Improving Learning

Australian Council *for* Educational Research

Learning progression for pre-school children and measuring early mathematics ability

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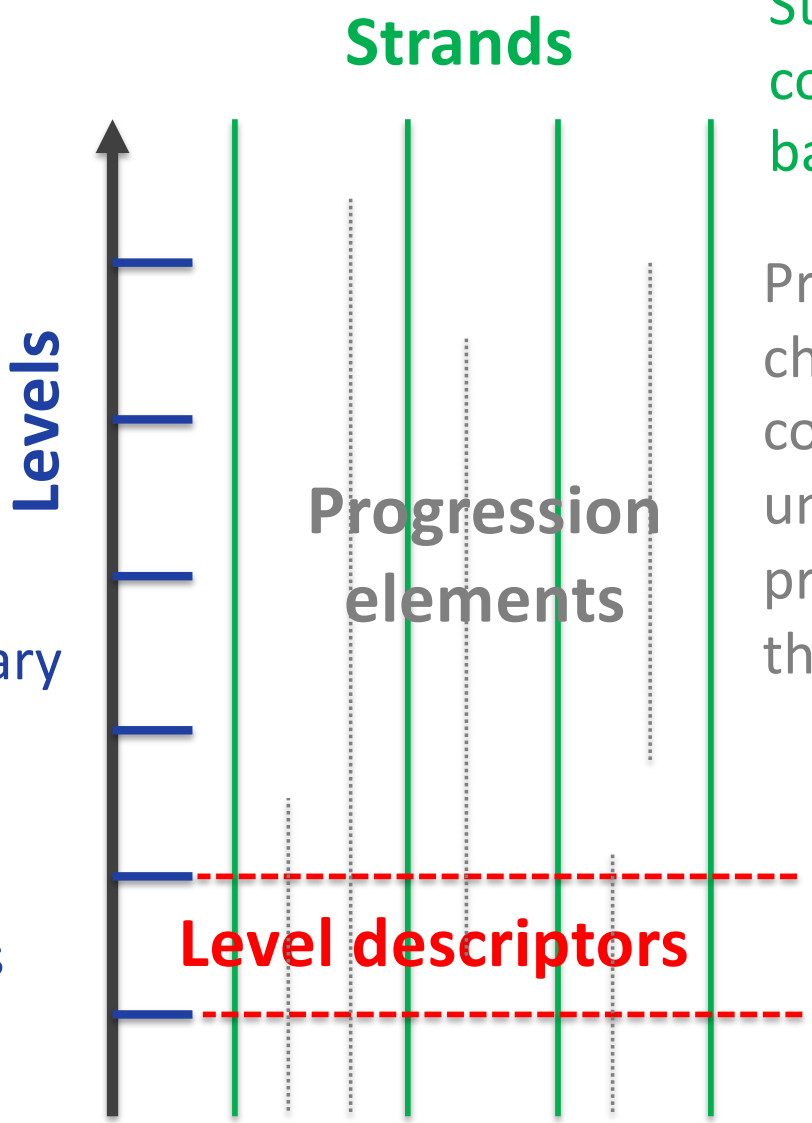
- Intro (Jen)
- How early is *early* in maths (Ross)
- Learning progressions (Ross)
- How do we measure learning and development in early mathematics? (Dan)
- Critique and wrap up (Jen)

An ACER definition of an LP

- A learning progression describes what it typically looks like for learners to move from early knowledge, skills and understandings to more advanced knowledge, skills and understandings within a domain.
  - 'progression' → continuity and coherence – seamless development of learning along core areas of the domain
  - 'typically' → may not be an accurate picture of how every student or every student group progresses
  - 'looks like' → based on real-world observation of learners
  - 'knowledge, skills and understandings' → a range of cognitive states and processes

What are the features of an ACER LP?



Strands are skill-based, concept-based or content-based divisions of domain.

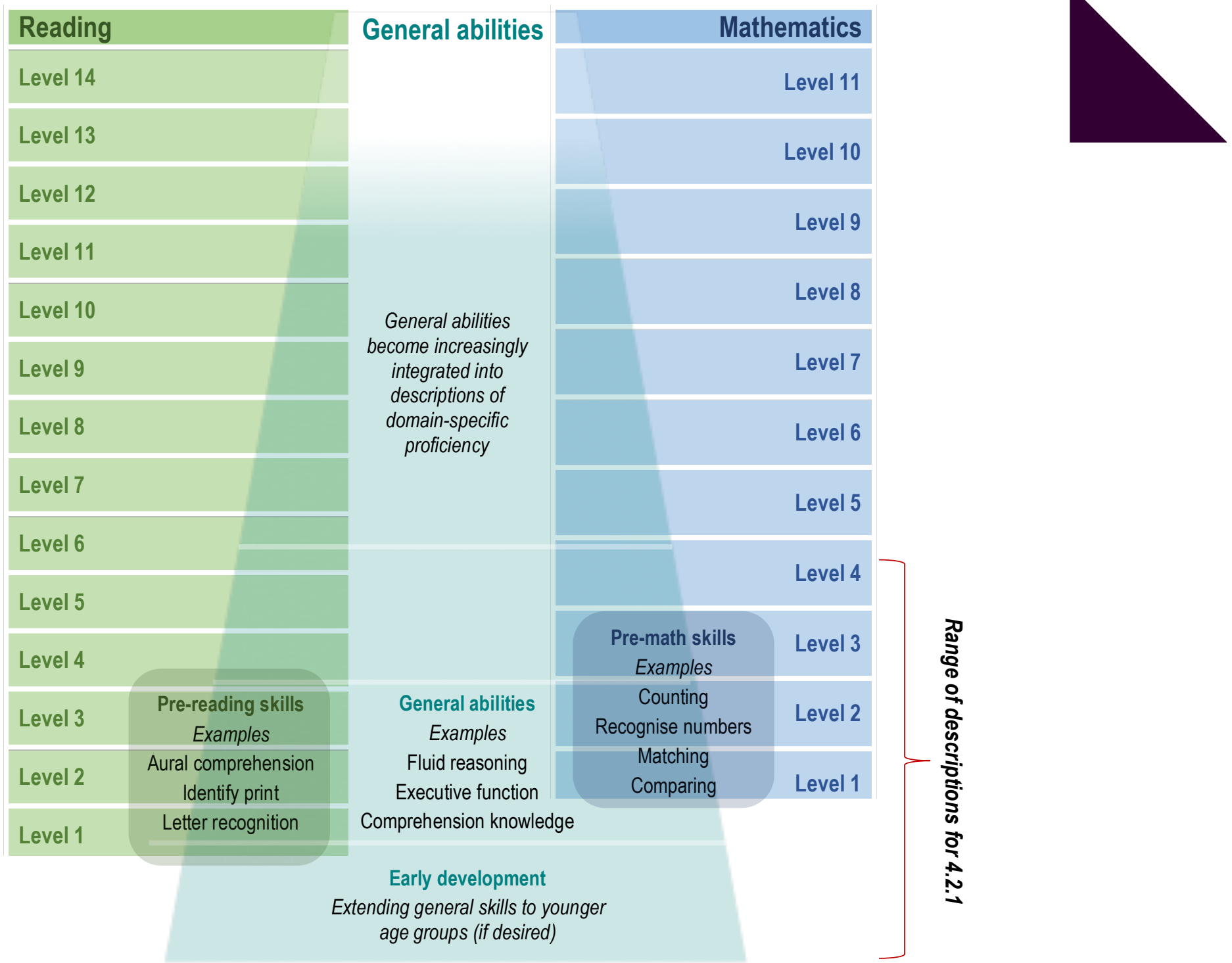
Progression elements are changes in concepts, contexts, behaviours and understandings that reveal progress in learning within the domain.

Levels are arbitrary but convenient divisions of developing knowledge, skills and understandings.

Level descriptors are descriptions of knowledge, skills and understandings at each level (overviews or strand-based)

What are the features of an ACER LP?

- ACER LPs have an underpinning quantitative basis in the form of an interval scale.
  - The scale is derived from analysis of learner performance data.
- ACER LPs have supplementary material associated with them.
  - instructional activities
  - illustrative assessment tasks
  - examples of learners' work


Reading
Level 14
Level 13
Level 12
Level 11
Level 10
Level 9
Level 8
Level 7
Level 6
Level 5
Level 4
Level 3
Level 2
Level 1
General abilities
General abilities become increasingly integrated into descriptions of domain-specific proficiency
Mathematics
Level 11
Level 10
Level 9
Level 8
Level 7
Level 6
Level 5
Level 4
Level 3
Level 2
Level 1
Pre-reading skills
Examples
Aural comprehension
Identify print
Letter recognition
General abilities
Examples
Fluid reasoning
Executive function
Comprehension knowledge
Pre-math skills
Examples
Counting
Recognise numbers
Matching
Comparing
Early development
Extending general skills to younger age groups (if desired)
Range of descriptions for 4.2.1

Describing children's learning

- How can educators measure mathematical ability?
  - Covers a range of learning appropriate to before school
  - Free/low cost
  - Available for use by educators
  - Comparable
- Example measures
  - MELQO, MICS, EGMA, DIBELS-M
  - EEF database

Example items

- Counting
  - *Now we are going to play some counting games. The first game is a counting out loud game. How high can you count? Start at one and count.*
  - STOP RULES: When a child states a number incorrectly or reaches 30.
  - MELQO #11 Verbal Counting

Example items

- Number identification

2	9	0	12	30
22	45	39	23	48
91	33	74	87	65
108	245	587	731	989

  - STOP RULES: 60 seconds
  - EGMA Toolkit example

Example items

- Number comparisons
  - *which domino shows the greater amount?*

  - STOP RULES: 60 seconds
  - DIBELS Maths K

Example items

- Producing a set
  - *Now we'll play a game with counters. Please give me three counters.*
  - *Now, please give me six counters.*
  - *Now, please give me fourteen counters.*
  - 20 uniformly sized small objects that can be used for counting (e.g., stones, bottle caps). Items should not be able to roll. No food items should be used.
  - STOP RULES: If child cannot give you 3 and 6 items (first 2 items)
  - MELQO #12 Producing A Set

Example items

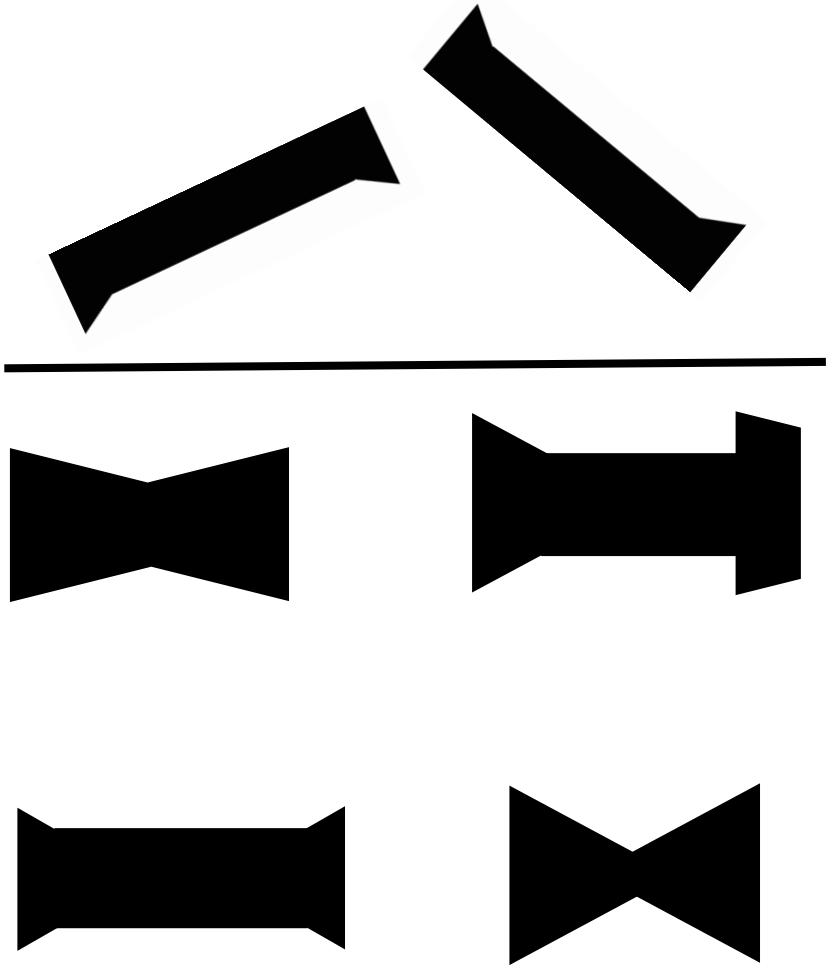
- Operations
  - *Now we'll play a game with counters. Please give me three counters.*

1 + 3 = ☐	4 – 1 = ☐
3 + 2 = ☐	5 – 2 = ☐
6 + 2 = ☐	8 – 2 = ☐
4 + 5 = ☐	9 – 5 = ☐
3 + 3 = ☐	6 – 3 = ☐

  - STOP RULES: 60 seconds
  - EGMA Addition and Subtraction Level 1
  - Note, MELQO uses counters + verbal response

Example items

- Mental transformation



– *In this game, we are going to look at some shapes and some pieces of shapes.*

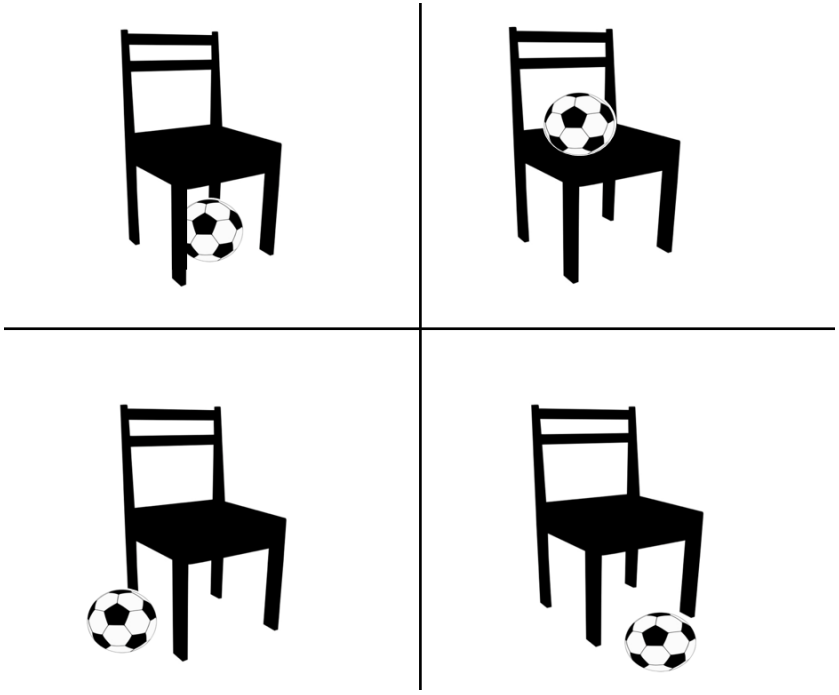
– *If you put these pieces together, they will make one of these shapes. Point to the shape the pieces make.*

– STOP RULES: none

– MELQO #16 Mental Transformation

Example items

- Visual Spatial



  - *Point to the picture with the ball on the chair.*
  - *Point to the picture with the ball under the chair.*
  - *Point to the picture with the ball in front of the chair.*
  - *Point to the picture with the ball next to the chair.*

  - STOP RULES: none
  - MELQO #10 Receptive Spatial Vocabulary

Are these good items?

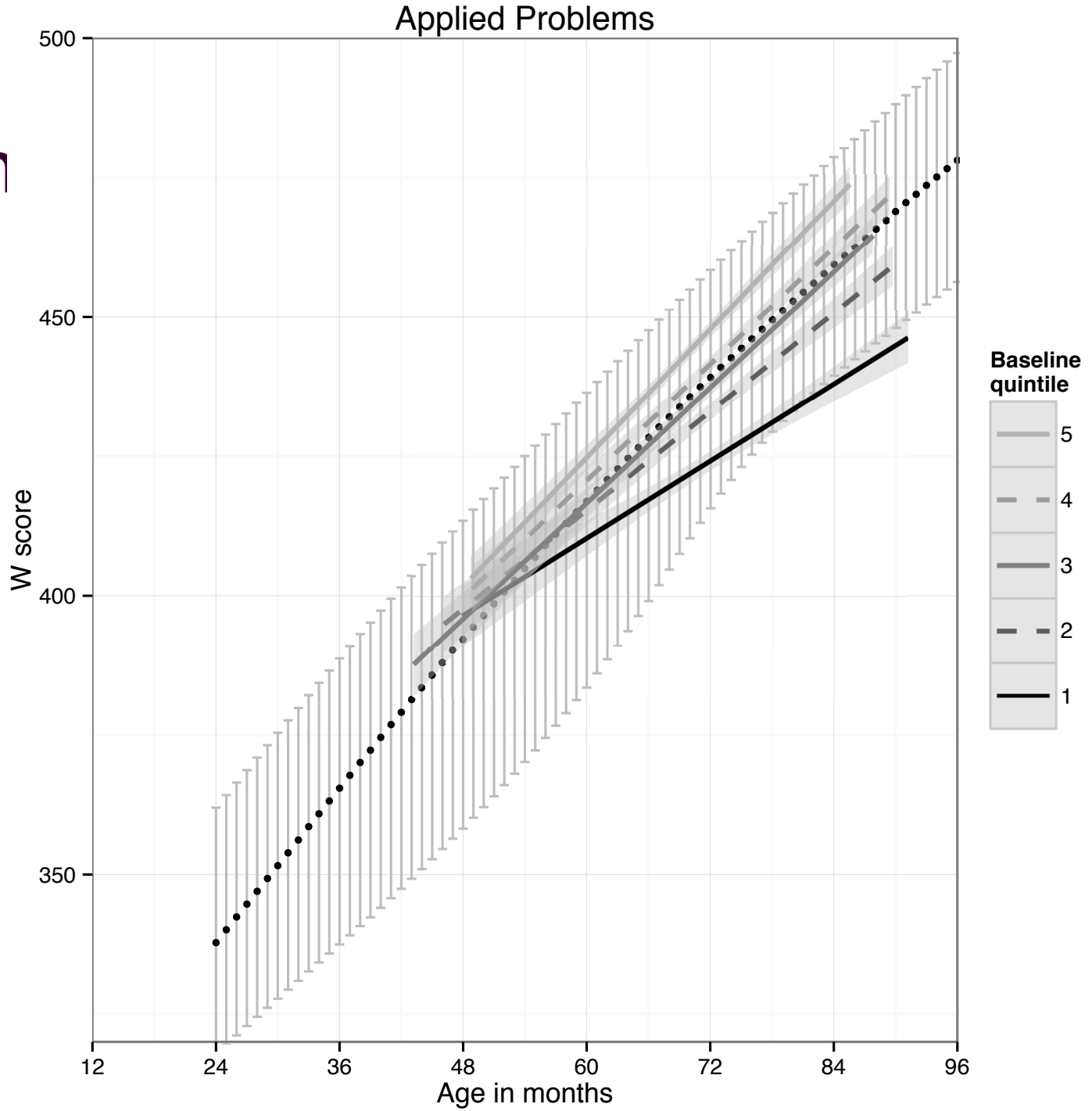
- A question of breadth
  - Other aspects of number
    - Subtraction, multiplication, division
    - fractions and decimals
  - Measurement and geometry
  - Statistics and probability
- A question of progression
  - How does this connect with maths in F-3, or 4+?
  - Psychometrics are weak
  - Developing world focus
- How do you measure growth in early maths?

What's the benefit?

- Linking early learning to later school-age achievement
  - Helps define lifelong learning
  - Links the work of EC educators to long-term outcomes
  - Helps quantify the benefit of fostering domain-general capabilities
  - Puts rigour around words like *holistic* and pre-mathematics

Wh

- To


Applied Problems
500
450
400
350
W score
12
24
36
48
60
72
84
96
Age in months
Baseline quintile
5
4
3
2
1

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