THE ELEVENTH ANNUAL SCIENCE AND MATH EDUCATORS CONFERENCE (SMEC 11)

Psychometric Versus Dynamic Assessment for Identifying Dyslexic Children with High Mathematical Abilities

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Selected Characteristics of G/LDs

a 12 point discrepancy between V-P score on WISC

a 7 point discrepancy between highest & lowest subset scores on a WISC

difficulty learning phonics, poor speller

shows an advanced vocabulary

Difficulty in completing easy work, but does well with harder concepts

systems thinker, sees complex relationships

prefers to develop own methods of problem-solving

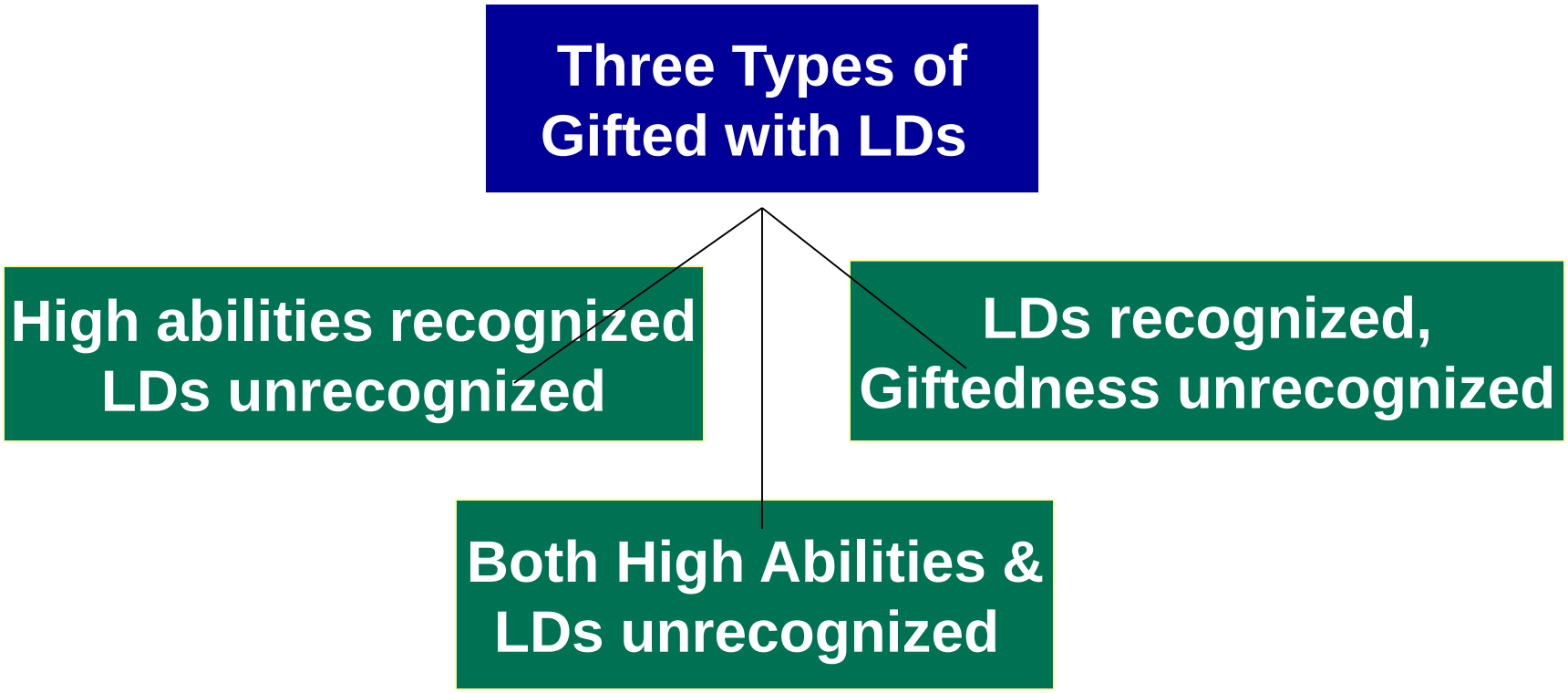
does not perform well on timed tests

performs poorly in some classes and well in others

poor auditory memory

Gifted Children with Learning Difficulties (G/LD)

- 10 - 25 % of gifted children could have a learning difficulty.



Classification of G/LDs

Type 1: High ability recognised, LDs unrecognised

- Have good verbal skills.
- Poor spelling and handwriting.
- Disorganised in their class work.
- Discrepancies between strengths and weaknesses widen as they grow older.
- Often viewed as 'underachieving’.

Classification of G/LDs

Type 2: LDs recognised, giftedness unrecognised

- Creative talents may be displayed at home.
- They usually excel in an area of interest.
- Their difficulty depresses their intellectual performance.
- 'LD' categorisation emphasises pupil's weaknesses rather than strengths.
- Often fail miserably at school.
- result can be low self-esteem low achievement, disruptive behaviour.

Classification of G/LDs

Type 3: Both high ability and LD unrecognised

- LD & Giftedness mask each other.
- Usually appear as average students.
- Able enough to compensate for their LD.
- Usually recognise their giftedness and LD as adults.
- Need occasions where they can exhibit their superior thinking in creative ways.
- This group is **most at risk of underachievement.**

(Baum, 1990; Al-Hroub, 2005)

Psychometric Assessment

… is designed to provide a consistent and effective measure of people's traits, abilities, skills, and interests

Advantages

- …they lead to judgments that are likely to be more valid
- …they are **relatively cheap and easy** to administer

Disadvantages

- The student must remain passive
- Unfair to ethnic group minorities & children from disadvantaged backgrounds.

Conversation between Kaufman and Wechsler

'He (David Wechsler) rejected most attempts that I made to add easy or hard items to the WISC-R saying firmly, 'My scales are meant for people with average or near-average intelligence, clinical patients who score between 70 and 130'. 'They are clinical tests'. **When I reminded him that psychologists commonly use his scales for the extremes,** and want to make distinctions with the **'below 70' and 'above 130' groups, he answered, "Then that is their misfortune".** It's not what I tell them to do, and it's not what a good clinician ought to do. They should know better' **(Kaufman, 1994, preface, p. xiv).**

Dynamic Assessment (DA)

…….is an interactive approach to conducting assessments within the domains of psychology, or special education or speech/language, that focuses on the ability of the learner to respond to intervention

Characteristics of DA

- Most often administered in a **pretest-intervention-posttest** format.
- Based on **clinical methods of assessment,** and most useful when used for **individual diagnosis.**
- Focuses on the learner's processes of problem solving.
- Assesses the child’s potential to change.

Dynamic Assessment (DA)

Advantages

- Link between **assessment** and **intervention**
- Information on children's learning potential
- Sensitive to progress.
- Ability to include adaptations and accommodations

Disadvantages

- Required experience and expertise.
- Limited practicality.

Research Questions

1. **What are the specific cognitive characteristics that these students tend to have on the Wechsler Intelligent Scale for Children (WISC-III-Jordan)?**
2. **To what extent does the use of dynamic assessment address the mathematically gifted abilities of children experiencing difficulties with learning?**
3. **What are the specific perceptual skills that these students tend to have?**
4. **What are the patterns and levels of learning difficulties that the MG/LD students displayed?**

Method

Sample

- As multiple case studies, general classroom teachers nominated **52 students (26 boys & 26 girls)** aged 10 years to 11 years and 11 months from Grades 5 and 6 at three primary public schools in Amman, Jordan.

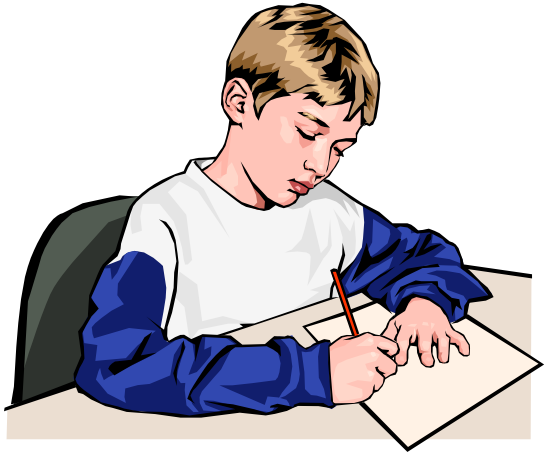
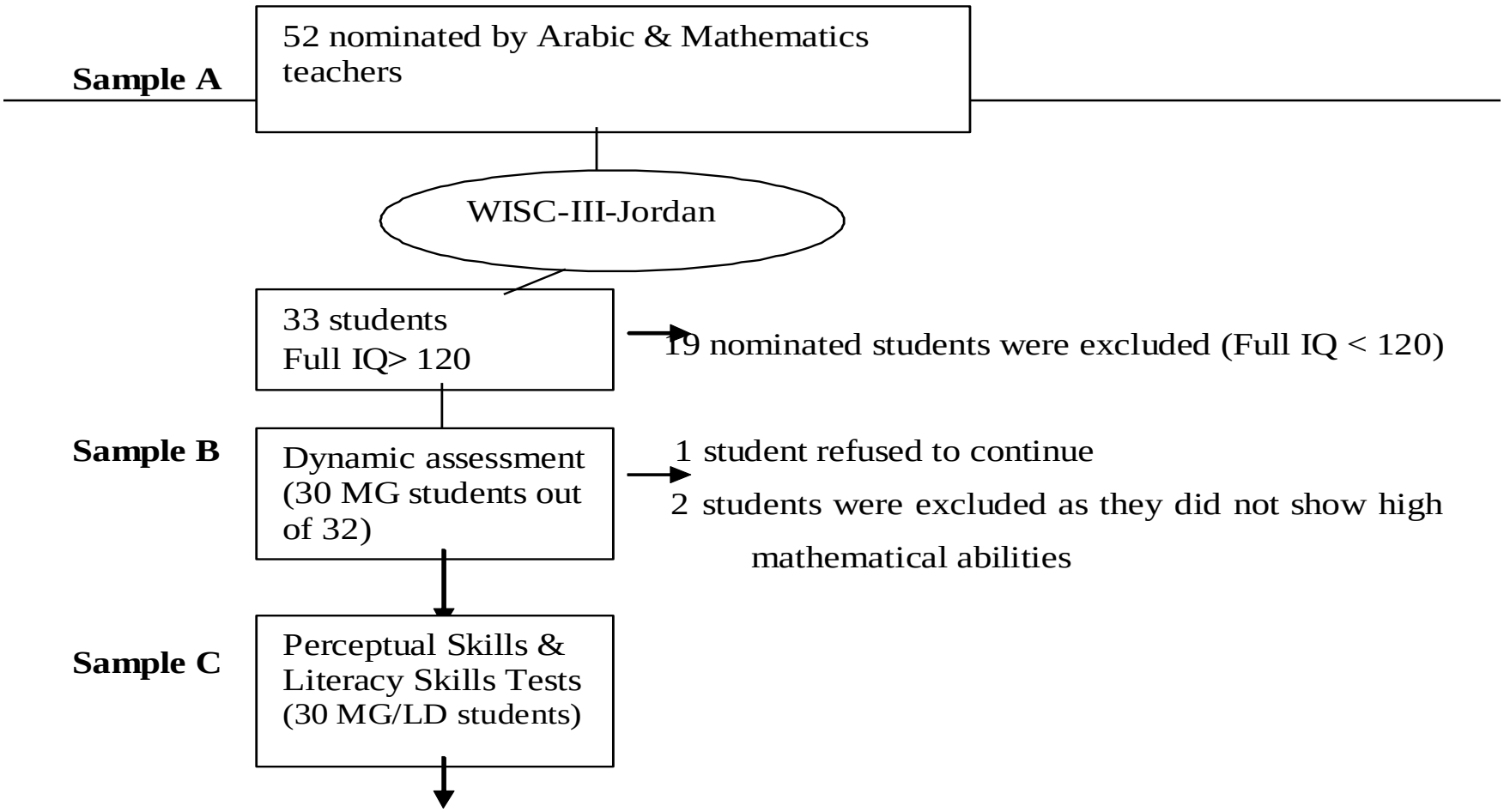


Figure: Development of Core Sample



Instruments

1. **The Wechsler Intelligence Scale for Children** (WISC-III Jordan, 1996)
2. **Dynamic Assessment involving a mathematics achievement test**
3. **The Group of Perceptual Skills Tests** (Waqfi & Kilani)
4. **The Diagnostic Scale of Arabic Language Basic Skills** (Waqfi, 1997)

The Wechsler Intelligence Scale for Children-III-Jordan, 1996

Verbal Scale

1. Information
2. Similarities
3. Arithmetic
4. Vocabulary
5. Comprehension

Performance Scale

1. Picture Completion
2. Coding
3. Picture Arrangement
4. Block Design
5. Object Assembly

Supplementary Subtests

1. Digit Span
2. Symbol Search
3. Mazes

Dynamic Assessment involving a mathematics achievement test (1)

- A test-intervene-test method was used.
- Pre- & Post-tests were derived from the Mathematical Basic Skills Scale (Waqfi & Khilani, 1997).
- Seven mathematical tasks were included:
  a) calculation operations;
  b) decimals ordering;
  c) rounding up;
  d) geometry;
  e) algebra; and
  f) problem solving.

Dynamic Assessment involving a mathematics achievement test (2)

- Pilot-test sessions were tested with 8 mathematically gifted students (4 girls & 4 boys; 4 Grade five & 4 Grade six).
- Range of scores 0- 20. In Pre-test, students required to score ≥ 40%.
- Teaching for 3 sessions (45 minutes for each session),
- Three groups, each group taught in its school.

The Group of Perceptual Skills Tests (Waqfi & Kilani, 1998)

- This battery includes 7 diagnostic subtests.
  1. ***Auditory Discrimination Test***
  2. ***Auditory Analysis Skills Test***
  3. ***Word Span Test***
  4. ***Digit Span Test***
  5. ***Visual-Motor Sequence Test***
  6. ***Visual-Motor Integration***
  7. ***Visual Analysis Skills Test***

The Diagnostic Scale of Arabic Language Basic Skills (Waqfi, 1997)

Seven subtests were used from this diagnostic test:

1. ***Vocabulary Recognition Subtest***
2. ***Reading Different Vocabulary Subtest***
3. ***Reading Similar Vocabulary Subtest***
4. ***Reading Comprehension Passages Subtest***
5. ***Listening Comprehension Vocabularies Subtest***
6. ***Listening Comprehension Passages Subtest***
7. ***Spelling Passage and Dictation Subtest***

These subtests were categorized into three learning aspects:

1. ***Reading Ability***
2. ***Listening Ability***
3. ***Spelling and Dictation***

Results

WISC-III-Jordan 1: Specific Cognitive Characteristics

- The MG/LD showed, only, a significant discrepancy of 12.73 points between (VIQ > PIQ). This discrepancy is 1.73 points significantly higher than 11.0 mean of the standardized sample.
- The average-IQ/LD group mean VIQ-PIQ discrepancy was 7.95
- While 60% of the MG/LD sample showed VIQ > PIQ significant difference, only 36% of the Average/LD group showed such difference.
- Both groups had remarkably similar scatter with no significant difference on Verbal & Performance Scaled Score Range.

WISC-III-Jordan 2: Specific Cognitive Characteristics

Table 1 Comparisons between WISC-III-Jordan Scatter Indices for MG/LD Sample and Average-IQ/LD Group

WISC-III-Jordan Scatter Indices	MG/LD Sample (n = 30)		Average-IQ/LD Group (n = 22)		Independent sample *t* tests (df = 50)
	Mean Difference	SD	Mean Difference	SD	
(VIQ-PIQ) discrepancy (Regardless of direction)	12.73	11.04	7.95	8.06	1.72
(VC-PO) discrepancy	8.63	10.90	5.91	8.70	.967
Verbal Scaled Score Ranges (5 subtests) (1)	4.40	1.73	4.50	1.90	-.20
Performance Scaled Score Ranges (5 subtests) (1)	5.57	2.27	5.45	1.82	.19
Full IQ Scale (1)	7.70	1.84	6.68	1.59	2.09*

(1) Scaled-score range is an indicator of subtest scatter within the Verbal and Performance Scale. It

Utility of Dynamic Assessment 1

- Pre-test was a good predictor of the change in scores, accounting for 90.4% (30/32) variance in performance between pre- & post-tests.
- Progress scores was the second major predicting factor in performance, accounting for 35.4% (7.08 points).

Utility of Dynamic Assessment 2

Table 1 Comparison of the Dynamic Mathematics Pre- and Post Tests Scores for the MG/LD sample

Dynamic Mathematics Tests ❶	MG/LD Sample (n = 30)				
	Min	Max	Mean	SD	Related (Paired) *t* test (df = 29)
Pre Mathematics Test	8.00	14.00	10.55	1.49	
Post Mathematics Test	15.0	20.0	17.63	1.30	
Mathematical Learning Progress (Post-Test minus Pre-Test)	4.50	10.50	7.08	1.54	25.24 **

** Significant at level P < .05* *** Significant at level P < .01*

❶ *The scores of the pre-test and post-test were out of 20 points.*

Utility of Dynamic Assessment 3

- No gender differences on mathematical progress.
- No significant correlations between maths learning progress, school maths achievement and/or Arithmetic subtests scores.
- Positive correlations between students' school mathematical achievement scores & Arithmetic subtest.

Perceptual Skills & Short-Term Memory (S-TM)

- **The findings revealed:**
  1. 40% Auditory dyslexic students
  2. Around 7% Visual dyslexic students
  3. 40% Mixed Auditory and Visual difficulties
  4. Around 13% Students with no perceptual problems

- **Also:**
  1. Around 27% of poor Visual but good Auditory S-TM
  2. Around 3% of good Auditory but poor Visual S-TM
  3. Around 63% of poor Visual and Auditory S-TM
  4. Around 7% of good Visual and Auditory S-TM.

The Diagnostic Scale of Arabic Language Basic Skills

- The MG/LD group exhibited poor spelling, writing, and listening, however, **Reading Ability** was found the weakest literacy area.
- Severe delay, between 1.2 and 2.5 grades, on all of the literacy language tests and areas.
- Considerable significant difference between boys and girls, with boys suffering significantly greater delays of up to three grades.
- The substantial correlations between literacy language areas with IQ verbal factors

Main Implications

- Psycho-educational assessment is essential to give a more complete picture about the student's cognitive abilities and difficulties.
- Using perceptual skills tests alongside the literacy and dyslexia tests will be beneficial & could be used by the resource room teacher (LD service teacher).
- Dynamic assessment may provide a clearer diagnosis of each student's expected competence.

Main Implications

- Dynamic measures are better predictors of pre-test & post-test mathematical improvement than IQ or initial static scores.
- Dynamic assessment methods should not viewed in direct opposition to individually based static techniques such as IQ testing.
- Dynamic assessment could be carried out in all the curriculum subjects by the regular-class teacher and/or gifted/LD service teacher.

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