Validity and Reliability Issues in the Large-Scale Assessment of English Language Proficiency

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Topic

- The measurement of language proficiency
- Assessment design: How to build a valid English-language assessment that reliably measures English-language proficiency
  - Building blocks
  - Constraints
    - Trade-offs
- Selected validity issues

Dimensions of Language Proficiency

- In measurement proficiency is defined as the unobserved (“latent”) variable that explains individual differences in performance on an observable set of measures.

- How is language proficiency measured?
  - Listening
  - Speaking
  - Reading
  - Writing
  - Composite scores for Oral (Listening & Speaking), Comprehension (Listening & Reading), Production (Speaking & Writing) may be of interest

Validity

Tests are validated by systematically collecting evidence to support the appropriateness of the intended use of the assessment?

Requires clear statements regarding the intended uses; validity is not assumed apriori

E.g., Will the assessment be used to classify English language proficiency in

- academic settings?
- business/employment settings?

Assessment Building Blocks

- Content standards
- Test Blueprints
- Forms configuration
- Test items
- Measurement and Scaling models
- Equating and linking procedures
- Standard setting procedures
- Score reporting methods

Content Standards

- Organize expectations about what students should know and be able to do
- Example: Washington students in grades 3-5 at an intermediate level of achievement should be able to:
  - Respond to directions, questions, and some idiomatic expressions.
  - Use simple sentences to retell or state main point and details of conversations and stories.
  - Recognize inappropriate use of register.

Test Blueprints

- Specify number and types of items for each of the content standards
- Match is in the eye of beholder
- Example: LAS Links

Grade Spans	Content		Item Type	Items
K-1, 2-3, 4-5, 6-8, 9-12	Listening	Listen for Information	MC	10
		Listen in the Classroom	MC	4
		Listen and Comprehend	MC	6
	Speaking	Speak in Words	DCR	10
		Make Conversation	CR	4
		Speak in Sentences	CR	5
		Tell A Story	CR	1
	Reading	Analyze words	MC	9
		Read Words	MC	8
		Read for Understanding	MC	18
	Writing	Use Conventions	MC	20
		Write About	SCR	2
		Write Why	SCR	2
		Write in Detail	CR	1

Key—MC: Multiple-choice—CR: Constructed-response—DCR: Dichotomous CR—SCR: Short CR

Forms Configuration

- Within One Administration
  - Single form
  - Parallel forms
  - Non-parallel forms
  - Hybrid
- Across Administrations
  - Constant form(s)
  - Overlapping forms
  - Non-overlapping forms

Degrees of Test Comparability

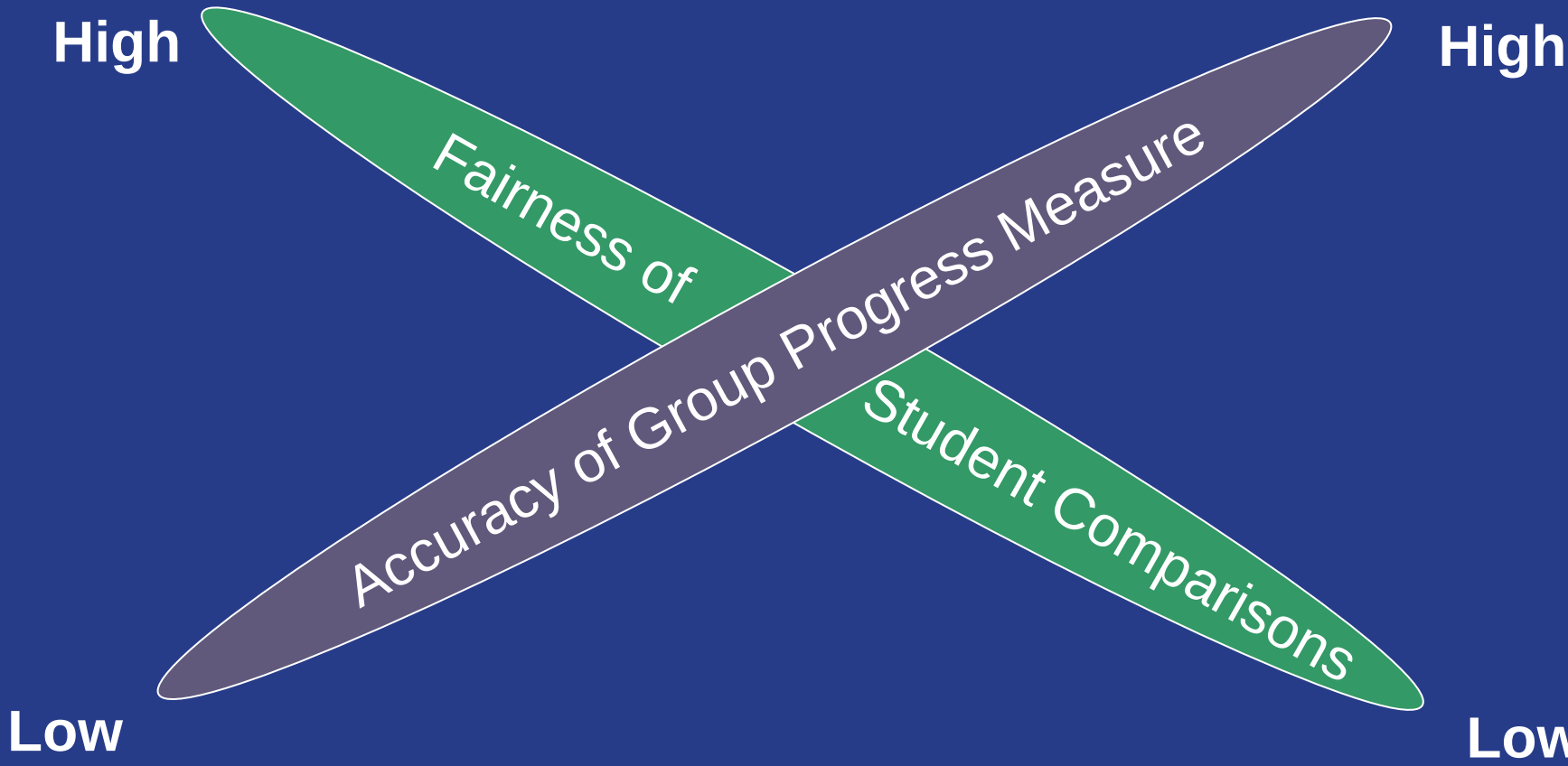
- Equated forms
  - Measure same construct
  - Forms are parallel
  - Each student indifferent to assignment of form
    - Same expected score, measurement error
  - “Strict comparability”
- Linked forms
  - Measure the same construct
  - Forms may differ in length, coverage, reliability
- Statistically related (e.g., regression)

Required comparability depends on use

Accountability Requirements

- Accountability requires fairness
- Fairness demands equivalent measurement
- Equivalent measures may be obtained from
  - Use of same instrument
    - Same test form(s)
  - Use of equated instruments
    - Documented technical quality

Breadth vs. Uniformity



Same Form All Students

NCLB Statewide Assessments
Student, school, …, state scores

Different form Each Student

NAEP
TIMMS

No student scores

Test Items

- Multiple Choice
  - Contrived, not “authentic” (perhaps)
  - Inexpensive to score
  - More items per unit time
  - Can measure complex thinking skills
- Constructed Response
  - More authentic, natural (not guaranteed)
  - Captures thinking process
  - Expensive to score (if by human)
  - Rater differences affect validity (within and across administrations)
  - Machine-scoreable constructed response looks promising
- Extended Response

Good and bad examples of all types exist

Measurement Models

- Specify relationship between student proficiency and success on items
- Unidimensional item response theory
  - 1-, 2-, 3-parameter logistic models
  - Partial credit models
- Multidimensional approaches
  - Multidimensional IRT
  - Bayesian inference networks
  - Cognitive diagnosis models
- Model fit critical
- Useful parameters need not make useful scores

Equating and Scaling

- Tied to forms configuration
- Complete before administration?
  - Requires equating study in advance
  - Enables immediate scoring
- Uses data from live administration?
  - Delays score reporting
  - Quicker development cycle
- Vertical scaling allows comparisons over age spans

Standard Setting

- Maps test scores to proficiency level
- Requires eliciting, synthesizing judgments
  - Categorizing students: “contrasting groups”
  - Categorizing (ordered) items: “bookmark”
- Good to involve variety of stakeholders
- Multiple methods, replication, support validity
- Descriptions of performance-levels follow

Reporting scores

- Statistically optimal estimates based on model/data
  - E.g., use information in full response pattern
- Simple and transparent rules
  - Use only number correct or total points

Large-Scale English Language Assessment

Large scale assessments bring challenges:

- Volume of work to administer, score
- Controlling exposure, timing of administrations

And opportunities:

- See population trends, characteristics
- Survey broad content efficiently
- Collect rich background information
- Research relationship of proficiency to background variables

Some Design Considerations

Designing for Validity

- Maintain broad definition of content domain
- Control exposure of items and item types
- Scoring algorithms (human, machine) robust

Designing for Reliability

- Optimize level of accuracy in scoring
- Sufficient test length: numbers of items/points

Designing for Efficiency

- Leverage technology: online assessment, speech processing, text analysis and AI scoring

Psychometric Design-Key Features

Similar challenges in large scale science assessment in United States. One design:

- Detailed framework of content standards
- Large development effort
  - Want to measure whole domain, not sample
- Multiple layers for multiple purposes
  - Public domain
  - Secure for teacher &/or district use
  - Secure for large-scale assessment testing

Patz, R. J. (2006). Building NCLB Science Assessments: Psychometric and Practical Perspectives.

Test blueprint

- 2/3 student test common to all
  - Common items or strictly parallel form
  - Reliable, comparable student scores
- 1/3 matrixed content
  - Matrixed (BIB) anchor test
  - Field test, link, new content
  - Background, OTL surveys

Matrixed Anchor Test

- Measures entire domain
- Arranged in balanced incomplete blocks
- Constant across administrations
- Provides accurate measures of progress in domain for groups (schools, districts, province, etc.)
- Supports research on growth in English-language proficiency
- Low exposure

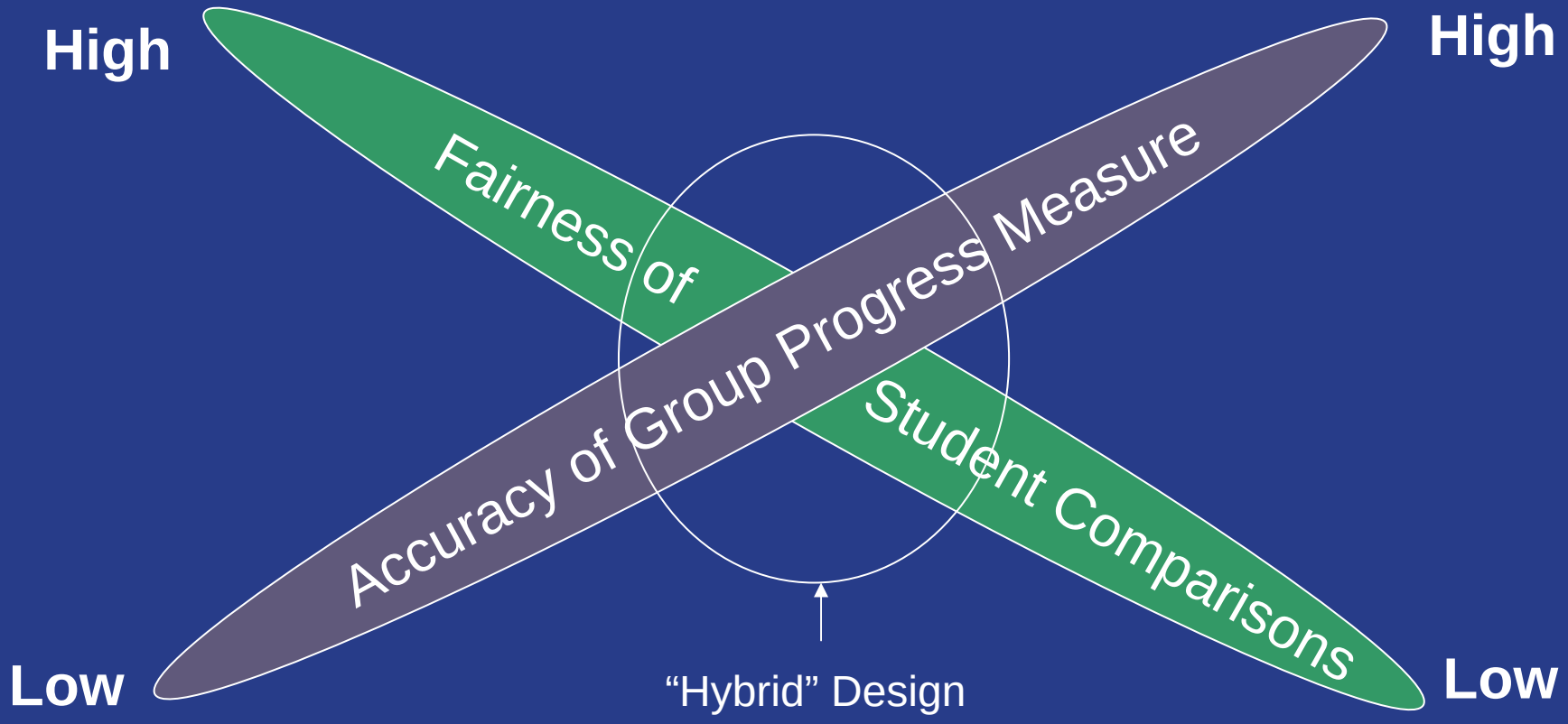
Common Form

- Reliable, comparable scores for students, schools
- Released immediately with scoring rules (e.g., Raw-score-to-performance-level)
- Linked, not equated to domain, last year's common form
- May purposefully wander through domain over years
  - In conjunction with multi-year professional development program

Configuring other building blocks

- Test items
  - MC+CR
  - Many instances of items from item templates possible
- Measurement models
  - Best fitting
- Scaling and equating procedures
  - Pre-link common form
  - Provides immediate reporting
- Standard setting
  - Bookmark better for BIB
  - Annual review of common-form cutpoints, interpretations
- Scoring and Reporting
  - Simple, interpretable rules for common form
  - Best available technical solution for anchor, trends

Breadth vs. Uniformity



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Limitations of Design

- Student comparisons on common form only
- Common form, matrixed form present different picture of achievement
  - Use both in accountability system
  - One immediate; one refined
- Common form does not support year-to-year comparisons
  - Use matrixed anchor for this
- Small schools can be problematic
- Domain interpretations have technical challenges
- Matrixed anchor could grow stale
- Large anchor, multiple forms, add expense

Building an Assessment: Required Expertise

- English-language development domain knowledge
- Psychometrics
- Item development
- Policy experience
- Communication
- Project Management

Discussion

- Design challenge is significant
  - Goals and constraints need refinements
- Building blocks are flexible, configurable
- Priorities of reliability, validity, efficiency, cost affect design
- Any design balances priorities
- Resources are available to help

Discussion (continued)

- English language proficiency tests need to reflect the complexity of the domain.
- Sampled items and item types need to be representative of the domain.
- Good test development procedures will lead to rich information, valid results and interpretations.
- Technology is a key enabler for large-scale assessment of English language proficiency