Analyzing and Understanding Learning Assessment for Evidence-Based Policy Making

Bangkok
14-18 September 2015

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Developing Analytical Frameworks
What is an analytical framework?

- Assessment Framework
  - Domain
  - Context

- Technical Design
  - Sample design
  - Test design

- Analysis Plan
  - Reporting
An assessment framework is a statement and discussion about what an assessment intends to measure.

By explaining the purpose and design of an assessment, the framework helps the people who are interested in the assessment to understand it, to interpret its results and to have confidence in them.
Assessment Frameworks:

• underpin the validity of the assessment, by making explicit what the aim of the assessment is, and what it will cover in terms of content, skills and knowledge

• provide a common language for discussion about the assessment and the results it reports to all those involved

• help to ensure that the test is measuring the domain and its context in a consistent way over time
Determining educational priorities
Where are priorities described?

**Political direction**
- Laws
- Regulations
- Gazettes
- Speeches
- Parliamentary minutes
- Political party statements
- White papers / green papers
- Press releases
- Media interviews

**Interest groups**
- International banks
- International organisations
  - UNESCO
  - GPE
- Civil society
  - NGO
  - Citizenship movements
- Teachers unions
- Academics
The Children's Right to Free and Compulsory Education Act 2009 enshrines the right of access to all Indians aged between 6 and 14.

Prime Minister Singh at the time said that such an education should be one that:

"enables them to acquire the skills, knowledge, values and attitudes necessary to become responsible and active citizens of India" and that "all children, irrespective of gender and social category" have the right to education in India.
What are the educational priorities in your country?

• How do you know?
• Where are they described?
• Who articulated them?
• How long have they been a priority?
Policy objectives
Types of contributions of educational research to public policy
(Wagemaker, 2003, adapted from Weiss, 1979)

Problem-solving: Research identifies missing knowledge to guide action

Interactive: Involves researchers and policy-makers in constructive cooperative dialogue

Political: Research is used to provide justification for an already favoured policy

Tactical: Need for research is used as an excuse to delay decision or action

Enlightening: Envisages research ideas filtering through and influencing how people think

Intellectual: Research widens horizons and raises the quality of the public debate
Research to inform controversies and debates

Research to fill gaps in knowledge

Research for monitoring the health of the education system
The policy cycle

1. Agenda Setting
2. Policy formulation
3. Policy implementation
4. Monitoring and policy evaluation
Examining existing data
Literature reviews

- Reference library searches
- International literature
- Look for theoretical foundations
Quantitative data

- Census statistics
- Household labour force surveys
- Educational assessment databases
  - International studies
  - Examinations
  - University participation
- May have direct access to database or only summary reports
- May be aggregated or disaggregated
Forming research questions
All the benefits of reform are going to the city dwellers

- Educational access
- Educational quality
- Educational resources
- Educational outcomes
Educational access

Is there a difference in the proportion of the population attending secondary schools from rural and urban environments?

Educational quality

Do rural students have as many books in their schools as urban students?

Educational resources

[computers, trained teachers, science labs, etc.]

Do rural students have the same reading literacy levels as urban students?

Educational outcomes
Is there a difference in the proportion of the population attending secondary schools from rural and urban environments?

Distance from school?
Barriers like mountains and rivers?
Gender difference?
Early marriage?
Socio economic status?
What about language of the school and language of the home?

CONTEXT

Working at the home/farm?
Is there a difference in the proportion of the population attending secondary schools from rural and urban environments?

Hypothesis: There is a difference in the proportion of the population attending secondary schools from rural and urban environments.

Null hypothesis: There is NO difference in the proportion of the population attending secondary schools from rural and urban environments.
Identifying appropriate tools for research
- Assessments
- Questionnaires
- Interviews
- Case studies
- Database mining
- Log data / self report

Is there a difference in the proportion of the population attending secondary schools from rural and urban environments?

Can we answer the question with existing data?

Can we inform the discussion with research?
Linking information with other databases
• Education Management Information System
• Household surveys
• Census data
• Geolocation databases

Assessments
Questionnaires
What are the issues with linking assessment data to other sources?

• Privacy
  – did you tell the school and students that their data would be anonymous?
  – will people or school be able to be identified once linked?

• Level of aggregation
  – Is data sufficiently disaggregated to link to the school?
  – What assumptions are you making by linking district level census data? Does it affect your research question?
Developing a contextual framework
The importance of examining contextual factors

- Why do we want to collect information on contextual factors?
  - Places test results into context (e.g., helping to explain why some students perform better than others)
  - Of interest by themselves (e.g., student attitudes over time)
Developing a Contextual Framework

• Needs to define the purpose of the study, what are the research questions
• Input of key stakeholders
• Where possible, justification for including contextual factors to be based on prior research
Types of contextual factors

- The individual context of the student
- The home environment of the student
- The school and classroom level
- The wider community
The individual context of the student

- Student characteristics
  - Age and gender
- Attitudes / Values
  - Attitudes towards school
- Perceptions
  - School climate
- Behaviours
  - Amount of time spent studying
- Self-concept
  - Self-efficacy of mathematics ability
The home environment of the student

- Household income
- Parental education
- Parental occupation
- Language spoken at home
- Household facilities
  - electricity, running water
- Household possessions
  - TV, computer
- Physical composition of house
  - walls, roof, lighting
The school and classroom level

• School characteristics
  – public/private; urban/rural

• School resources
  – presence of library, computer room

• School organizational practices
  – monitoring student/teacher attendance

• Staff capabilities
  – teacher education / training
The wider community

- Urbanisation of the local area
- Interaction between school and local community
- Characteristics of the education system / community / region
  - This may be obtained from external sources eg. census
<table>
<thead>
<tr>
<th>Level</th>
<th>Structure/demographics</th>
<th>Resources</th>
<th>Values</th>
<th>Practices/behaviours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Country</td>
<td>Size of population</td>
<td>Education budget</td>
<td>Literate workforce</td>
<td>Secondary school entry admission</td>
</tr>
<tr>
<td>Community</td>
<td>Rural/urban</td>
<td>Public library</td>
<td>Literate workforce</td>
<td>Support for girls attending school</td>
</tr>
<tr>
<td>School</td>
<td>Proportion of female teachers</td>
<td>School library</td>
<td>Academic excellence</td>
<td>Teacher observation</td>
</tr>
<tr>
<td>Classroom/teacher</td>
<td>Teacher gender</td>
<td>Subject textbooks</td>
<td>Expectation of student performance</td>
<td>Monitoring of attendance</td>
</tr>
<tr>
<td>Home</td>
<td>Language spoken at home</td>
<td>Educational resources at home</td>
<td>Value academic achievement</td>
<td>Cooperation with schools</td>
</tr>
<tr>
<td>Student</td>
<td>Student gender</td>
<td>Pen and paper</td>
<td>Motivation towards academic achievement</td>
<td>Engagement with reading</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Learning Performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Attitudes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Interests</td>
</tr>
</tbody>
</table>
Contextual questionnaires: issues to consider in design and analysis
Questionnaire types

• Student
  – Only appropriate if students at an age capable of understand content

• Parent/Home
  – For collecting information about the student and their home environment that they might not be able to answer (parental education / occupation; household income)
  – Response rates relatively low, lots of missing data (potential literacy issues)
Questionnaire types

• Teacher
  – Sampling considerations
    • All teachers v teachers of specific subjects
    • Teachers of sampled students (links to student data)

• School questionnaire
  – Usually principal
  – Parts may be directed towards heads of departments eg. head of science, ICT-coordinator
Question design issues

• Questions should be designed with target audience in mind:
  – Questionnaires designed for Primary/ Early secondary students should have minimal reading load

• Analytical issues
  – Will the question format provide you with the information you need to answer the research question?
Length of questionnaire

• Effect on response rates
  – The longer the questionnaire, the less likely someone will complete it (particularly for teachers)

• Respondent fatigue
  – Longer questionnaires more likely to have higher missing / unreliable data towards the end

• As a rough rule, student questionnaires should be no longer than 20 minutes
Fatigue?

As time goes on, missing responses increase.
Open-ended questions

- Can provide qualitative information not possible to collect otherwise
- Higher burden on respondents
- Time consuming to process

Q12 What are your greatest needs in order to improve your teaching of science in your class?

*Please write your answer on the lines provided below.*
Question formats
Categorical questions

• Respondents choose from a list without an inherent order

Q2 Which of the following is your favourite food?

Please mark an “X” in one square only.

Rice
Roti
Dal
Samosa
Another food
**Question formats**

**Ordinal questions**

- Respondents select an option with an inherent order

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**Q8** To what extent do you agree or disagree with the following statements about your school?

*Please tick one box on each line.*

<table>
<thead>
<tr>
<th></th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) I like to read books during my lunch break</td>
<td>□ 1</td>
<td>□ 2</td>
<td>□ 3</td>
<td>□ 4</td>
</tr>
</tbody>
</table>

---
Question formats
Other question types

• Frequency scales
  – What is your age? (Less than 30, Between 30 and 50, Greater than 50)

• Ranking questions
  – Rank each of these four restaurants that you like best from 1 (most liked) to 4 (least liked)

• Matrix questions
  – Write down how many male and female teachers do you have for each year level of your school
Closer Look: TIMSS
TIMSS 2015
Assessment Frameworks

Ina V.S. Mullis
Michael O. Martin, Editors

TIMSS & PIRLS
International Study Center
 Lynch School of Education, Boston College
The TIMSS 2015 Context Questionnaire Framework establishes the foundation for the background information collected in TIMSS 2015.

Through the TIMSS 2015 Encyclopedia and context questionnaires, TIMSS collects data about how educational systems throughout the world deliver and promote learning in mathematics and science. [p61]
Contextual foci / levels

Encyclopedia

- National and community contexts
- Home contexts
- School contexts
- Classroom contexts
- Student characteristics and attitudes toward learning

Questionnaires
National and community contexts

- Economic resources, population demographics, and geographic characteristics
- Organization and structure of the educational system
- Student flow
- Language(s) of instruction
- Intended mathematics and science curriculum
- Teachers and teacher education
- Monitoring curriculum implementation
Student flow

• Age of entry

• Preprimary education

• Grade retention

• Tracking
Parent / home questionnaire

A. Did your child attend <ISCED Level 0>?

Check one circle only.

Yes --- ○
No --- ○
(If No, go to #5)

If Yes,

B. How long was he/she in <ISCED Level 0>?

Check one circle only.

3 years or more --- ○
between 2 and 3 years --- ○
2 years --- ○
between 1 and 2 years --- ○
1 year or less --- ○
How old was your child when he/she began primary/elementary school?

Check one circle only.

5 years old or younger --- ○
6 years old --- ○
7 years old --- ○
8 years old or older --- ○

How well could your child do the following when he/she began primary/elementary school?

Check one circle for each line.

Very well

<table>
<thead>
<tr>
<th>Line</th>
<th>Very well</th>
<th>Moderately well</th>
<th>Not very well</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Recognize most of the letters of the alphabet</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>b) Read some words</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>c) Read sentences</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>d) Write letters of the alphabet</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>e) Write some words</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Have you ever repeated a grade?

Fill in one oval for each line.

Yes  No

a) In elementary school  ①  ②

b) In middle or junior high school  ①  ②
School questionnaire

Is there a difference in the proportion of the population attending secondary schools from rural and urban environments?
A. How many people live in the city, town, or area where your school is located?

Check one circle only.

- More than 500,000 people -- ○
- 100,001 to 500,000 people -- ○
- 50,001 to 100,000 people -- ○
- 15,001 to 50,000 people -- ○
- 3,001 to 15,000 people -- ○
- 3,000 people or fewer -- ○

B. Which best describes the immediate area in which your school is located?

Check one circle only.

- Urban—Densely populated --- ○
- Suburban—On fringe or outskirts of urban area --- ○
- Medium size city or large town --- ○
- Small town or village --- ○
- Remote rural --- ○
C. Which best characterizes the average income level of the school’s immediate area?

Check one circle only.

High ---  
Medium ---  
Low ---  
Background Questionnaire and Test
Data: Some issues of Analysis
Revision and Piloting

• Allow sufficient time for questionnaires to undergo thorough review
  – By stakeholders with an interest in the study
  – By people familiar with data analysis and questionnaire item writing

• All items should be piloted
  – Questionnaires to be refined based on analysis of pilot data
  – May pilot different forms of a question
    • Different response formats
  – May pilot open ended to form response categories from results, for main survey
Unit of analysis

• The student is the unit of analysis

• Always express findings relative to the unit of analysis
<table>
<thead>
<tr>
<th>N students</th>
<th>Principal has Masters?</th>
<th>N students</th>
<th>Principal has Masters?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1030</td>
<td>Y</td>
<td>27</td>
<td>N</td>
</tr>
<tr>
<td>1225</td>
<td>Y</td>
<td>79</td>
<td>N</td>
</tr>
<tr>
<td>300</td>
<td>N</td>
<td>8</td>
<td>N</td>
</tr>
<tr>
<td>60</td>
<td>N</td>
<td>29</td>
<td>N</td>
</tr>
<tr>
<td>40</td>
<td>N</td>
<td>8</td>
<td>N</td>
</tr>
<tr>
<td>20</td>
<td>N</td>
<td>23</td>
<td>N</td>
</tr>
<tr>
<td>50</td>
<td>N</td>
<td>53</td>
<td>N</td>
</tr>
<tr>
<td>200</td>
<td>Y</td>
<td>70</td>
<td>N</td>
</tr>
<tr>
<td>220</td>
<td>N</td>
<td>69</td>
<td>N</td>
</tr>
<tr>
<td>250</td>
<td>N</td>
<td>60</td>
<td>N</td>
</tr>
<tr>
<td>75</td>
<td>N</td>
<td>51</td>
<td>N</td>
</tr>
<tr>
<td>60</td>
<td>N</td>
<td>60</td>
<td>N</td>
</tr>
</tbody>
</table>

4067 students in 24 schools
2455 students are in schools where the principal has a masters or higher **60%**
3 out of 24 principals have Masters **12.5%**
Linking different levels of respondent

Parent → Student
Teacher → Student
School → Student
District → Student
Community → Student
Linking different levels of respondent

Teacher → Student

How many teachers currently teach the student?
How long has the current teacher taught the student?
How many previous teachers does the student have?

For example: Good teacher now in grade 6, but previous five teachers were bad.
How will you interpret the findings?
Cognitive vs ‘non-cognitive’

• Cognitive domain: skills and knowledge
  – calculate, analyse, critique, evaluate

• Attitudes, values, behaviours, perceptions
  – How often do you...?
  – How much do you agree that...?

• Different development and analysis strategies
Policy monitoring example

Organization and structure of the educational system

1999 Structural reforms in Poland
Using International Surveys - Poland

<table>
<thead>
<tr>
<th>Grade</th>
<th>Age</th>
<th>Grade</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6</td>
<td>Zero Class (Primary Schools or Kindergartens)</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>7</td>
<td>Comprehensive Primary Schools</td>
<td>7</td>
</tr>
<tr>
<td>II</td>
<td>8</td>
<td>Final Test</td>
<td>8</td>
</tr>
<tr>
<td>III</td>
<td>9</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>IV</td>
<td>10</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>V</td>
<td>11</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>VI</td>
<td>12</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>VII</td>
<td>13</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>VIII</td>
<td>14</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>I</td>
<td>15</td>
<td>General Secondary Schools</td>
<td>15</td>
</tr>
<tr>
<td>II</td>
<td>16</td>
<td>Secondary Vocational Schools</td>
<td>16</td>
</tr>
<tr>
<td>III</td>
<td>17</td>
<td>Basic Vocational Schools</td>
<td>17</td>
</tr>
<tr>
<td>IV</td>
<td>18</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>V</td>
<td>19</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

• in PISA 2000; 13.7% of students scored 600 or more points, as opposed to only 10.6% in 2000.

• By 2003, the percentage of students who scored 400 points or less in PISA decreased to about 15% from 21.4%