Developmental maieutics
—a methodology for integrating research, assessment, curricula, and instruction

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Overview

- What testing is: what testing could be
- DTS goals
- DiscoTest
- Skill theory
- Developmental maieutics
- Building instruments
Testing as it is

- Questions have right and wrong answers;
- Students learn if they are succeeding or failing, and where they stand in their class;
- Teachers learn what students remember from their lessons, and how students compare to one another.
- Districts learn if students have passed the test.
Testing as it could be

- Tests would tell us
  - how each student understands the course material;
  - how relevant core skills (inquiry, argumentation, perspective-taking, language, metacognition) are applied;
  - what each student is most likely to benefit from learning next.
Testing as it could be, cont.

- Ideal tests would support learning by
  - asking students to *engage, employ, and explore* important knowledge and ideas;
  - providing students with frequent opportunities to build the skills they will need in adult life;
  - allowing students (and their parents) meaningfully to track their learning;
  - enhancing teachers’ understanding of learning and development; and
  - helping teachers to determine *what comes next*. 
The vision

Assessments that:
- support teaching that is engaging, promotes deep understanding, and develops reasoning and communication skills;
- expand our understanding of conceptual and skill development;
- support learning (in multiple ways);
- allow students, teachers and parents to track student development along a universal scale; and
- are practical (inexpensive, easy to integrate into existing curricula, efficient, readily available).
DiscoTest

http://discotest.org
Developmental maieutics
Developmental scoring systems

- Piaget & Kohlberg
- Fischer’s skill scale
- A latent dimension
The LAS
The LAS is a metric

- Metrics take time to build and refine
  - a unidimensional content & context-independent trait
  - a system for assessing the amount of the trait
  - a method for evaluating the reliability and validity of the measure
  - calibration (or standardization) of the measure
- The LAS
Dynamic skill theory

- Dynamic skill scale
  - 5 tiers (reflexes, actions, representations, abstractions, principles)
  - 4 (3) levels per tier (single elements, mappings, systems, systems of systems/single elements)
Skill levels are orders of hierarchical complexity

- Each level represents a new order of hierarchical complexity—a new level of elaboration and integration
- This can be observed in the logical structure of statements and concepts.
  - Directly observable in statement structure
  - Indirectly observable in the meanings of concepts
A good leader will show you how is fun to have because she knows where to go and knows what to do and will show you how.

A good leader is competent and trustworthy if she is inspiring without appearing arrogant.
The Lectical Assessment System (LAS)

- Using this system, analysts determine a performance’s core structure—
  - *explicit* logical structure, and
  - *implicit* conceptual structure.
- Taken together, they make it possible to accurately determine its level.
The developmental spiral
What is a good leader?

A good leader is in front.
What is a good leader?

A good leader is in front so she can show you the way.
What is a good leader?

A good leader will show you how is fun to have because she knows where to go and knows what to do and will show you how.
What is a good leader?

A good leader

- is good with people
  - is fun
  - is helpful
  - is friendly
What is a good leader?

A good leader is in front, so she can show you the way which makes them good with people and trust her intentions.
What is a good leader?

A good leader

is fun to have

because she

knows where to go

and

knows what to do

and

will show you how

A good leader is

inspiring

if she is

trust-worthly

and

competent

without appearing

arrogant
What is a good leader?

A good leader

is good with people

is fun

is friendly

is helpful

A good leader is

a highly competent servant to her organization

inspiring

visionary

deeply committed
Validity and reliability

- Construct validity
  - Comparison with scoring systems designed by Armon, Kohlberg, Perry, and Kitchener & King
  - Modeling studies showing evidence of hierarchical integration

- Reliability
  - Over several studies, statistical reliabilities consistently in the range of .85 to .95, depending on range of sample
  - Inter-rater agreement rates at or above 85% within 1/3 of a level (now maintained at 85% within 1/4 of a level).
What psychometric models tell us

- For domain specific systems that have been validated longitudinally, skill level explains approximately 85%–95% of the variance in score distribution.
- There is more noise in domain specific systems than in the LAS.
- Lectical™ levels act more like progressions that involve state changes.
Content independence
The LAS behaves like a “ruler”

- Scoring is content & context independent
- Scoring criteria are always the same no matter what kind of conceptual content one is looking at
Why is this ruler-like quality important?
Content and context independence

- allows us to distinguish between different features of performance. For example:
  - developmental level vs. aspects of argumentation
  - developmental level vs. perspective-taking
Perspective taking

Mean perspective measure

Phase score

Error bars = 95% confidence interval for the mean

n = 39
n = 56
n = 53
n = 62
n = 22
n = 8
n = 5

10:4 11:1 11:2 11:3 11:4 12:1 12:2
A general metric

- allows us to relate performance to objectives. For example:
  - to meaningfully describe progress toward learning goals
  - to examine the relation between performance and task demands
Performance vs. standards

GOAL/STANDARD

7 8 9 10 11 12

- science
- english
- history
- math
Developmental pathways and institutional demands

levels of institutional demands

skills

levels of competencies
The maieutic spiral

1. **Implement and assess**
   - Analyze texts
2. **Developmental analysis**
   - Merge analyses
3. **Design and implementation**
   - Design instruments, collect data
   - Jointly identify research goals
4. **Establish collaboration**
   - Describe learning sequences
5. **Conceptual complexity**
   - Analyze texts
6. **Narrative cohesion**
   - Describe learning sequences
7. **Analytic assessment**
   - Merge analyses
8. **Narrative cohesion**
   - Analyze texts
Analyze texts

- Collect interview and assessment data;
- Score with the LAS;
- Analyze conceptual content (themes, concepts, and sub-concepts);
- Examine content in relation to levels; and
- Describe initial sequences.
Coding

- Core structure (complexity level) is only one aspect of performance.
- To learn how core structure relates to specific concepts and skills, we build concept coding schemes.
Coding, cont.

- **Skills**: argumentation, perspective taking, inference-types
- **Conceptual content**: themes, sub-themes, and concepts
- What we focus on is a function of what we want to get out of the data
Analysis

Raw interview data
(unanalyzed protocols)

Lexical (structural) analysis

Content analysis

Organize protocols along the dynamic skill scale

Identify themes within protocols

Examples of reasoning about each theme, arranged along the skill scale

Descriptions of reasoning about each theme at each level

Combine to produce

Employ inductive procedure to produce
Epistemology example
Epistemology research

- adolescents and adults
- dualism (right/wrong) to contextual relativism
- single developmental strand (within domains)
- contextual relativism evolves from understanding that knowledge is uncertain
Problems

- Lower levels based on performances of adolescents (Dawson, 2002, 2003)
- Assumption that lowest level (rarely observed in adolescents) is dualistic not empirically supported (Chandler, Boyes, & Ball 1990)
- Scoring systems, laden with conceptual content, are based on small construction samples (Dawson, 2003, 2004)
Addressing problems

- To determine what early behavior looks like, study epistemological development in children.
- To eliminate bias introduced by content-laden scoring systems based on small construction samples:
  - Base developmental assessments on structural features of performance.
  - Analyze conceptual content independently.
Questions

- Does strict dualism characterize young children’s epistemologies?
- Does relativism (truth is context dependent) emerge from increasing awareness of the uncertainty of knowledge?
- Is relativism a culturally mediated phenomenon?
Method: Data and developmental assessment

- 108 respondents, age 5 to adulthood
- Television dilemma
- 2 to 7 protocols per case
- Lectical™ Assessment System, 5 phase version
  - domain independent
  - level of abstraction and logical structure
  - reliability and validity
- Mean complexity level across protocols
Television dilemma

- Dilemma for children: Parents disagree about whether television is good or bad for children. Some parents say it is good for children to watch as much TV as they want. Other parents say that all TV is bad for children. What do you think: Is TV good or bad for children? When adults disagree, how can you tell which adult knows best? Can you ever be sure which side is right?

- Dilemma for adolescents and adults: Psychologists disagree about the impact of violent television on children. One group argues that the evidence suggests that television violence causes children to engage in violent behavior. Another group argues that the evidence suggests that television violence prepares children for the realities of adult life, much like fairy tales did before the invention of television.
## Distribution of scores

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<th>Complexity phase</th>
<th>Age-range</th>
<th>Frequency</th>
<th>Percent</th>
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<td>11.1</td>
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<td><strong>100.0</strong></td>
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Method: Content analysis

- Responses to probe 7, “Is there anything that everyone can agree about?”
- Coded responses into thematic categories
- Examined distribution of themes by complexity level
- Analyzed texts in light of patterns
# Themes by complexity level

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<th>SA</th>
<th>AM</th>
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Results

• “Truth is uncertain” and “truth is relative” appear at every complexity level
• Notions that truth is uncertain and that truth is relative develop on separate strands
• Relativism, uncertainty of truth, and absolutes coexist at every complexity level
Truth & lies, real & fake, same & not same, right & wrong

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

Truth is certain/uncertain

Truth is absolute/relative
Representational mappings

- Truth is certain/uncertain
  - Conceptualized in terms of truths/lies or real/fake. Children demonstrate an awareness of objects and events (things) in their taken-for-grantedness. Distinctions are made between real and fake or pretend, truths and lies. Children performing at this level may assert that the truth can’t be found if someone lies or fakes something really well or if it is a truth that is too hard to find.

- Truth is relative
  - Aware that two authorities can disagree and may claim that both are right. The rules at Tommy’s house are true in his house and the rules in my house are true in my house.
Representational systems

• Truth is certain/uncertain
  - Conceptualized in terms of what is known. There is an emerging understanding that certain types of things tend to be true, while other things should be categorized as untrue or uncertain (categories of things that can be true or not). Some attempts to seek out reasons for thinking something is true or not (concrete evidence).

• Truth is relative
  - Disagreements between people are understood as common and as a kind of proof that people do not agree with one another. Truth—the right thing or right decision—is something that people will argue about.
Fact: A phenomenon that is consistently observable

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

Truth is certain/uncertain

Truth is absolute/relative

Concrete precursor insights into the objective world
**Proof:** A consistently observed or unchallenged event/phenomenon

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

- Truth is certain/uncertain
- Truth is absolute/relative

Proof: consistently observed or unchallenged event/phenomenon

Concrete precursor: insights into the objective world
Belief: Version of the truth that results from a particular opinion

Truth is certain/uncertain

Truth is absolute/relative

Concrete precursor: insights into the objective world

Single principles
Abstract systems
Abstract mappings
Single abstractions
Representations
**Opinion:** What different individuals may think about a phenomenon

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

Truth is certain/uncertain

Truth is absolute/relative

Concrete precursor insights into the objective world
Single abstractions

- Truth is certain/uncertain
  - Conceptualized in terms of abstract notions of fact (non-facts) and proof (or lack thereof). These are general concepts about differences between types of things that summarize a variety of insights into the given-ness of objects and events. At this level, facts, which are things that can be proven, are often the only things considered to be true.

- Truth is relative
  - “Everyone has their own opinion,” appears as the dominant conception at this level. The main insight is that people have different opinions, which means they will not agree on things, and this means there isn’t really a truth.
Information: Multiple types (expert, scientific, experiential)

- Expert
- Scientific
- Experiential

Truth is certain/uncertain

Truth is absolute/relative

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

Fact
Proof
Belief
Opinion

Concrete precursor insights into the objective world
Accuracy: Some types of information are better than others

- Fact
- Proof
- Belief
- Opinion

Truth is certain/uncertain

Truth is absolute/relative

Single principles
Abstract systems
Abstract mappings
Single abstractions
Representations

Concrete precursor insights into the objective world
Bias: People choose the information they take into account

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

Bias:

People choose the information they take into account.

Truth is certain/uncertain

Truth is absolute/relative
Perspective: People have different sets of beliefs that impact decision making

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations

Truth is certain/uncertain
Truth is absolute/relative

Fact
Proof
Belief
Opinion

Concrete precursor insights into the objective world
Concrete precursor insights into the objective world
Abstract mappings

- Truth is certain/uncertain
  - Emphasis on the need to make a distinction between things that are factual and things that are not. This is facilitated by a more fully elaborated conception of accuracy, which involves differentiating between different types or sources of information.

- Truth is relative
  - The abstract mappings concept of belief captures a distinction between the sciences and the everyday world of human interaction. Science is about facts, religion, values, and views are about belief. Science can be proven, belief cannot.
**Evidence: Procedures for determining the accuracy of information**

- **Truth is certain/uncertain**
  - concrete precursor insights into the objective world

- **Truth is absolute/relative**
  - concrete precursor insights into the objective world

**Categories:**

- Single principles
- Abstract systems
- Abstract mappings
- Single abstractions
- Representations
Limits: General social or cognitive constraints on capacity to agree

Truth is certain/uncertain

Truth is absolute/relative

Single principles

Abstract systems

Abstract mappings

Single abstractions

Representations
Abstract systems

- Truth is certain/uncertain
  - A central concern with evidence characterizes reasoning at this level. Respondents provide systematic descriptions of evidence and how to generate it. There is an increasing differentiation between scientific evidence and other (interpersonal) kinds of evidence and an emerging recognition of the ways in which human nature impacts the evaluation of evidence.

- Truth is relative
  - Relativism results from differences in perspective and the bias that results from the inevitably limited nature of individual perspectives. Two different perspectives can reveal two different valid truths, even if these truths contradict one another.
Paradigms or models

- evidence/validity
  - information
  - fact
  - concrete precursor insights into the objective world
- cognitive/social limits
  - accuracy
  - proof
  - concrete precursor insights into the objective world
  - bias
  - belief
  - concrete precursor insights into the objective world
  - perspective
  - opinion

Truth is certain/uncertain

Truth is absolute/relative

Single principles

Abstract systems

Abstract mappings

Single abstractions

Representations
**Single principles**

- Truth is conceptualized in terms of models or paradigms, which are built upon precursor conceptions of perspective and bias. Paradigms are conceived as responsible for the existence and maintenance of individual and group perspectives. They are intersubjectively constituted frameworks of meaning and life practices that create a kind of meta-perspective. At this level relativism and the uncertainty of truth are seen to be a result of differences between paradigms (differences between overarching approaches to living, culture and inquiry) or evolving models (differences in explanation due to the advance of knowledge).
Answers?

- Early forms of contextual relativism are apparent in the performances of 5-year-olds.
- The roots of relativism are in the social world.
- Gradually, over the course of development, conceptions of social relativism are integrated with conceptions of truth in the physical world.
Scoring and coding in action

http://devtestservice.org/coding/chooseglc.php
Assessments & skills
Design possibilities

- Perspective-taking intervention
- Argumentation intervention
- Word generation intervention

Control

History

- American slavery

Science

- Conservation of matter

Literature

- Friendship in Pride and Prejudice

Complexity level

Academic language

Argumentation

Social perspective

Conceptual content