Reflections on Positioning Diagnostic Classification Modeling in Classroom Assessment

Justin Paulsen and Chris Andrews

Indiana University

Annotate our slides

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Cognitive Diagnostic Models (CDMs)

How do you solve this problem?

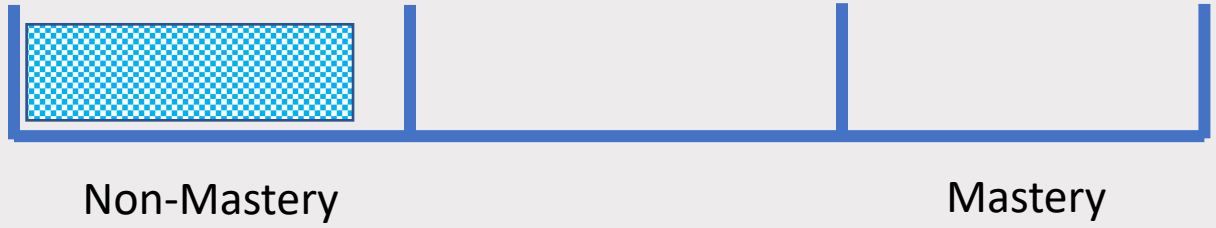
$$2\frac{8}{6} + 3\frac{10}{6}$$

1. Convert the first mixed number to a fraction
2. Convert the second mixed number to a fraction
3. Add the two numerators
4. Simplify fraction to simplest term

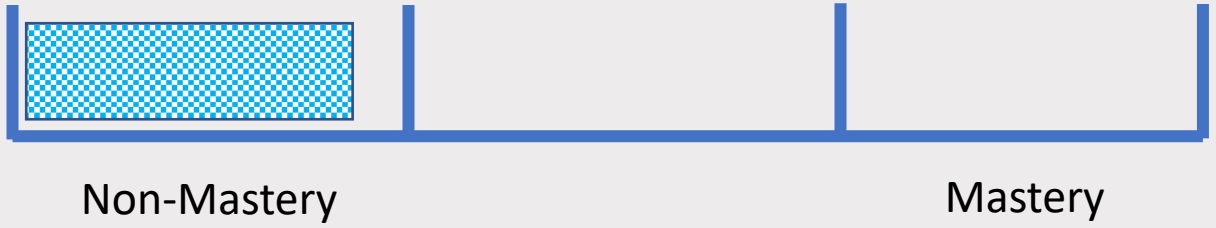
Taken from Tatsuoka, 1995, p. 337

Cognitive Diagnostic Models (CDMs)

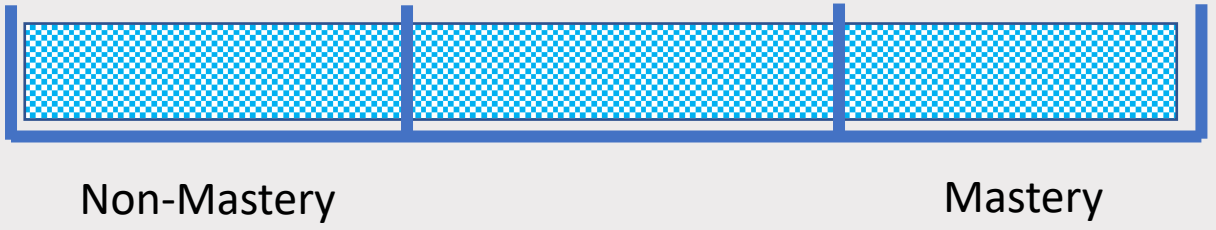
1. Convert the first mixed number to a fraction



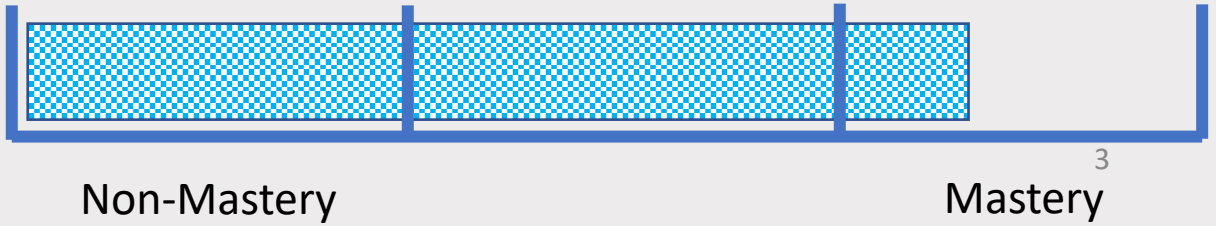
2. Convert the second mixed number to a fraction



3. Add the two numerators



4. Simplify fraction to simplest term



Formative and Classroom Potential of Cognitive Diagnostic Assessments (CDAs)

- Formative assessment is most effective where the proximity of the assessment feedback is close to the instructional context (Hickey & Pellegrino, 2005; Shepard, Penuel, & Pellegrino, 2018)

- Fine-grain attribute classifications in CDMs are well suited to formative assessment.

QUESTIONS

1. How can CDM classifications fit into the existing classroom assessment system in a way that does not distort instructional or assessment practices?
2. How do we maintain focus on quality of learning when CDM classifications report discrete classifications?
3. How can CDM classifications provide more guidance to students on next steps and encourage student self-regulation as Shepard, Penuel, and Pellegrino (2018) suggest?

How can CDM classifications fit into the existing classroom assessment system in a way that does not distort instructional or assessment practices?

Tensions

- CDAs typically developed by non-teachers (e.g., test developers, psychometricians)
- CDMs are a large-sample model
- Outcomes need to be useful by a teacher without adding more work

How do we maintain focus on quality of learning when CDM classifications report discrete classifications?

Tensions

- CDM classifications do not present a holistic view of the student.
- CDM classifications do not typically include descriptive features.
- Implicit assumptions of learning that may not align with classroom contexts.

How can CDM classifications **provide more guidance to students on next steps and encourage student self-regulation** as Shepard, Penuel, and Pellegrino (2018) suggest?

Tensions

- CDAs provide granular reporting of student competencies, but little direction on what students should do next.
- Feedback is a highly emotional interactive process, CDA proficiency levels may result in affective impacts.

(POTENTIAL) SOLUTIONS

- Identify reliable and valid diagnostic classification methods for small sample use.
- CDAs need to provide more detailed, granular feedback that is actionable for students and teachers.
- CDM classifications should be accompanied by detailed contextualization of the meaning of the classifications.

Identify reliable and valid diagnostic classification methods for **small sample use**

A handful of empirical demonstrations of CDMs have been conducted with small samples (N=96-144)

Research examining the possibilities of non-parametric diagnostic classification, neural network estimation, Bayesian estimation, and other CDMs should be conducted

CDAs need to provide more **detailed, granular feedback** that is **actionable for students and teachers**

Empirical CDM Attributes:

Numbers, variables, geometry, statistics, representation

Vocabulary, syntax, extracting explicit information

Classroom assessments need attributes more like:

Combine like terms, multiply by least common denominator, isolate the unknown, multiply or divide by the coefficient before the unknown

CDM classifications should be **accompanied by detailed contextualization** of the meaning of the classifications

*What can I understand, interpret or analyze in authentic **informational texts**?*

PERFORMANCE INDICATORS		
NOVICE LOW	**NOVICE MID**	**NOVICE HIGH**
I can identify memorized or familiar words when they are supported by gestures or visuals in informational texts.	***I can*** identify some basic facts from memorized words and phrases when they are supported by gestures or visuals in informational texts.	***I can*** identify the topic and some isolated facts from simple sentences in informational texts.

EXAMPLES: Written

NOVICE LOW	NOVICE MID	NOVICE HIGH
I can… (customize with specific content).	***I can… (customize with specific content).***	***I can… (customize with specific content).***
I can identify some locations or stores by their signs.	***I can*** identify nutritional categories on food labels.	***I can*** follow directions in a Scavenger Hunt game
I can match a word or character in a headline to a supporting visual.	***I can*** identify items on a shopping list.	***I can*** understand a variety of simple messages on greeting cards.
I can recognize some names of cities on a map.	***I can*** identify names of classes and their locations on a class schedule.	***I can*** select a movie based on a short description.
I can identify labeled aisles in a store.	***I can*** identify my departure and arrival times from a transportation schedule.	***I can*** understand someone's profile on a social media site.
I can recognize the labels on a recycling bin.	***I can*** understand what information is provided on a student ID card.	***I can*** understand some facts about the weather especially when weather symbols are used.
	I can understand subject-specific terms on a word wall.	

Taken from ACTFL Can-Do Statements

Thank You

If you have any questions or want to connect with us, contact us at jumpauls@indiana.edu; andrewch@Indiana.edu