

Learning Progressions: Sources and Implications for Assessment

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Presentation at the CCSSO Large-Scale Assessment
Conference

June, 19, 2007 Nashville, TN



Overview

- Challenge: Need support for learning beyond current large-scale assessment and accountability
- Focus: “Learning Progressions” and instructional assessments
- Elaboration: Sources for learning progressions
- Application: Things states can do to develop learning progressions and associated assessments



Challenge: Supporting increased student learning

- Assertion 1: Current large-scale assessment and accountability are insufficient to produce the student learning we desire.
 - We can make accountability and large-scale assessment better, but they will always be insufficient because they are too distal to teaching and learning.
- Assertion 2: Learning progressions and instructional assessments can support learning and teaching more powerfully (but still are only part of the solution).



Focus: Learning Progressions

- “Descriptions of the successively more sophisticated ways of thinking about an idea that follow one another as students learn” (Wilson & Bertenthal, 2005)
- “Descriptions of successively more sophisticated ways of reasoning within a content domain” (Smith et al., in press)
- “A picture of the path students typically follow as they learn... A description of skills, understandings and knowledge in the sequence in which they typically develop.” (Masters & Forster, 1996)
- The organization of learning experiences designed to “help students go ahead in different subjects as rapidly as they can”... “to learn how to learn.” “Any subject can be taught effectively in some intellectually honest form to any child at any stage of development.” (Bruner, 1960)



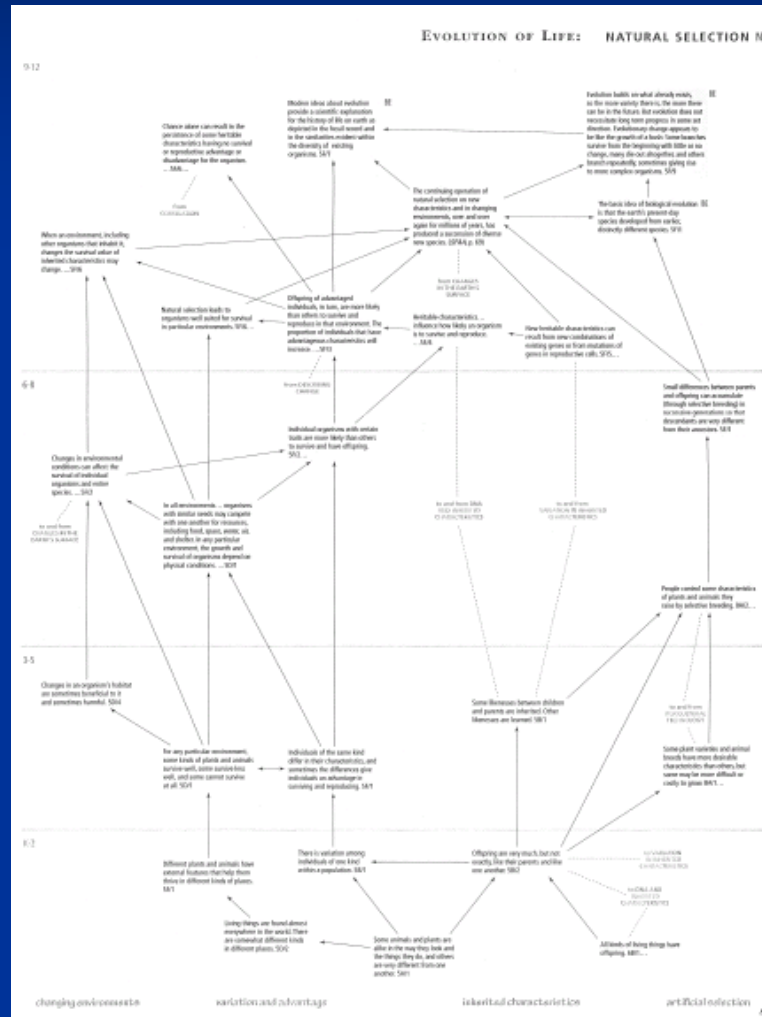
Learning Progressions: Characteristics

- Selected content
- Developmental sequence
- Examples – see handout
 - Natural Selection, Moving the Continents (AAAS)
 - Counting and Ordering in math (Masters & Forster)
 - Spelling stages (Mariotti & Homan)
 - Science achievement (Lapointe et al.)
 - “Leaves change and fall” (Gong et al.)
 - Sinking and floating/density (Kennedy & Wilson)



Example 1: AAAS Atlas of Science Literacy (Natural Selection)

Characteristics:



Characteristics of these “Learning Progressions”

- Natural Selection, Moving the Continents (AAAS)
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Learning Progressions, Standards, and Educational Reform

- View 1: Learning progressions are an extension of the standards-assessment model for educational reform.
 - Clear learning targets (content and performance), all students, feedback to guide instruction
- **HOWEVER** – Standards typically lack the detail, developmental coherence, and skills (reasoning, etc.) needed to present sufficient learning targets and learning progressions

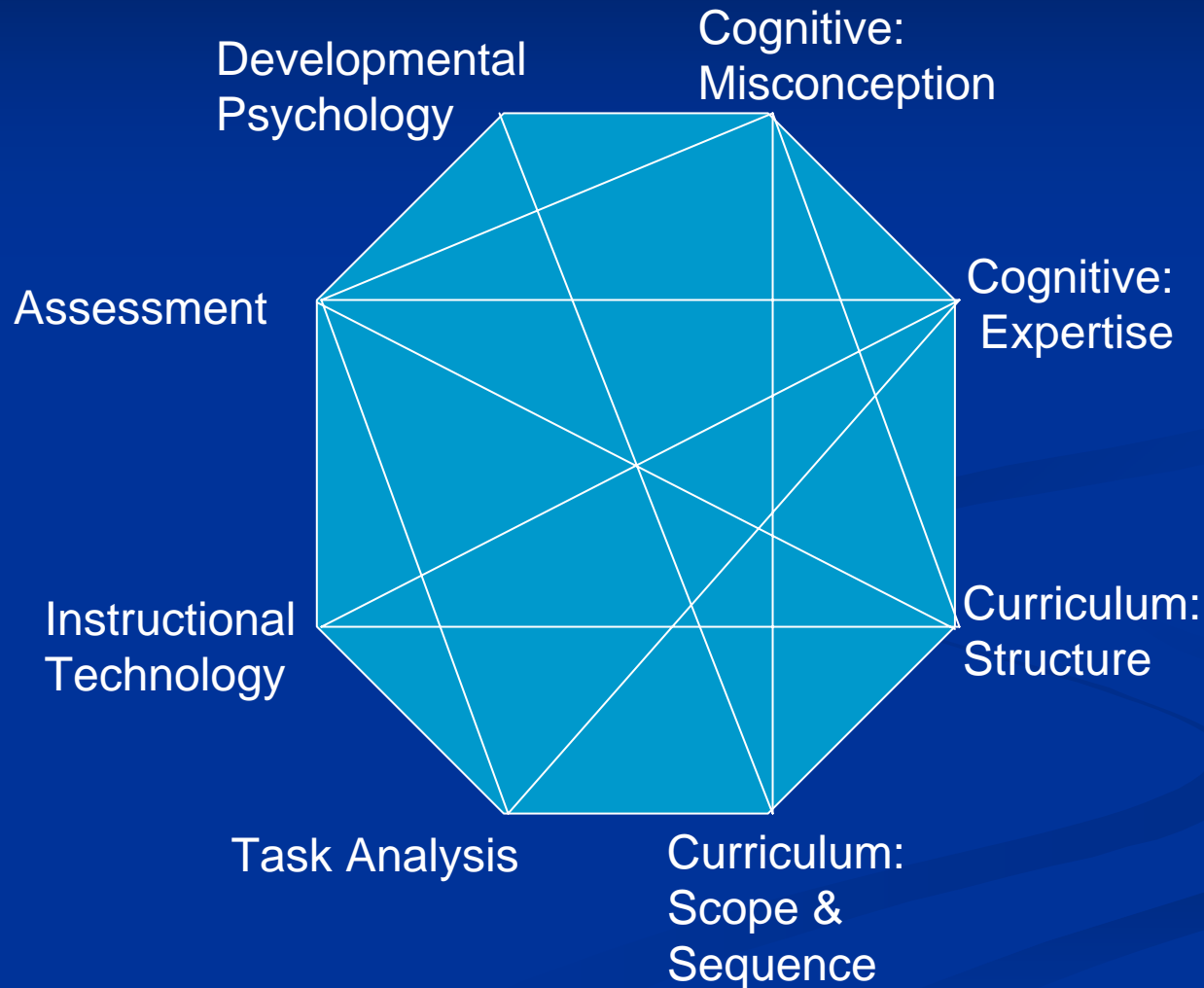


Some Key Traditions Informing Learning Progressions

- Developmental psychology
- Cognitive psychology
 - Misconception/Naïve theories
 - Expertise
- Curriculum
 - Structure (Content & Skills)
 - Scope & Sequence
- Task analysis
- Instructional technology
- Assessment



Relations of traditions



Developmental Psychology

Features and examples

■ Features:

- Inherent
- Universal
- Invariant*

■ Examples:

- Piaget: preoperational, concrete, symbolic
- ACER: Spelling
- Applebee: Children's concept of story



Curriculum: Scope & Sequence

Features and examples

- Features:
 - Lays out content knowledge – can be content web rather than linear
- Examples:
 - AAAS: Atlas of Science Literacy
 - Most state content standards



Cognitive: Misconception

Features and examples

- Features:
 - Incorrect schema (concept, procedure)
 - Rule-oriented (“mal-rules”) – well-structured content with a “grammar”
- Examples:
 - Brown & Burton: “buggy subtraction”
 - Minstral: Inertial motion



Curriculum: Structure

Features and examples

- Features:
 - Focuses on “essence” and “structure”
- Examples:
 - Bruner:
 - NSF “learning progressions” projects
 - Ginsberg: Multiplication deep structure, multiple representations



Cognitive: Expertise

Features and examples

- Features:
 - Content *plus* cognitive skills (habits of mind, heuristic)
 - *Plus* structure, models, extensive schemata
- Examples:
 - Wilson: density; Siegler: balance beam
 - Conant: Sea of Air
 - Applebee: Child's concept of story



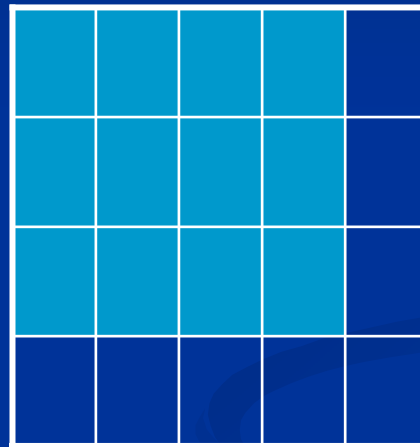
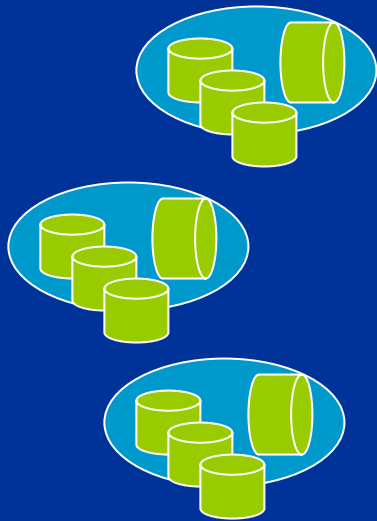
Example: Multiplication

- Acquisition – movement from addition to multiplication
 - Multiplication: problem of finding the total quantity of objects contained in a given number of groups with the same number of elements
 - Cognitive challenges:
 - Learner has to know and operate with two different grouping systems (number of groups and number of items in a group) – not like addition or subtraction
 - Operational number systems different than place value system (e.g., 12 is one ten and two ones)
 - Generalization of learned representations (e.g., quantity per set model; area model; number line model)



Multiplication – cont.

■ Multiplication Example (Ginsburg)



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

What is intended to develop

- Deep content representation
- Other dimensions
 - Skills; Complexity
 - Independence
 - Generalization, application, reflection = “habits of mind”
- = Proficiency



Content standards not enough

- Good examples of state grade-level content standards showing some development of knowledge, skills, or complexity over time
 - NRC Science (2007)



Complexity continua

- Rote recall to strategic thinking (Webb)
- Memorize, perform routine procedures, communicate understanding, perform nonroutine problems, conjecture/generalize/prove (Porter & Smithson)
- Concrete to abstract (Dienes)
- Global to analytic to deductive (van Hiele)
- Pre-operational to operational (Piaget & Beth)
- Concepts to rules to problem-solving (Gagne)
- Enactive to symbolic (Bruner)
- External to internal (Vygotsky)
- Situated to decontextualized (Cole & Griffen; Greeno)
- Facts/skills to applications to analysis/synthesis/evaluation (Bloom)
- Naïve interpretations (based on superficial characteristics) to scientific models (focused on key attributes and underlying regularities) (Steen)
- Application, learning potential, metacognition, beliefs and values, whole (Ginsburg et al.)



Proficiency

- Content, complexity, independence together
- Usually not specified completely
- Centered mostly on the complexity and independence dimensions!
- How does *proficiency* develop?



Task Analysis

Features and examples

- Features:
 - Make explicit needed knowledge and skills
- Examples:
 - Alternate assessments (some)
 - BUT – don't get side-tracked into trees vs. forest (addition: lining up columns vs. moving towards variable & functions)
 - AAAS Atlas(?)



Instructional Technology

Features and examples

■ Features:

- Explicit attention to links, transitions, decision-points, etc.
- Incorporates content sequencing and experience (instruction) (e.g., practice, assessment)

■ Examples:

- Bruner: Acquisition, Transformation, Evaluation
- D. Merrill: Component Display Theory
- Suzuki violin, karate (?)



Assessment

Features and examples

■ Features:

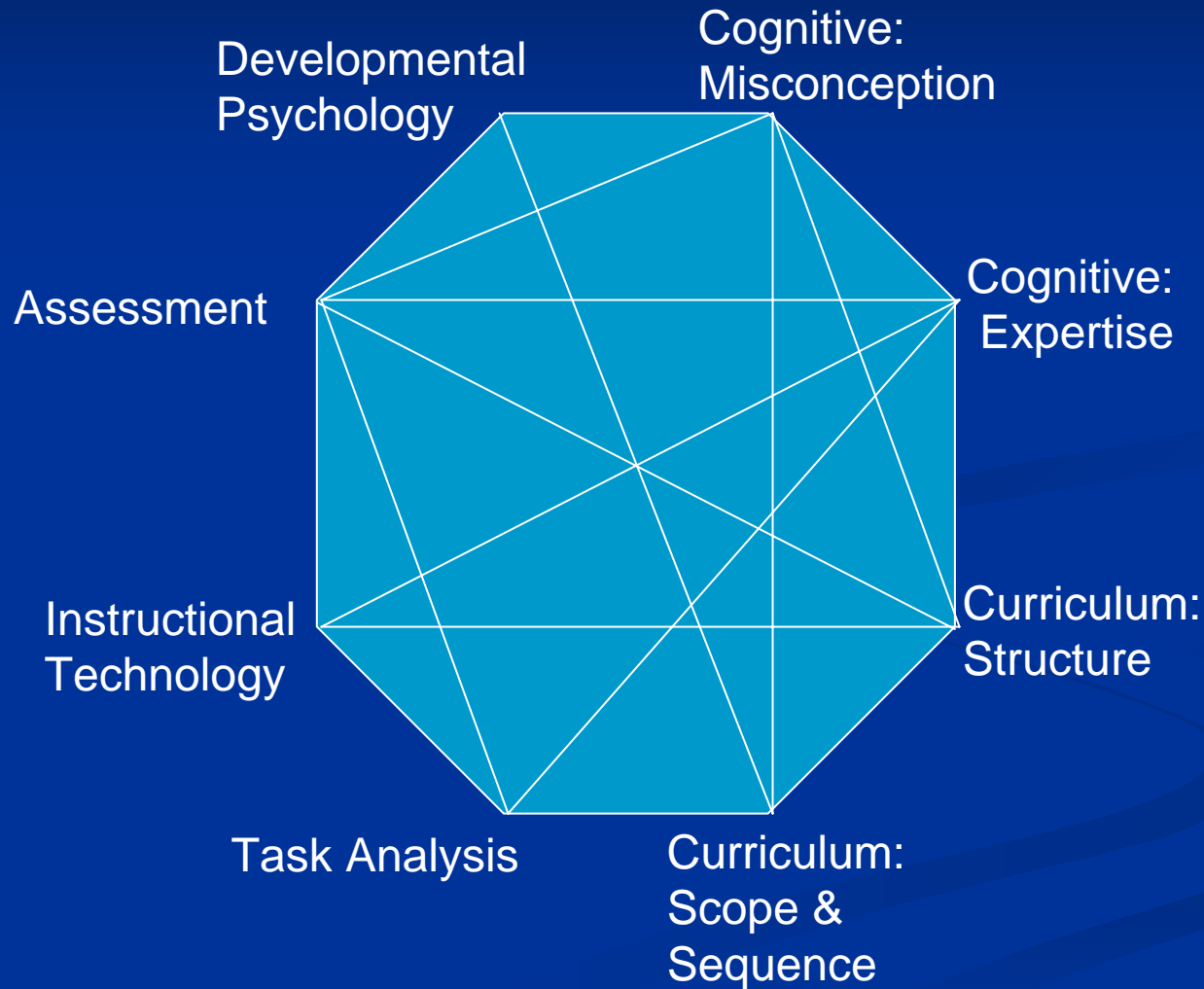
- Leveled
- Empirical basis
- Compact (unidimensional; single scores)
- “Objective” and uniform
- Dynamic

■ Examples:

- NAEP Science levels
- ACER, Wilson



Relations of traditions



Developing Learning Progressions and Assessments

- Don't wait for conclusive research and consensus about “the right way”
- Do understand the conceptual frameworks, and decide what emphasis you'll make (and why)
- Do collect as many examples of different approaches as you can
- Do clarify your purpose(s)
- Consider revising/extending your state content standards
- Analyze curricula (frameworks, syllabi, maps)



Progression Design Decisions

- Specification – Generalization (content)
- Content – Skills – Models
- Proficiency – content, complexity, student role
- Individualization (students/teachers)
- “What is” vs. “What typically is” vs. “What should be”
- Interpretation: Contextualization
- Reconceptualization: developmental rubrics versus achievement levels
- Consider supporting teacher benchmarking to develop learning progressions at some level (district?).



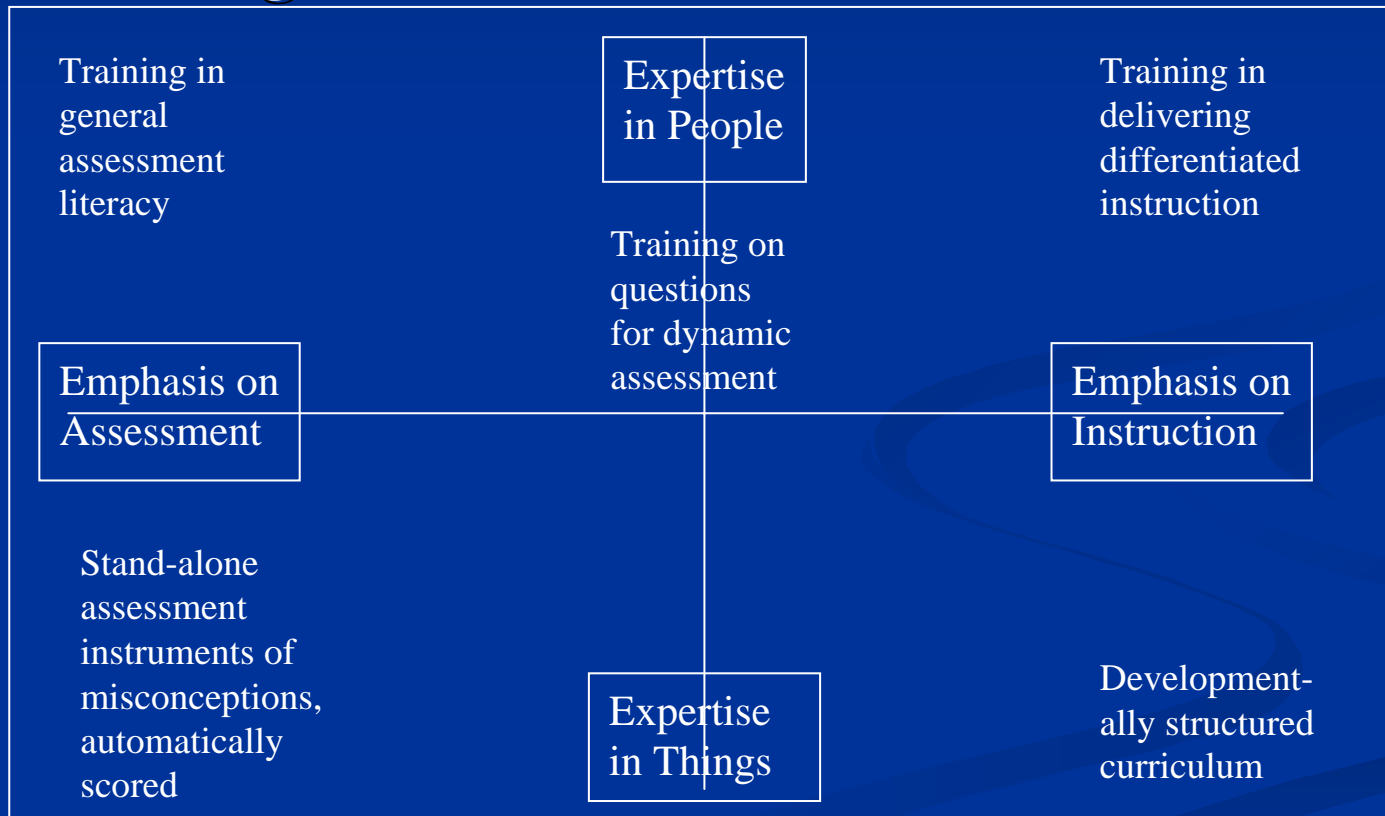
Learning Progressions and Assessments

- Interim assessments
- Growth
- Formative assessments



Formative Assessments

■ Two design dimensions



Plan on being a Learner!

- Keep up with developments – all around us!
- Try things out yourself
 - Extend standards
 - Develop curriculum
 - Develop formative assessments
 - Flexibility (e.g., Acceleration)
- Communicate within the community of people working



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