Learning, the brain, & technology: A new approach to assessment

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LONG TRAIL SCHOOL LECTICA®
Overview
Overview

- Virtuous (dopamine opioid) cycles of learning
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- Virtuous (dopamine opioid) cycles of learning
- DiscoTests
Overview

- Virtuous (dopamine opioid) cycles of learning
- DiscoTests
- Research findings
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‣ Virtuous (dopamine opioid) cycles of learning
‣ DiscoTests
‣ Research findings
‣ What we can do for you
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- Virtuous (dopamine opioid) cycles of learning
- DiscoTests
- Research findings
- What we can do for you
- Discussion
It started with 500 babies
They were all addicts
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- Yes, all 500 babies appeared to be hopelessly addicted to learning.
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- They were willing to go through just about anything to get a fix—even physical pain, again and again.
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- Why?
The “wanting” and “liking” cycle
The “wanting” and “liking” cycle

- The brain’s dopamine/opioid cycle
The “wanting” and “liking” cycle

- The brain’s dopamine/opioid cycle
- It’s the cycle that gets hijacked in addiction.
The “wanting” and “liking” cycle

- The brain’s **dopamine/opioid** cycle
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- Dopamine makes us want to learn, achieve, or explore.
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- Virtuous dopamine/opioid cycles of learning

Learning to walk

No cycles here, just steady progress. But what is it really like?
The virtuous cycle: learning in the zone
Virtuous cycles in the classroom
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1. Set *provisional* learning goals
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2. Find out what individual learners know and how they think with what they know.
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6. Provide timely feedback, focusing on growth over time rather than success or failure.

7. Help students get the most out of feedback: provide many opportunities for learners to reflect about outcomes associated with the application of new knowledge.
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8. **standardized**—to a theoretically defined, non-arbitrary learning metric
Hundreds of little tests that...
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- play a key role in fostering virtuous cycles of instruction, practice, and feedback, by
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  - telling teachers how deeply students understand what they are learning
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- provide decision makers with reliable, valid, and accurate information about real learning
Background information
Background information

- Guided by our learning model and the 8 principles for ideal assessment design, we develop formative learning tools called Lectical Assessments (a.k.a. DiscoTests).
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They are both formative and summative.
Formative vs. summative
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- Formative assessments can be embedded in curricula (used as learning tools) to support learning and provide rich information about student understanding. They often have open-ended constructed-response questions, and incorporate self (or peer) evaluation.
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- Lectical Assessments can be used in both ways.
The RFJ: critical thinking
The RFJ: critical thinking

› The Reflective Judgment (RFJ) DiscoTests
The RFJ: critical thinking

- The Reflective Judgment (RFJ) DiscoTests
  - focus on several components of critical thinking, including evidence, inquiry, deliberation, disagreement, conflict resolution, persuasion, and truth
The RFJ: critical thinking

The Reflective Judgment (RFJ) DiscoTests

- focus on several components of critical thinking, including evidence, inquiry, deliberation, disagreement, conflict resolution, persuasion, and truth
- support students’ learning while preparing them to grapple with complex 21st century issues
<table>
<thead>
<tr>
<th>Phase</th>
<th>Conflict resolution</th>
<th>Deliberation</th>
<th>Disagreement</th>
<th>Truth</th>
</tr>
</thead>
<tbody>
<tr>
<td>08d</td>
<td>that to end a fight you can talk instead of fighting.</td>
<td>that to make a decision, you can think (think hard) or ask parents (teachers, etc.).</td>
<td>that people disagree because they think or like [different specific things].</td>
<td>that the truth is [something specific] that the student knows or has been, experienced, or heard. You can't be sure about the truth, because [specific people] might be lying.</td>
</tr>
<tr>
<td>09a</td>
<td>that to end an argument you can ask the other side what they think or tell them what you think.</td>
<td>that to make a decision, you can think about what you have learned from your parents (or in school) and what has happened to you or someone you know.</td>
<td>that people disagree because they are smart or dumb, right or wrong, bad or crazy, or have different answers.</td>
<td>5% (41)</td>
</tr>
<tr>
<td>09b</td>
<td>that to end an argument, you can make a deal, explain your opinion, or try to change someone else's opinion. Talking it out keeps people from hurting one another or helps you find out which answer is better.</td>
<td>that to make a decision, you can think about your own opinion (what you like, think, believe, have seen) and the opinions of other people.</td>
<td>that people disagree because they know (have learned) different things, have different opinions, think differently, know more or less, are upset or angry, or don't like one another.</td>
<td>2% (37)</td>
</tr>
<tr>
<td>09c</td>
<td>that to end an argument, you can ask a third party to decide or make an agreement. To make an agreement you should find out what people mean and be polite or grown up. A good agreement gives you the best answer or something you want, or gives both sides [something specific] they want.</td>
<td>that to make a decision, you can think about why people think or feel the way they do, do [something specific] to keep track of information, or double-check information.</td>
<td>that people disagree because everybody has different opinions or thinks differently, both sides have reasons, they aren't listening, or they are selfish.</td>
<td>2% (113)</td>
</tr>
<tr>
<td>09d</td>
<td>that to end a disagreement, you can ask a third party to give an opinion, have a debate, or have a discussion. During a discussion, you should listen to the other side. The best answer is a compromise—a solution or deal that gives both sides something they want.</td>
<td>that to make a decision, you can think about what makes sense or what you know from experience, think about how good [sources'] reasons are, or compare information.</td>
<td>that people disagree because they have gotten different results, have had different life experiences, are convinced by different things, are stubborn, or find it hard to change their minds.</td>
<td>2% (63)</td>
</tr>
<tr>
<td>10a</td>
<td>that to resolve a disagreement, you should hear both sides and be willing to change your mind. Having a discussion makes it easier to work out a compromise—a solution that is based on the opinions of both sides or is acceptable to both sides.</td>
<td>that to make a decision, you can make an educated guess, use common sense, be logical, consider possible consequences, try to understand both perspectives, or analyze or compare information.</td>
<td>that people disagree because they have studied somewhat different things, were raised differently, have different values, aren't considering one another's perspectives, or are set in their opinions.</td>
<td>2% (7)</td>
</tr>
<tr>
<td>10b</td>
<td>that to resolve a disagreement, you need to be rational and have an open mind. Discussion involves negotiating or talking about pros and cons, and makes it possible to come up with better ideas or to find a compromise—a solution that is &quot;in the middle&quot; or that allows both sides to get the most important things they want or need (satisfies both sides).</td>
<td>that to make a decision, you can make a rough estimate, consider your own values or instincts, consider what is behind perspectives, put yourself in an opponent's shoes.</td>
<td>that people disagree because there is evidence on both sides, or they have different [10b] backgrounds, [10b] personalities, or motives, have looked at different factors, or are unreasonable.</td>
<td>2% (14)</td>
</tr>
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<td>2% (3)</td>
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<td></td>
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<td></td>
<td>3% (18)</td>
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<td>10c</td>
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Start & current status of the partnership
Partnership with Lectica grew out of a Long Trail School Strategic Visioning Committee’s work to create a set of practices and policies that define our school—The LTS Educational Experience.
Start & current status of the partnership

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- Lectica’s foundation in the virtuous cycles of instruction, practice, and feedback correspond with Long Trail School’s Core Beliefs.
LTS Core Beliefs
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1. Learning how to think is more important than being told what to think.
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2. Curiosity and conversation motivate.
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3. Children deserve a safe, welcoming, and supportive school where everybody is known and valued.
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8. Education is a shared responsibility.
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6. Intelligence is not fixed at birth.
7. Reflection supports meaningful learning and moral development.
LTS and the RFJ
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› LTS was attracted to the Reflective Judgment Disco Tests—two of which were beta tested with the entire student body in the fall and spring of the 2012-2013 school year—because of its foundation in Lectica’s top 8 design principles and Long Trail’s efforts to develop more authentic, relevant, and reflective assessment tools compatible with our Seven Principles of the brain and our Eight Core Beliefs about learning and the learning environment.
The benefits of Lectical Assessment
Background information
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- On the Lectical Scale, students in today's classrooms grow an average of .13 to .15 of a level per year in a given area of study.
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- On the Lectical Scale, students in today's classrooms grow an average of .13 to .15 of a level per year in a given area of study.
- On average, we have found that the capabilities of students within a particular classroom span 5-7 years of development.
Supporting growth
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- Formative vs. summative use of Lectical Assessments in semester-long courses
Supporting growth

- Formative vs. summative use of Lectical Assessments in semester-long courses
  - Summative: Lectical growth = .09 (n=5)
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  - Summative: Lectical growth = .09 (n=5)
  - Formative: Lectical growth = .19 (n=5)
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- Students grow more if they take more Lectical Assessments
Projected growth comparisons for formative & summative use of DiscoTests

Graph showing projected growth scores with grade on the x-axis and lexical score on the y-axis. Two lines represent formative and summative use, with the formative line consistently below the summative line across grades K to 12.
Reflective activity
Reflective activity

- Students who take courses in which there is no reflective activity grow from 00–.03 of a level per semester.
Reflective activity

- Students who take courses in which there is no reflective activity grow from 0.0–.03 of a level per semester.
- As reflective activity increases, growth increases.
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  - Students who score their own performances, then reflect upon how their scores compare to those of their teachers’, develop targeted skills as rapidly as students who have been formally tutored.
Reflective activity

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- As reflective activity increases, growth increases.
  - Students who score their own performances, then reflect upon how their scores compare to those of their teachers’, develop targeted skills as rapidly as students who have been formally tutored.
  - Students who take Lectical Assessments, complete all of the recommended activities, and engage in reflective discussion in a community of learners develop as quickly as students taking a formal course.
LongTrail School & Lectica: next steps
Next steps for the partnership
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- The **Reflective Judgment Disco Tests**, with their focus on critical thinking are compatible with Long Trail School’s Eight Core Beliefs—especially “Learning how to think is more important than being told what to think”.
Next steps for the partnership

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‣ Long Trail School prides itself in teaching students how to write and to see writing as “thinking on paper” and has for many years focused on brain-compatible best practices such as offering students choice and taking less of a “snap shot” approach (selected-response items only) to more of a “photo album” approach (more open-ended, authentic types of assessment).
Next steps, cont.
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- Discussions have begun about developing and embedding tests within course specific content areas.
Next steps, cont.

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- These tests have the potential to:
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- These tests have the potential to:
  - transform formative and summative assessment (further moving away from selected response types of assessment towards more open-ended assessments); and
Next steps, cont.

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- These tests have the potential to:
  - transform formative and summative assessment (further moving away from selected response types of assessment towards more open-ended assessments); and
  - provide a reflective piece critical to student understanding and development of skills.
Next steps, cont.

- Discussions have begun about developing and embedding tests within course specific content areas.

- These tests have the potential to:
  - transform formative and summative assessment (further moving away from selected response types of assessment towards more open-ended assessments); and
  - provide a reflective piece critical to student understanding and development of skills.

- The idea of using assessments as learning tools delivered in a low-anxiety context is exciting.
Moving forward
The RFJ: critical thinking
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› The Reflective Judgment (RFJ) DiscoTests
The RFJ: critical thinking

- The Reflective Judgment (RFJ) DiscoTests
  - six forms (and growing)
The RFJ: critical thinking

- The Reflective Judgment (RFJ) DiscoTests
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  - ready for summative and formative use
Join the DiscoTest Initiative
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› Become a DiscoTest Network school
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  - Learn from research conducted in the network
DiscoTest portfolio report card

Marilyn Monroe

Lectical score

Grades

Social studies
Physical science

32
Extras
Score (1st coder) by student grade

4591 students / 4882 DiscoTests

Score (1st coder)

Student grade

Low SES
High SES
Reliability
Reliability

- Over many studies, statistical reliabilities are consistently in the range of .89 to .97, depending on range of sample.
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- Inter-rater agreement rates are maintained at a minimum of 85% within 1/5 of a level).