Assessing clinical reasoning: Beyond the facts

Lectica, Inc. is a 501(c)(3) nonprofit with a mission to improve education by changing testing. Changing testing changes everything.
Background
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- 1977-1986: 500 addicted babies, learning cycles
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- 1994: learning and assessment
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- 2010: Lectica is born
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- 2010: Lectica is born
- 2013: we (finally) receive our 501(c)(3) status
Concluding remarks
Effective medical practice requires the ability to make high stakes clinical decisions under conditions of complexity and uncertainty.
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- To meet these demands, medical practitioners need robust conscious and unconscious knowledge networks, reflective dispositions, and excellent analytical capabilities.
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We build standardized formative assessments (LectaTests) that are designed to be embedded in these virtuous learning cycles.
The cast of characters
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- A decision-making model
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- A model of learning in two parts:
  - knowledge networks
  - analytical skills
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- A model of learning in two parts:
  - knowledge networks
  - analytical skills
- An approach to measuring and developing both kinds of learning
  - how it works
  - the evidence so far
A decision making model
Factors in decision-making

- How a decision is made depends on three things:
  - The problem
  - The decision making environment
  - The decision maker(s)
Features of the problem

- **Time constraints**—how quickly is a decision required, what is the duration of the project?
- **Complexity**—signal/noise, number and nature of variables, the ways in which variables interrelate
Features of the environment

- Tools
- Resources
- Rules, standards, and procedures
- Peer support
Features of the decision maker

Knowledge base: the depth, breadth, and quality of a decision maker’s conscious and unconscious knowledge networks (cognitive complexity)

Reasoning skills: skills for evaluating evidence and information, critical thinking

Learning skills: the ability to diagnose knowledge gaps, identify resources, and coordinate new knowledge with existing knowledge

People skills: the ability to work with and leverage the knowledge and skills of stakeholders and peers

Level of well-being (health, fitness, stress level, mood, self-awareness/monitoring/mastery, etc.)
Problem
- temporal constraints
- complexity

Environment
- tools
- resources
- rules & standards
- peer support

Decision maker
- knowledge base
- reasoning skills
- learning skills
- people skills
- wellbeing
Growing a robust knowledge base
What is robust knowledge?
What is robust knowledge?

› Breadth
  - how much you know
  - facts and procedures
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  - how deeply you understand what you know
  - how well connected your conscious and unconscious knowledge networks are
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  - how well connected your conscious and unconscious knowledge networks are

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

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

GOALS

reflection, analysis

capabilities vs. goals

inquiry, instruction

feedback

deliberation

actions, performances
The virtuous cycle of learning

reflection, analysis

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GOALS
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The dopamine/opioid cycle
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Neurons that wire together, fire together
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The neural net

“Any two cells or systems of cells that are repeatedly active at the same time will tend to become ‘associated’, so that activity in one facilitates activity in the other.” (Hebb 1949, p. 70)
Developing reflective/analytical skills
What are reflective/analytical skills?
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- The ability to make connections between ideas, information, perspectives, and evidence
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- The ability to operate on ideas—to apply what you know in real-world contexts
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‒ The ability to make connections between **ideas**, **information**, **perspectives**, and **evidence**

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‒ Skills for evaluating information and evidence
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- Mindfulness and self monitoring
Reflective/analytical skills in decision making
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Did he really have an opportunity to learn? How quick and how clear was the feedback on his judgments?

—Kahneman, *Thinking fast and slow*
Testing drives instruction
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Testing drives instruction

- Conventional tests primarily examine factual and procedural knowledge.
- They neglect depth of knowledge and analytical skill.
- Instructors, who want their students to succeed, teach to the test.
- Instruction is removed from its rightful place in the virtuous cycle of learning.
- The result—impoverished neural nets and inadequate development of reflective and analytical skills.
Lectical Assessments
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- Are grounded in a strong theory of learning (Fischer’s Skill Theory).
- Are based on exhaustive ongoing research into how specific knowledge and skills develop (Developmental Maieutics).
- Are formative: support depth learning and the development of reflective/analytical skills.
A solid research tradition

- Strong theory of learning
- Rich tradition (Baldwin, Piaget, Case, Kohlberg, Armon, Kitchener & King)
- Thousands of publications
- Skill Theory & the skill scale (Fischer, 1980)

Skill Scale/Lectical Scale
All Lectical Assessments are calibrated to this scale
A good leader

10.5

has good people skills

recognizing good people
good work ethic
knowing how to reward people
knowing how to motivate people

doing whatever it takes
fair but not a pushover
A good leader

11.5

creates dynamic teams

which requires

good people skills

open lines of communication at every level

letting people know who you are

cultivating these skills in others

listening deeply

valuing individual qualities of persons

recognizing talent
A good leader
12.5
reframes what is believed to be appropriate or possible
which requires
creating systems that foster
personal development
understanding of the internal and external environment
making it possible to
co-create a new or better direction
dynamic teams
Building Lectical Assessments
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- The Lectical Assessment System (LAS) — used to place performances on the Lectical Scale
Building Lectical Assessments

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- Developmental Maieutics—use the LAS to study how concepts and skills are learned
  - taxonomy of learning
  - developmental dictionary
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- **Developmental Maieutics**—use the LAS to study how concepts and skills are learned
  - taxonomy of learning
  - developmental dictionary

- These inform
  - the calibration of CLAS, our Computer-assisted Lectical Assessment System
  - rich formative feedback for students and instructors
  - learning resources
An example: the LDMA
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- How people make decisions in complex real-world situations
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- Targets skills like decision making process, perspective coordination, contextual thinking, collaborative capacity
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- Scored to determine its Lectical Level
An example: the LDMA

- How people make decisions in complex real-world situations
- Targets skills like decision making process, perspective coordination, contextual thinking, collaborative capacity
- Poses a challenging (ill-structured) real-world problem
- Scored to determine its Lectical Level
- Coded for other aspects of performance
Other Lectical Assessments

- Lectical Reflective Judgment Assessment (LRJA)
  - evidence & inquiry
  - knowledge & truth

- Lectical Ethical Reasoning Assessment (LERA)
  - ethical acumen
  - coordination of competing claims

- Lectical Developmental Pedagogy Assessment (LDPA)
  - pedagogical perspective
  - application of pedagogy to instruction
Validity and reliability
Lectical Assessments
Lectical Assessments

- Are direct tests of targeted skills,
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- Meet the same reliability standards as the best high-stakes assessments,
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- Predict on-the-ground competence, and
Lectical Assessments

- Are direct tests of targeted skills,
- Meet the same reliability standards as the best high-stakes assessments,
- Detect 10 statistically distinct levels of performance in adulthood (as good as it gets),
- Predict on-the-ground competence, and
- Increase learning when used formatively.
Higher scores, better jobs

Distribution of Lectical Scores
(lower-level and senior managers)

Density

Lectical Score

Lower-level managers, (M =11.30)
Senior mangers, (M =11.56)
What does this difference mean?
A few differences between individuals performing at 11.3 and 11.6 on the Lectical Scale

- **nuance**—the ability to detect and work with subtle features of a situation or environment
- **agility**—the ability to reframe problems and generate multiple plausible solutions or scenarios
- **humility**—a deeper appreciation of the boundedness of one’s own perspective, which translates into receptivity, reflective disposition
- **context as cause**—the ability to consider the broader contexts in which issues arise as possible causes
Formative matters
Formative matters

- Formative vs. summative use of Lectical Assessments in semester-long courses (40 hours of instruction)
  - Summative: Average Lectical growth = .09 (n=5)
  - Formative: Average Lectical growth = .19 (n=5)
Concluding remarks
Complexity & uncertainty

- Effective medical practice requires the ability to make high stakes clinical decisions under conditions of complexity and uncertainty.
To meet these demands, medical practitioners need robust conscious and unconscious knowledge networks, reflective dispositions, and excellent analytical capabilities.
By supporting *virtuous cycles of learning*, medical schools can achieve these objectives while embedding the skills and dispositions required for ongoing learning and development.
Lectica

- We build and deliver standardized formative assessments (LectaTests) that are designed to be embedded in these virtuous learning cycles.
Changing testing changes everything.
Perspective coordination: closing the complexity gap
Distribution of Lectical Scores
(lower-level and senior managers)

Density

Lectical Score

Lower-level managers, (M =11.30)
Senior managers, (M =11.56)
What is a perspective?
What is a perspective?

- A person’s point of view or worldview
What is a perspective?

- A person’s point of view or worldview
- A context
What is a perspective?

- A person’s point of view or worldview
- A context
- Perspectives are nested
What is a perspective?

- A person’s point of view or worldview
- A context
- Perspectives are nested
  - individual physician
What is a perspective?

- A person’s point of view or worldview
- A context
- Perspectives are nested
  - individual physician
  - team
What is a perspective?

- A person’s point of view or worldview
- A context
- Perspectives are nested
  - individual physician
  - team
  - unit
What is a perspective?

- A person’s point of view or worldview
- A context
- Perspectives are nested
  - individual physician
  - team
  - unit
  - hospital or clinic
What is a perspective?

- A person’s point of view or worldview
- A context
- Perspectives are nested
  - individual physician
  - team
  - unit
  - hospital or clinic
  - health care system
What is a perspective?

› A person’s point of view or worldview
› A context
› Perspectives are nested
  - individual physician
  - team
  - unit
  - hospital or clinic
  - health care system
  - society
The relation between human capabilities and the task demands of nested perspectives

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Perspective seeking and Lectical level

Error bars = 95% confidence interval for the mean
Perspective seeking and Lexical level

- Perspective seeking increases with developmental level.

![Bar chart showing mean perspective measure across different phase scores with error bars indicating 95% confidence interval for the mean.](chart.png)
Perspective seeking and Lexical level

- Perspective seeking increases with developmental level.
- Perspective seeking can be done by toddlers.

![Graph showing the increase in perspective seeking measure with developmental level.]
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- It is likely, therefore, that the increase in perspective seeking with development reflects a propensity to seek perspectives.

![Graph showing mean perspective measure across different phase scores](image-url)
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- It is likely, therefore, that the increase in perspective seeking with development reflects a propensity to seek perspectives.
- Perspective seeking promotes development.
- So, if we want to develop people, we need to develop their perspective-seeking skills.
Cultivate a collaborative disposition
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- Raise the salience of perspective seeking by demonstrating how much working with others can improve performance
Build perspective-seeking skills
Build perspective-seeking skills

- Knowing when to seek perspectives
Build perspective-seeking skills

- Knowing when to seek perspectives
- Knowing which ones to seek
Build perspective-seeking skills

- Knowing when to seek perspectives
- Knowing which ones to seek
- Methods for seeking them
Build perspective-seeking skills

- Knowing when to seek perspectives
- Knowing which ones to seek
- Methods for seeking them
- Knowing which ones matter (critical listening)
Contextual thinking

- Contexts are perspectives
- Contexts can be causes
  - recognizing that the contexts in which problems arise often play a role in their emergence (e.g., when policies create environments that inhibit optimal care)
  - critical skill for all diagnosticians, but especially for those in senior leadership roles—makes it possible to design systems and structures that support optimal care
Coordinating perspectives
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- Weighing (high 10), balancing (low 11), bridging (high 11), and synthesizing (low 12)
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  - **Weighing**: figuring out which perspective is more important or accurate, then choosing it
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  - **Balancing**: finding out the most important things about alternate perspectives and seeing if you can find a solution that takes them into account
  
  - **Bridging**: finding areas of overlap between perspectives and using these to optimize a decision
  
  - **Synthesizing**: identifying the unstated commonalities at the root of divergent perspectives and using these to define fundamental principles
Collaboration
Collaboration

- Determining what level of collaboration is optimal for making a specific decision.
Collaboration

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- In complex situations, the ability to collaborate with others is essential for meeting the task demands of many workplace decisions.
Collaboration

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- In complex situations, the ability to collaborate with others is essential for meeting the task demands of many workplace decisions.

- Collaboration requires excellent perspective-seeking and coordination skills and can be enhanced with good decision making models and tools:
  - Cynefin framework (Snowden & Boone, 2007)
  - Dynamic steering (Sociocracy)
  - Collaborative learning (Daniels & Walker, 2001)
Immediate and long-term benefits

- Individuals with good perspective coordination skills can leverage the knowledge and skills of others to develop solutions that meet complex task demands.

- Perspective seeking plays a pivotal role in learning and development.