

Using criterion-referenced assessment to illuminate the digital literacy capability of students with disabilities: A PhD study

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Overview

- Background
- Literature review
- Aim of study
 - Research questions
 - Methodology
- Research design
 - Steps in designing the assessment
 - Example of assessment items and sample reports
- Data analysis
- Questions

Background

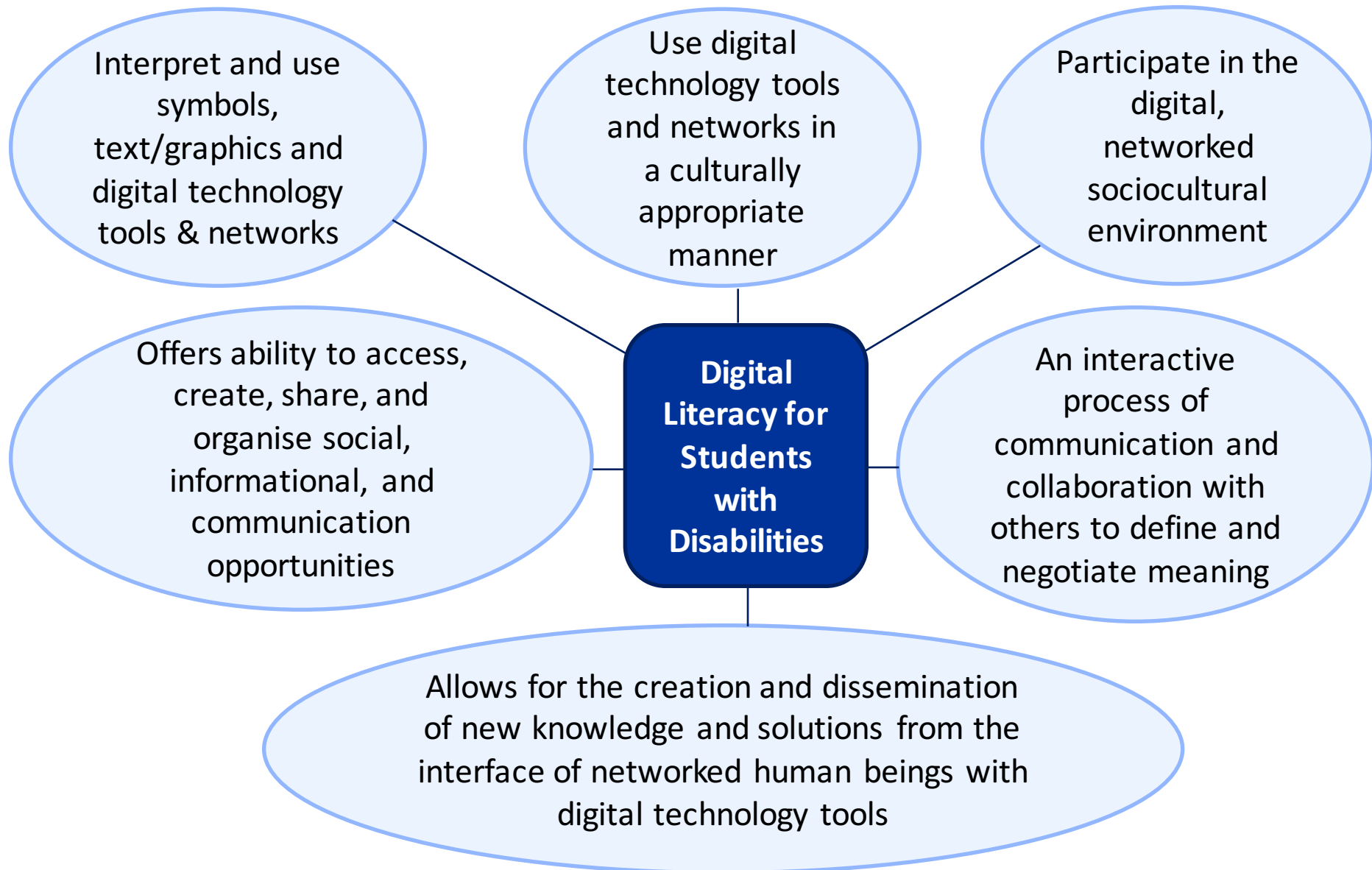
- Students with disabilities experience challenges to accessing **social, informational, and physical opportunities for learning** due to the impact of their impairment/s meeting barriers (Slee, 2014)
- Digital technology use: a **compensatory process** for students with disabilities to access opportunities for learning (Vygotsky, 1993)
- Digital literacy: a 21st century skill for all (Griffin & Care, 2014) – but **what is it?**
- **Teachers** have difficulty teaching students with disabilities (VEOHRC, 2012), and teaching digital literacy (Phillips, 2015)
- Currently, no assessment or learning progression for digital literacy capability exists for students with disabilities

Literature review

Conceptualising digital literacy

- **Multiple** constructs, capabilities, terms – and little agreement
- Learning to use digital technology and using it to learn can be understood as a **literacy**
- Sociocultural constructivist framing of digital literacy – a **human right**

Digital literacy



Literature review cont'd

- **Who are** students with disabilities?
- How does disability restrict access to **opportunities for learning**?
- How can digital literacy provide **access**?
- What are the impacts of **student characteristics** on digital literacy learning?
- What are the impacts of **teacher characteristics** on assessing digital literacy in students with disabilities?
- What **challenges** does teaching digital literacy present for teachers of students with disabilities?
- How can teachers **support** digital literacy learning for students?

Aim of study

- **Develop and validate measures** to support the teaching and learning of digital literacy capability for students with disabilities
- **Investigate constraints** on:
 - Digital literacy learning of students with disabilities due to **student background characteristics**, and
 - Use of the measure by teachers due to **teacher background characteristics**

Research questions

- **What** is digital literacy, and **why** is it important for students with disabilities?
- To what extent can a measure of digital literacy be developed to describe a **learning progression** of digital literacy for students with disabilities?
- To what extent do **teacher characteristics**, i.e.,
 - experience in teaching students with disabilities,
 - experience in teaching digital literacy,
 - self-reported digital literacy, and
 - attitudes to digital technologyimpact their capacity to **observe, monitor, and report** on student digital literacy learning?
- To what extent do **student characteristics**, i.e.,
 - type and severity of disability, and
 - access to assistive technologiesimpact their digital literacy **learning**?

Methodology: Six phases

1. Construct definition - completed

- a. Literature review
- b. Taxonomy identification

2. Draft framework - completed

- a. Workshops with subject matter experts
 - a. Examine Phase I materials
 - b. Draft statements of competencies

3. Judgement of relative difficulty - completed

- a. Workshops:
 - a. Pairwise comparisons
 - b. Hypothesised learning progression
 - c. Panelling and piloting



Working together to develop the observation statements and build the hypothesised framework

First draft of items

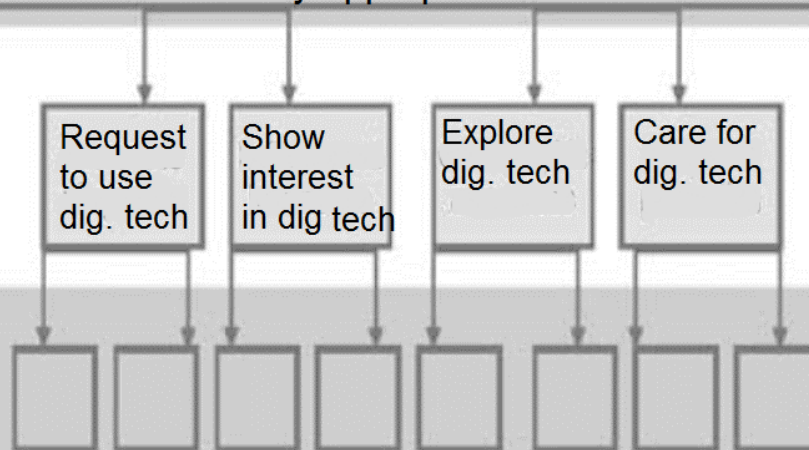


Building a criterion-referenced framework

CONSTRUCT: The area of inquiry

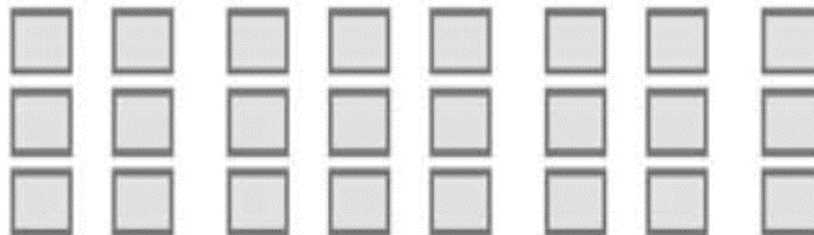
Digital literacy: being able to interpret and use the symbols, text/graphics and tools of digital technologies and networks, and also the ability to do so in a culturally appropriate manner

CAPABILITIES: A set of representative abstract skill areas that combine to describe the construct.



INDICATORS: Behavioural indicators for each capability. These are observable behaviours that can be used as evidence of a student's capability in terms of the things the student can do, say, make, or write.

QUALITY CRITERIA: Observational statements that describe 'how well' each of the behavioural indicators could be demonstrated by the student. These were used to create the observation statements for the assessment materials.



Using a matrix format for panelling

<div> <div>More proficiency</div> <div></div> <div>Less proficiency</div> </div>		Criterion 2.4	Criterion 3.3		<div> <div>More difficult</div> <div></div> <div>Less difficult</div> </div>
	Criterion 1.3			Criterion 4.4	
		Criterion 2.3		Criterion 4.3	
	Criterion 1.2		Criterion 3.2	Criterion 4.2	
		Criterion 2.2			
	Criterion 1.1			Criterion 4.1	
		Criterion 2.1	Criterion 3.1		
	Item 1	Item 2	Item 3	Item 4	

Evidence framework

Taxonomy (adapted from Dreyfus & Dreyfus, 1980)	Item 6: Exploring digital technology
Acting without conscious review of steps/ internalised experience used to guide decisions	
Acting on prior experience of success or failure to achieve personally relevant outcomes	6.4 Examines functions of digital technology by drawing on prior experience and knowledge
Following rules to achieve personally relevant outcomes (registering success or failure)	
Following rules and taking situational cues into account (contextualised)	
Following rules and steps (decontextualised, simple or single step)	6.3 Follows directions to explore <u>functions</u> of digital technology devices (e.g., tapping items on touchscreen, inserting earphone jack into port, pressing buttons)
Engage with the phenomena	6.2 Interacts with <u>physical features</u> of digital technology (e.g., by looking at, feeling or listening)
Attend to the phenomena	6.1 Responds to stimuli in the environment (e.g., by startling, turning head, smiling, becoming still, pausing other activity)

Methodology: Six phases cont'd

4. Trial - completed

- a. Data collection from online assessment
- b. Approx. 60 schools, mostly specialist (approx. 900 students)

5. Data analysis – completion in Feb 2017

- a. Coded and calibrated using Rasch item response partial credit modelling
- b. Plotted according to cognitive demand
- c. Item and person fit, reliability and DIF

6. Validation – completion in May 2017

- a. Identification of levels of progressive development
- b. Interpretation by subject matter experts
- c. Comparison of defined levels against hypothesised framework

ABLES assessments



Education
and Training



Select from any of the following assessments

English, Speaking and Listening

English, Reading and Writing

Personal and Social Capability

Mathematics

Movement

Digital Literacy

Critical and Creative Thinking

Main Menu

Sample question

INSTRUCTIONS: Choose the closest match to this student's typical performance. If the student's performance falls between two levels, select the lower one. Students may demonstrate their skills/understanding with or without the use of assistive technology (e.g., switch, closed captioning) and by using their typical communication mode (e.g., speech, signing, picture exchange, AAC device, etc.)

Learning to use digital technology

Q2. Paying attention to new or unfamiliar digital technology (e.g., computers, tablets, smartphones, program/apps)

- ☐ Attends to the use of a new or unfamiliar device or program/app by another (e.g., by watching, reaching towards, becoming still, smiling, pausing other activity, moving into position, or turning towards, etc.)
- ☐ Uses a new or unfamiliar device or program/app with direct support or guidance (e.g., following single step instructions to activate unfamiliar icons, or to touch a new device, or to listen to audio instructions from a new app, etc.)
- ☐ Maintains attention on a new or unfamiliar device or program/app (e.g., continuing to focus on using new device or program/app when other activities in class could be distracting)
- ☐ Is moving towards but has not yet achieved these skills/behaviours



Pathway

7. The student uses a range of strategies to confirm or modify understanding of text. S/he interprets the main ideas and purpose of texts, and is working towards ordering ideas in written work.

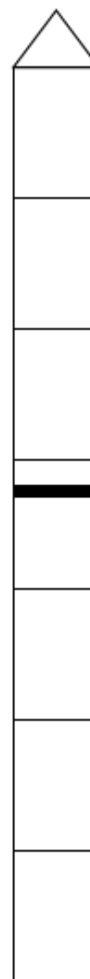
5. The student matches print and spoken text in the environment, and recognises how sounds are represented alphabetically. In writing, the student uses conventional letters, groups of letters, and simple punctuation such as full stops and capital letters.

3. The student recognises the difference between text and pictures, and may sort, match, or identify letters and numbers. The student may recognise very familiar words by sight, and link these to basic needs and wants.

1. The student is exploring objects within a familiar environment, and may show interest in photographs of familiar objects/people.

██████ The student is estimated to be at this location

Level



Pathway

6. The student reads and responds to short texts with familiar ideas and a small amount of unfamiliar vocabulary. The student makes use of known spelling patterns to attempt the spelling of unfamiliar words.

4. The student names some letters of the alphabet and identifies their common sounds. S/he recognises the connection between print and the spoken word, and reads some familiar words and signage using partial cues and illustrations.

2. The student is learning to identify objects, pictures, shapes and sounds, and may role-play reading, scribble freely, or recognise own name in print.

Assessment items: Learning to use

1. Paying attention to familiar digital technology
2. Paying attention to new or unfamiliar digital technology
3. Showing interest in digital technology
4. Requesting to use digital technology
5. Making choices about the use of digital technology
6. Controlling own use of digital technology
7. Exploring digital technology
8. Managing problems with digital technology
9. Caring for digital technology devices and peripherals
10. Using digital technology symbols
11. Applying digital technology terms
12. Using digital technology safely

Assessment items: Using tech to learn

1. Responding to information/content presented via digital technology
2. Creating content using digital technology
3. Finding information/content using digital technology
4. Storing content using digital technology
5. Sharing content using digital technology



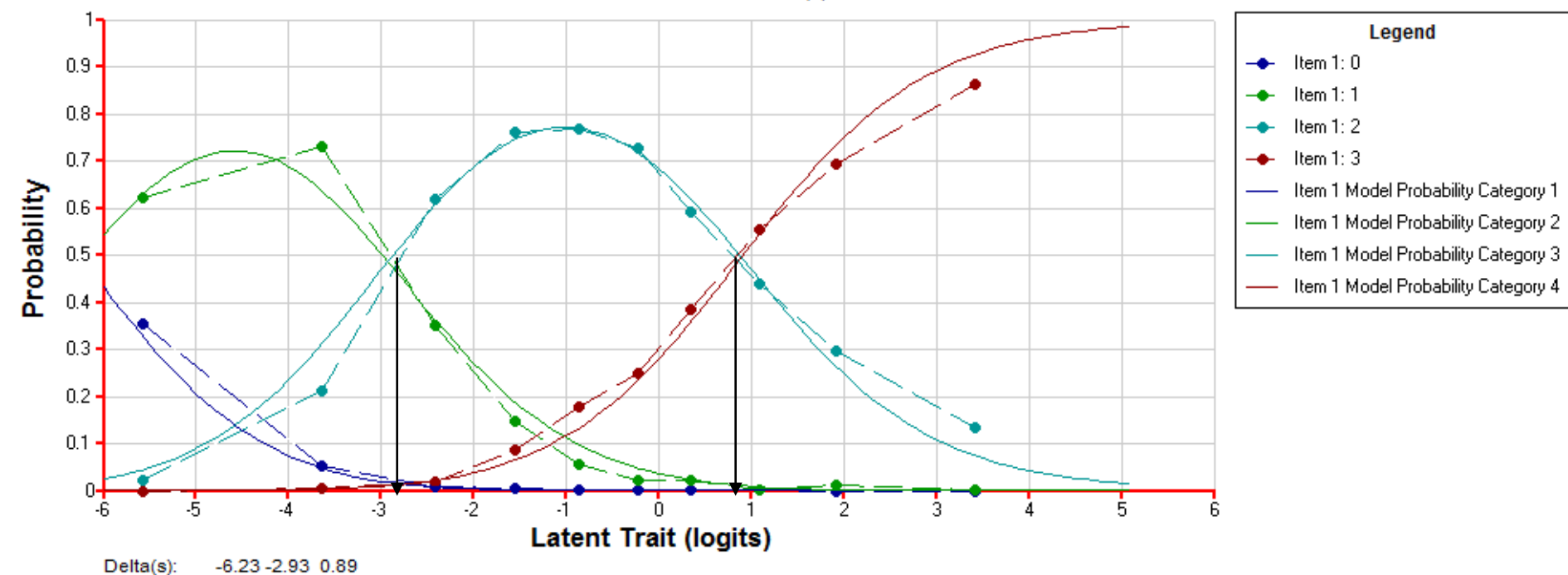
- Match between item difficulty and student ability
- Item and person reliability
- Alpha reliability
- Item fit
- Person fit
- Item characteristic curves
- Deltas and thresholds
- Parameter invariance (sub groups)
- DIF and DSF

Each 'x' represents 3.2 students
The labels for thresholds show the levels of item,
and category, respectively

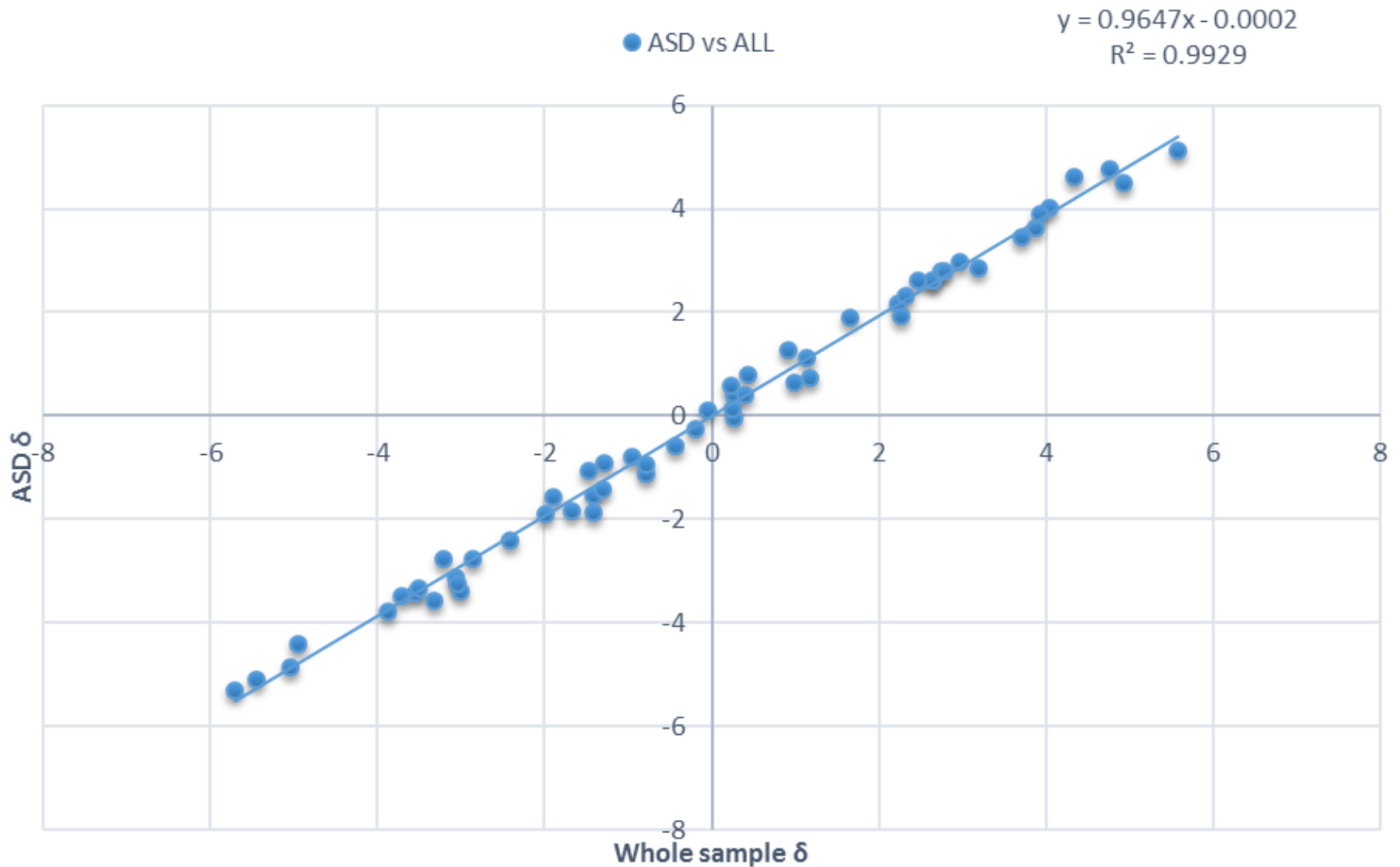
Characteristic Curve(s) By Score

item:1 (1)

Weighted MNSQ 0.98



Parameter invariance (Numeracy)



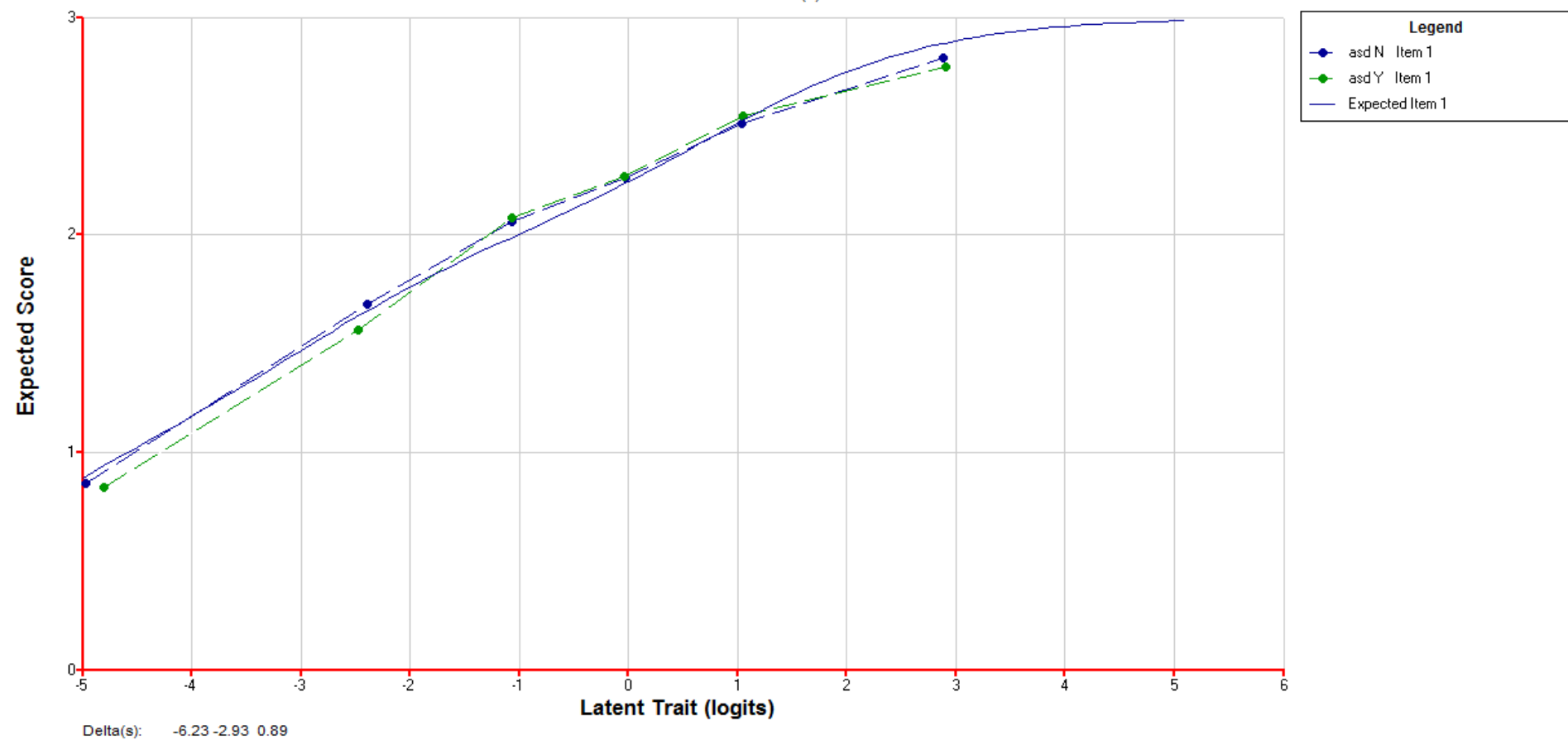
Example summary of DIF analysis (Numeracy)

Item	Grouping variable	DIF description	Skill assessed	Criterion	DIF explanation
Item 3	Vision impairment	Small, uniform - item more difficult for students with vision impairment	Recognising quantities of 1-3 without counting (e.g., using words, signs or symbols)	Reacts to (e.g., looks, listens, turns towards) a representation of 1-3 objects	Vision is largely relied upon to subitise. Although haptic (tactile) subitising exists (Plaisier, Bergmann & Kappers, 2009) it is not well described in the criterion.
Item 5	ASD	Small, uniform -item easier for students with ASD	Ordering numbers	ALL	Ability to work with number symbols is commonly a preserved strength in students with ASD (Hiniker, Rosenberg-Lee & Menon, 2015).
Item 8	ASD	Small, uniform - item more difficult for students with ASD	Describing changes in quantity	Responds (e.g., looks, gestures, smiles, protests) when an object is added or removed from the group	Impaired verbal communication is commonly identified in lower functioning students with ASD (Baron-Cohen, Leslie & Frith, 1985).

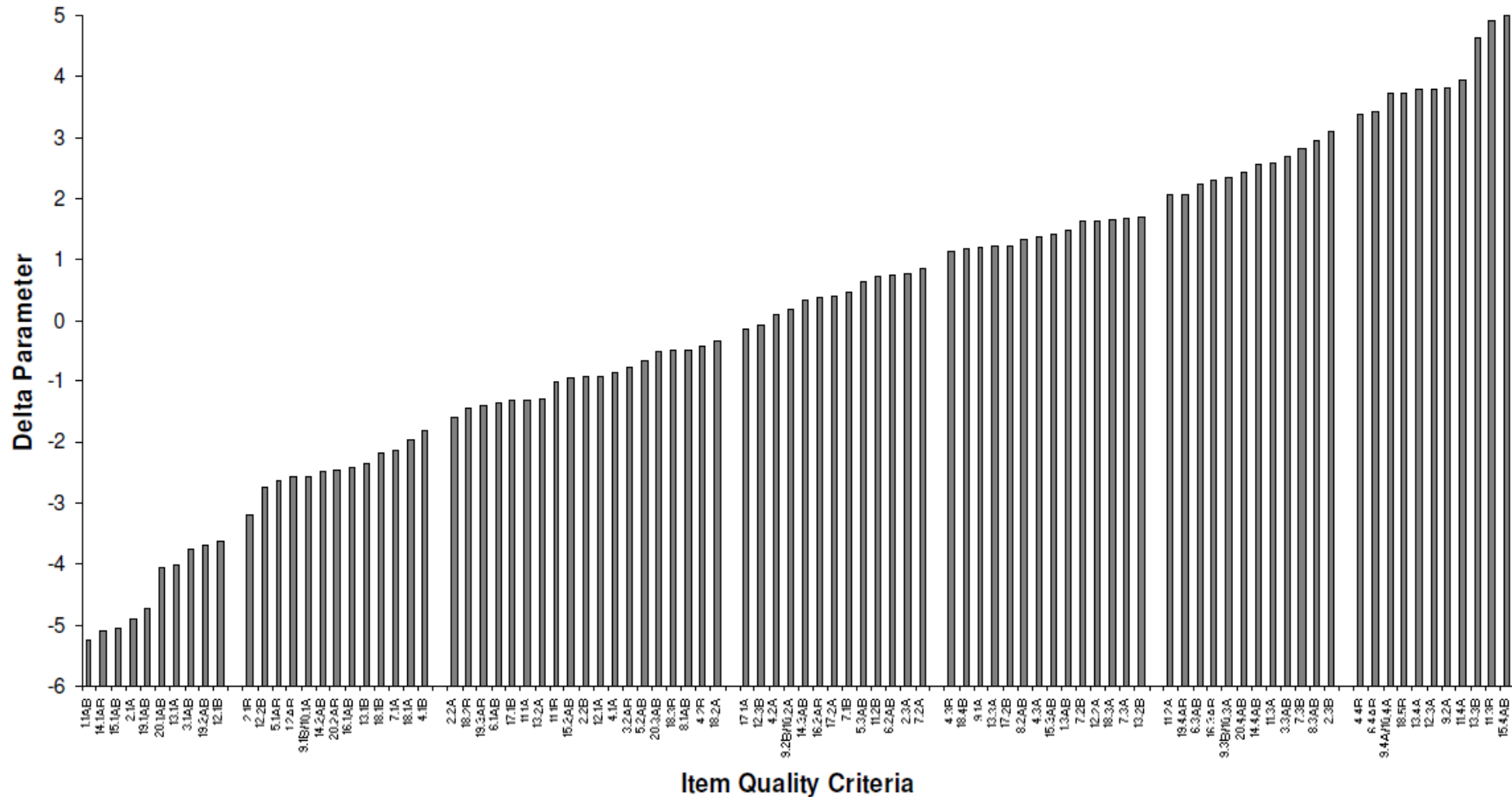
Expected Score Curve(s)

Weighted MNSQ 0.98

item:1 (1)



Setting cut scores and defining levels



Setting cut scores and defining levels

Criterion	δ	Description	Derived Standard
1.1AB	-5.24	Looks at, touches or pats photographs of familiar objects.	Students are beginning to explore objects within a familiar environment and may be responsive to photographs of familiar objects or people. They are learning about books and stories, and may accept materials for drawing or remain present during the reading of a story.
14.1AB	-5.09	Responds to photographs of familiar objects/people (e.g., smiling, touching).	
15.1AB	-5.04	Makes choices between objects (or photographs of objects).	
2.1A	-4.88	Remains present while a story or other reading material is being read or shown.	
19.1AB	-4.74	Picks up and holds objects.	
20.1AB	-4.03	Taps an object with a finger.	
13.1A	-4.01	Accepts materials for drawing or writing.	
3.1AB	-3.76	Shows enjoyment of being read to (e.g., by smiling, looking, relaxing).	
19.2AB	-3.68	Holds and uses large crayons and pencils, perhaps with a fist-like or similar grip.	
12.1B	-3.62	Remains present during drawing or writing activities.	

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