phase

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### Distribution in grade 5 of a few themes related to persuasion

- **Body Level One**
- **Body Level Two**
- **Body Level Three**
- **Body Level Four**
- **Body Level Five**
# Putting the virtuous cycle of learning to work

## Heat map

- **Distribution in grade 5 of a few themes related to persuasion**

- **Percentage of students who “hit” a particular theme in each phase**

- **Majority of performances in the 09b-09d range (5-6 years of development)**

### Phase 08d
- (d) happens in your brain and helps you figure out the right answer or remember [specific things] you have experienced
- (g) learners telling someone [to do something specific]

### Phase 09a
- (a) helps you figure out the best answer, can be better or worse, helps you remember or think about things you have learned or [experienced]
- (b) getting [someone] to talk [to you]
- (c) telling [someone] what is true, right, wrong, or okay, or that they bad or good ideas

### Phase 09b
- (a) helps you figure out if you are right or wrong or what makes sense, may involve having ideas, paying attention, or understanding things you have learned, thought, or imagined
- (b) telling to one another to tell your opinions or ideas
- (c) doing, saying, or showing [something that will make an opponent agree with you], telling or getting people to listen, gathering people to talk to [an opponent]

### Phase 09c
- (d) helps you figure out what makes the most sense, helps you make better choices or decisions; involves comparing and contrasting or thinking about facts, evidence, or ideas
- (a) discussing a problem, finding out what people are thinking, or explaining your opinions or reasons
- (b) getting people to think or do the right thing, see their mistake, or see for themselves, getting them on your side, getting [someone] with experience to talk to them, seeing or understanding what you mean or are talking about, “Think about it”, think about their choice, or think about what people want, asking “what if”

### Phase 09d
- (a) [mental activity] that involves making sense or knowledge, helps you figure out why something makes sense or not; involves skills like double-checking, reevaluation, or bringing more reasons, evidence, or ideas
- (b) sharing opinions, believing [or asking] seeking to explain what the opinions, ideas, or thoughts of the other side or both sides, debating with or persuading one another, presenting reasons, perspectives, evidence, or facts and coming to one another or working together to figure something out (e.g., working it out, discussing it together)
- (c) being persuasive, giving an answer that will “move people’s lives”, getting someone to see your point, making your judgment, think about their reasons, or “think twice”, telling them something they will understand or that would convince you

### Phase 10a
- (d) the thinking that is behind a persuasive or positive position, what it is based on, requires for constructing ideas or making a sensible, realistic, or logical argument: involves making an educated guess, thinking for yourself, processing things, or thinking scientifically, may be stronger or weaker
- (e) reasoning with an opponent, making your idea understandable, getting people to see things through your eyes or from another perspective, getting them to see common sense or the other side of things, providing evidence or arguments [opponent] can’t ignore or deny, making it difficult to argue with you, overpowered the [opponent’s] argument, or saying something both sides would understand

### Phase 10b
- (a) [mental activity] required for making valid or unbiased declarative or arguments, the logic or reasoning behind a perspective, involves thinking about how things relate to one another, taking things into consideration, determining if something is probably, considering potential consequences, or being skeptical
- (b) sharing or discussing the reasoning behind ideas, brainstorming to bounce around ideas, an exchange of ideas in which all [immediate] perspectives, evidence, or pros and cons are heard or understood
- (c) getting someone to see reason or consider a possibility, using an argument that is likely to get an opponent to agree with you or “win them over”, overcoming or overpowering an argument, or making it difficult to disagree with you

### Phase 10c
- (d) communicating fully, showing how things relate or showing relationships, using an argument that is hard to understand or [with empathy], using an argument that will “shake them up” or get their sympathy

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### Distribution in grade 5 of a few themes related to persuasion

<table>
<thead>
<tr>
<th>Phase</th>
<th>Reasoning</th>
<th>Discussion</th>
<th>Persuading as inducement</th>
<th>Persuading as argumentation</th>
<th>Persuading as tactics</th>
</tr>
</thead>
<tbody>
<tr>
<td>08d</td>
<td>n = 145</td>
<td>n = 53</td>
<td>n = 104</td>
<td>n = 251</td>
<td>n = 192</td>
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<tr>
<td>09a</td>
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<td>09b</td>
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<td>09c</td>
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<tr>
<td>10b</td>
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</tr>
</tbody>
</table>

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Percentage of performances in the 09b-09d range (5-6 years of development)
### Task 1

- **Zone A**
  - Describe how students’ thinking about persuasion develops from zone A to zone C.
  - Descriptions should be 10 words or less.

### Table

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>08a</td>
<td>(a) thinking about facts, evidence, or ideas</td>
<td>(b) describing, explaining or questioning what you think or know about something or making an educated guess</td>
<td>(d) getting someone’s opinion or ideas</td>
<td>(c) expressing or persuading someone to listen to or agree with your opinion or reasoning</td>
<td>(e) trying to influence someone else’s opinions or actions</td>
</tr>
</tbody>
</table>

### Zone A
- **Description**: Students begin by thinking about facts, evidence, or ideas. They describe, explain, or question what they think or know about something, or make an educated guess.

### Zone B
- **Description**: Students move on to describing, explaining, or questioning what they think or know about something or making an educated guess. They start to express or persuade someone to listen to or agree with their opinion or reasoning.

### Zone C
- **Description**: Students further develop their thinking by trying to influence someone else’s opinions or actions. They actively seek to persuade or influence others, going beyond just describing or questioning.
Design a lesson plan that will meet the needs of students in all 3 zones.

This lesson plan should be subject specific—STEM, social studies, literature, etc.
Putting the virtuous cycle of learning to work

Task 2 cycle & skills

Reflective/analytic skills

1. Skills for evaluating information and evidence
2. Skills for seeking and making use of feedback
3. Skills for evaluating outcomes
4. Awareness of cognitive biases and skills for avoiding them
5. Mindfulness and self monitoring
Putting the virtuous cycle of learning to work

Task 2 cycle & skills

- Use the virtuous cycle of learning.

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Task 2 cycle & skills

- Use the virtuous cycle of learning.
- Make sure students will exercise some of the 5 reflective/analytic skills.

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Task 2 cycle & skills

- Use the virtuous cycle of learning.
- Make sure students will exercise some of the 5 reflective/analytic skills.
- Have a member of your group write a short description of your lesson plan, including the skills students will be practicing.

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How will you use what you learned here?

- How will the learning model presented here inform
  - lesson design
  - interactions with students

- What are the challenges/hurdles to making this kind of learning happen in your classroom?
Conclusions
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- To thrive in a complex, challenging, and changing world, we need well-educated brains.
Conclusions

- To thrive in a complex, challenging, and changing world, we need well-educated brains.
- Well-educated brains feature rich, integrated neural networks that are cultivated through action, reflection, and analysis.
- Educational assessments and instruction should support the development of robust knowledge networks.
- Equipped with a simple learning model and diagnostic assessments, classroom teachers can support optimal learning for every student.