Tools & Strategies for Developing and Using Learning Progressions

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Learning Progressions can provide a schema for …

- Planning & Modifying Instruction
- Developing Meaningful Assessments – especially formative assessments
- Monitoring Progress
  - Mastery of Specific Concepts & Skills
  - Novice ⟷ Expert

Looking at 4 *Interrelated Guiding Principles* of Learning Progressions

1. Based on Research
2. The big ideas/the "essence" of concepts/processes are the binding threads
3. May not be linear, but articulate movement forward to increased understanding
4. Go hand-in-hand with well-designed/aligned assessments

“If we knew what we were doing, we wouldn’t call it research.”

Einstein

Unpacking Guiding Principle #1:
Based on Research

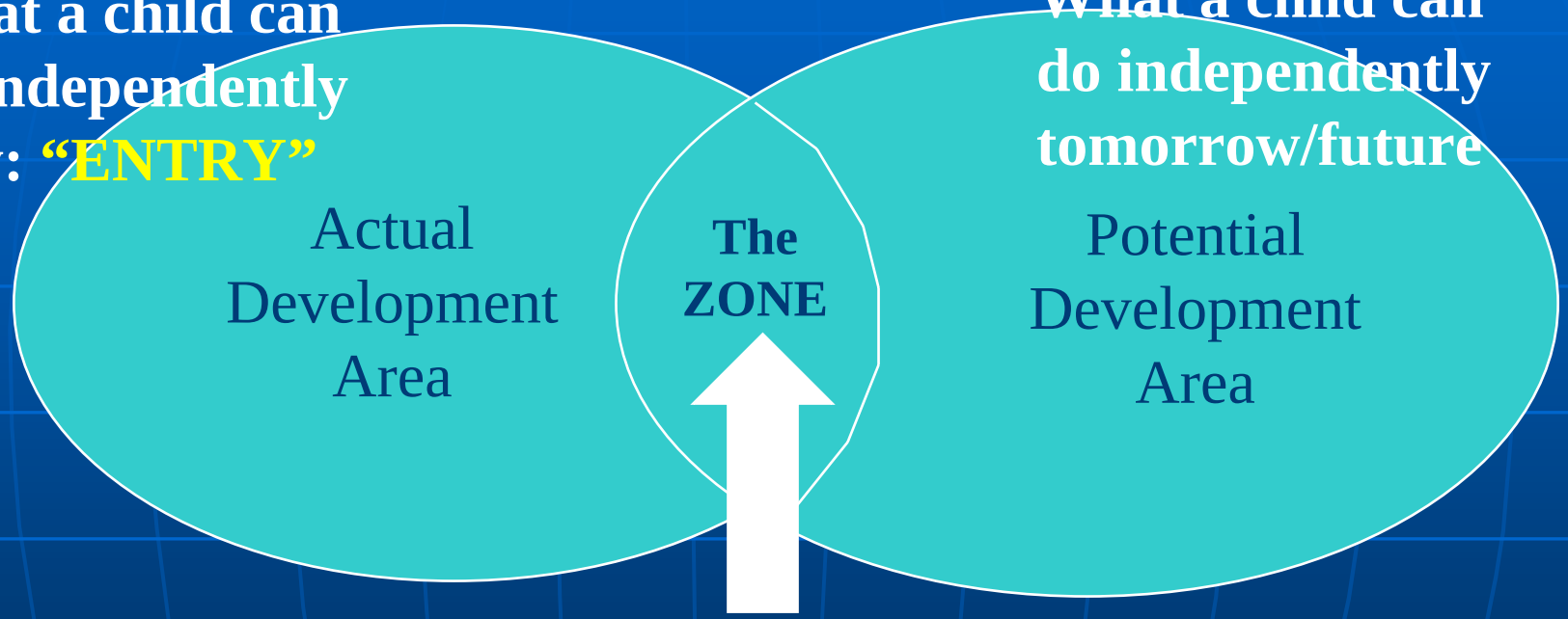
1. What does cognitive research tell us about building deeper understanding?
2. What does content-specific research tell us about learning/building upon earlier skills/concepts?
3. What do we elicit & learn from ongoing action research/formative assessment?
   - ✓ Observations (ongoing & systematic)
   - ✓ Evidence (what's there/what's not there)
   - ✓ Assessment Tasks (short constructed responses that "uncover" student thinking)

Vygotsky: Zone of Proximal Development

(What a child can do *with assistance* today)

What a child can do independently now: "ENTRY"

What a child can do independently tomorrow/future



LEARNING PROGRESSIONS ZONE:

Dynamic area

Causes development to move forward

Social interaction essential (scaffolding)

Learning Progressions
"Link" the Zones of ALL Students

What can they extend?

Advanced

Proficient

Need for additional scaffolding?

"On track" for proficient

Modify materials & response formats?

2% Consistently Low Performing

1% Alt Assessment

Many (but not all) students are here.

Content-Specific LP Examples
(based on research)

Mathematics: Fractions

- Partition an area into parts
- Identify the fraction described by the partitioned area
- Find the fractional part of a whole

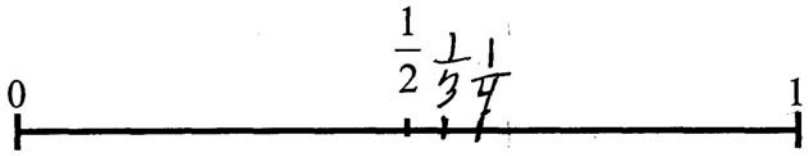
Reading: Vocabulary Development

- Recognize & learn words
- Recognize & learn related words (e.g., synonym, antonym)
- Use word structure to determine meaning
  - syllables
  - base words and affixes
- Use context to determine meaning
  - intended meaning
  - multiple meanings

Action Research/Formative Assessment: Short constructed response that elicits application & conceptual thinking…

Place $\frac{1}{3}$ and $\frac{1}{4}$ in the correct location on the number line below.

Explain your answer using words or diagrams.



I chose these spots because, it says $\frac{1}{2}$, and then $\frac{1}{3}$ comes after $\frac{1}{2}$, and then $\frac{1}{4}$ after $\frac{1}{3}$ because it goes 1, 2, 3, 4, and so that is how I think.

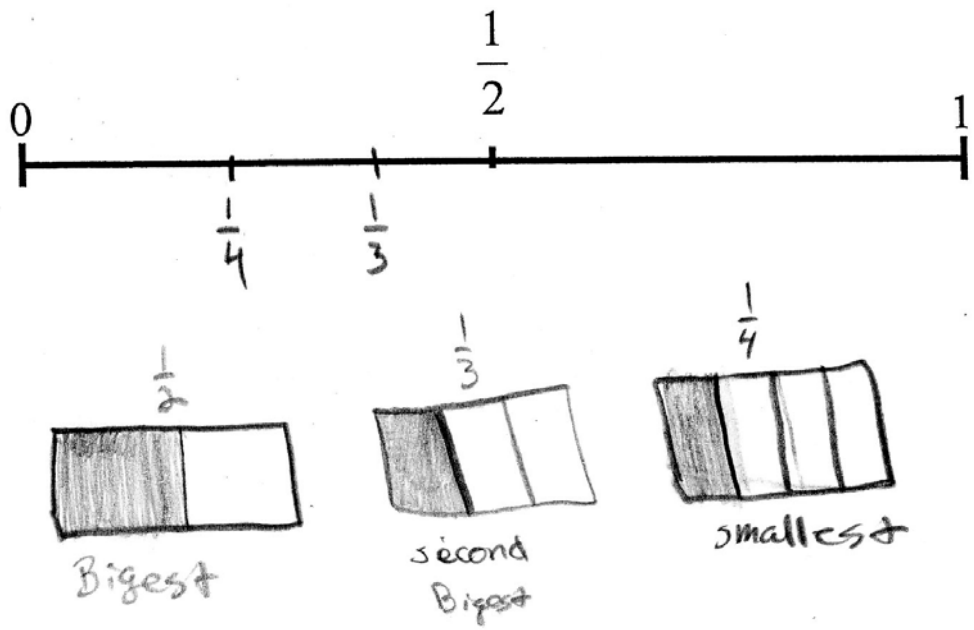
What understandings are evidenced in this student's work?

Source: Vermont Mathematics Partnership/OGAP

Formative Assessments help to develop/validate the LP range and later to monitor progress

Place $\frac{1}{3}$ and $\frac{1}{4}$ in the correct location on the number line below.

Explain your answer using words or diagrams.



What understandings are evidenced in this student work *that are different*?

What are some potential next instructional steps based on the evidence?

Source: Vermont Mathematics Partnership/OGAP

LP Refined/Expanded/Validated with Action Research: "Filling the Gaps"

Mathematics: Fractions LP

- Understand the difference between whole and part
- Knowing when whole number reasoning is not appropriate
- **Partition an area** or set of objects or number line **into parts**
  - Even number of parts
  - Odd number of parts
- **Identify fraction described by the partitioned area**
- Use multiplicative reasoning (division and multiplication) "3 of 4 equal parts"/not 3 of 4
- **Find the fractional part of a whole**
  - Set model (a set of objects)
  - Area model (a figure)
  - Linear model (number line)
- Finding a fractional part where the number of parts (e.g., objects in the set) is a multiple of the magnitude of the denominator
  - Set model
  - Area model
  - Linear model

Handout: “Analysis to Action”

Unpacking Guiding Principle #2:
Big ideas/the "essence" are the threads

- Identify the Big ideas/the "essence" of concepts/processes **(Wiggins & McTighe)**
  - ✓What has enduring value beyond the classroom? Why learn it?
  - ✓ What are the essential questions students seek to answer/discover?
- Does the "essence" connect LPs within ... & across years?

Handout: Developing & Refining Learning Progressions

Unpacking Guiding Principle #3:
Articulate Increased Understanding

- May not be linear, but moves learners forward
  - ✓ A map versus a route
  - ✓ Depth, breadth, complexity, strategy use, ability to generalize/transfer in a variety of contexts …
- Moves from pre-existing/prior knowledge to expected learning/understanding
- Describes a range of performance: how students organize ideas, facts; mental models/schema
  - ✓ Novice (distracted by surface features & unrelated content; have no/ mental models or faulty mental models; use all of working memory space)
  - ✓ Expert (use little working memory space, rely on patterns rather than bits of information)

Handout: Student Profile

Applying Principles 1, 2, & 3

A Vocabulary Example

- Identify words that are nouns
  - match object to picture
  - match picture to word
- Identify words that are verbs
  - match object to picture
  - match picture to word
- Identify words that have same or different meanings
- Track text from left to right
- Track text from top to bottom
- Read high frequency words

QUESTIONS

1. **Does this LP appear to be research based?**
   - ✓ **What do we know about vocabulary development?**
2. **What is the "essence" of this learning progression?**
   - ✓ **What is the thread that connects throughout the LP?**
   - ✓ **See HANDOUT**
3. **Does the LP describe a range from emerging skills/ concepts to proficiency?**
   - ✓ **Depth? Breadth? Complexity?**
   - ✓ **Specific to General**
   - ✓ **Novice to Expert**

Unpacking Guiding Principle #4: Well-Designed (aligned) Assessments

- Use evidence to Refine & Validate LPs
  - Are there in gaps in the LP?
  - Should you refine your thinking?
- Focus on tasks/probes that elicit how learners reason, use, or organize information - "Evidence to DIE for"
  - Describe what they did & how they did it; Interpret what they know, can do, or understand? Evaluate level/depth of competence in the domain/subject?
- Use evidence (especially from "formative probes") to inform next steps for instruction

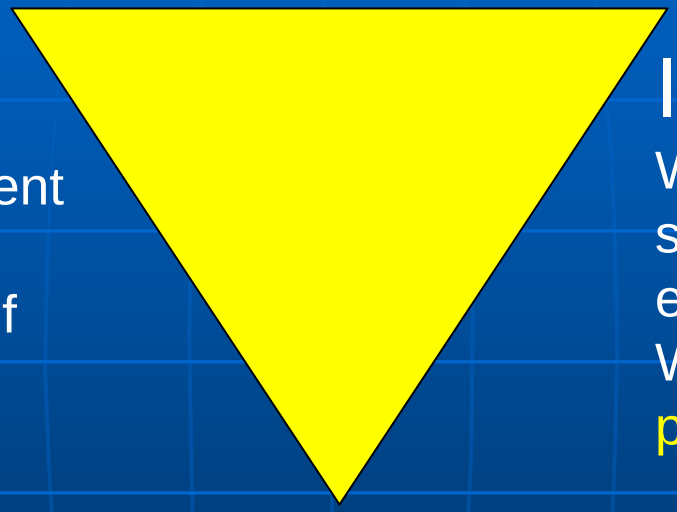
Coming full circle…

LPs seek to articulate what students will learn, how they will demonstrate learning, and what making progress *could* look like for most students;

Assessments seek to describe and interpret what students did and measure how much progress was made.

The Assessment Triangle

(Knowing what Students Know, Pellegrino, et al., 2001)



Observation:

What will/did the student do/say?
Was there evidence of reasoning/ use of strategies?

Interpretation:

What do you know for sure, given the evidence?
Where do you need to probe more?

Cognition:

How will/did the student represent knowledge? How is/is the student developing competence in the subject?

Summary Questions: Develop/Refine/Validate

1. Is this LP research based?
   - What does the/our research say about learning ____?
2. What is the "essence" of this learning progression?
   - Does the thread connect throughout the LP? And across grade levels? Or are threads getting tangled?
3. Does the LP describe a meaningful *range* of skills/concepts? How does understanding "grow?"
   - Depth? Breadth? Complexity? Generalize/Transfer?
   - Novice –to- Expert?
   - Is there enough LP clarity to design/align assessments?
4. What do your data tell you?
   - Are there gaps? (need lower levels, between levels, higher levels, side trips on the map)
   - Are you getting enough/the right information to: track progress; see patterns; link to the learning progression?
   - Do you need to modify/expand your assessment tools?

Some concrete suggestions…

- Wording refinements to LPs
  - Is language clear enough for designing assessments that elicit differences/a range of possibilities?
  - Is language clear enough for distinguishing "levels?"

- Conceptual refinements of LPs
  - Check grain size (e.g., some benchmarks are too small)
  - Are conceptual levels too arbitrary? (e.g., half visual and half numeric patterns vs. visual patterns learned before numeric)
  - Check "essence" especially when extending down HANDOUTS (Examples of Foundational Skills, LPs)

- Tools & Strategies for manageable & consistent data collection and interpretation
  - "Analysis to Action" Tools HANDOUT (4 applications)
  - Student Profile HANDOUT (Science Inquiry PreK-4)

4 Interrelated Guiding Principles

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Monitor & instruct using well-designed/aligned assessments

Use available Research

Observe, interpret, plan

Develop, validate, & Refine LPs

Create the LP "map"

Find the threads

Articulate increased understanding

Connect using the essence of concepts or processes

A Few Ways to Get Started

- Grade level/content teams analyze existing units of study within a content area to identify (and clarify) *implied* LPs
- Select any (research-based) LP model in one content area and "test" its validity by collecting instructional and formative assessment data to analyze
- Content teams conduct cognitive labs with existing common assessments to better understand how learning evolves
- Use a Problem-Based School Development approach: A small team of committed teachers develop & pilot a LP over several months & report findings and recommendations to staff
- University support: pre- and in-service courses & opportunities for guiding action research

Some LP-Related Resources

- Black, Harrison, Lee, Marshall, & Wiliam (2004) *Assessment for Learning*
- Caine Learning Institute [online] http://www.cainelearning.com/
- Duschl, Schweingruber, & Shouse (Eds.) (2007) *Taking Science to School: Learning & Teaching Science in Grades K-8*
- Education Department of Western Australia (1996, 2000) Addison-Wesley-Longman, *First Steps Frameworks*
- Hess (2007) "Tools & Strategies for Developing and Using Learning Progressions"
- Hill (2001). *Developmental Continuums: A Framework for Literacy Instruction and Assessment K-8*.
- Jensen (1998) *Teaching with the Brain in Mind*
- Pellegrino, Glaser, Baker, et al. (2001) *Knowing What Students Know: The Science and Design of Educational Assessment*
- (OGAP) "VMP's Ongoing Assessment Project: A Cognitively Based Formative Assessment System in Mathematics" (2007 CCSSO Presentation, Petit)
- Pinnell & Fountas (2007) *The Continuum of Literacy Learning Grades K-8: Behaviors and Understandings to Notice, Teach, and Support*
- Shepard, Hammerness, Darling-Hammond, Rust, with Snowden, Gorden, Gutierrez, & Pacheco (2005) *Preparing Teachers for a Changing World: What Teachers Should Learn & Be Able to Do*
- Sousa (1995) *How the Brain Learns*
- Sprenger (1999) *Learning & Memory*: *The Brain in Action*
- Wiggins & McTighe (1998, 2001) *Understanding by Design*