Assessment, Information systems, Monitoring Statistics

UIS Asia-Pacific Regional Office

NESIS SCB Technical Support Services
EFA M&E, UN ESCAP UNCCA, MDG, PRSP
Guys! Are you sure this is the best way of getting there?
GATHERING INFORMATION
On indicators, policies & plans from
Surveys, research documents, reports

ANALYSIS
Of root causes &
their linkages

Policy Decision
SELECTION
Of areas of cooperation
The IQ of an Organization: the quality of information available for

- Setting policy goals and targets
- Evaluating past system performance
- Monitoring progress of policy targets toward goals
- Assessment of learning achievement
- Strategic resource planning

- How is the quality of statistics used for decision-making in your system?
  - Reliable?
  - Valid?
  - Timely?
  - Interpretable?
  - Relevant and Applicable?
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Monitoring</th>
<th>Assessment</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>improve implementation/formative</td>
<td>improve learning formative/sum</td>
<td>improve policies and strategies/summative</td>
</tr>
<tr>
<td>Aimed at</td>
<td>operations and management</td>
<td>curriculum design, teachers and course providers</td>
<td>policymaking and leadership</td>
</tr>
<tr>
<td>Focus</td>
<td>account of what has been implemented</td>
<td>learning objectives, TL methods and materials</td>
<td>evaluation of policies and strategies vs goals &amp; targets</td>
</tr>
<tr>
<td>Informati</td>
<td>inputs and process</td>
<td>Learning achievements per objectives, TL process</td>
<td>outcomes and impact</td>
</tr>
<tr>
<td>on</td>
<td></td>
<td>Learning results per method-materials</td>
<td>learning achievements, socio-economic changes</td>
</tr>
<tr>
<td>Indicators</td>
<td>resource input, efficiency, quality of delivery</td>
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</tr>
</tbody>
</table>


Monitoring

Are we moving closer to the goal?
Forward? Backward?
Central functions in policy cycle

Policy formulation
- Decision
- Evaluation
- Monitoring
- T-L Impact

Administration
- Mobilization
- Implementation

Intelligence

Effectiveness

Efficiency
Policy Analysis Framework

- **Formulation** – defining goals, identifying target groups and setting targets
- **Decision** – “authoritative allocation of values”
- **Mobilization** – resources delivered for system development
- **Implementation** – systems development – structures, functions, regulations, processes, etc.
- **Monitoring** – systems performance benchmark indicators
- **Assessment** – systems outputs, outcomes, impact
## Indicators for Education Sub-sectors

<table>
<thead>
<tr>
<th>Indicator areas</th>
<th>Early childhood</th>
<th>Formal Basic education</th>
<th>NFE Out-of-school youth &amp; adults, literacy, life skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demand for education and training</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input of resources and policies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of education delivery process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access and participation/coverage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output of knowledge and skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on individual welfare &amp; health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on gender &amp; social disparities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on community development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impact on socio-economic systems</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Example Problem: Low school enrolment rates in border region

Evidence/data based

Causal Analysis
From Theory, Hypothesis, Debate to Evidence-based Policy

Scientific process and research design
- Theory, design and measurement
  - theory $\rightarrow$ model $\rightarrow$ data
  - Measurement validity and reliability
- Causal inference procedure
  - Simple sequential inductive approach
  - Hypothesis testing, reject-confirm iterative approach
  - Causal modelling and path analysis of direct, indirect, conditional and interaction effects as well as spurious correlation
From Theory to Evidence-based Explanation

Operationalization
- Model: concepts
- Units, variables, time, relations

Data collection

Theory

Causal inference

Data analysis

Integration

Dissection

Specification

abstraction
Operationalization

- Data matrix/box – “data modeling”
  - Units of analysis
  - Variables (attributes & behavior)
  - Time-space
- Measurement, scaling, examples:
  - Learning achievement
  - “Parental love”
  - Child-centered T-L
- Data analysis: statistical models
  - Univariate scalability, centrality and distribution profile
  - Bivariate correlation/covariance, test of hypothesis
  - Multivariate analysis of co-variances,
  - Path analysis of causal models, fitness-test of theory
  - Etc.
Hypothetical Causal Model

dependent, immediate factors, conditioning factors

Z1 → X1 → X5

Z2 → X2 → X5

Enroll in school
Causal model

Explain differences in GER & NER

Conditioning factors: policy determined
- Legal requirement: Compulsory/non-compulsory primary education
- Budgetary allocation for migrant workers/non-Thai
- Availability of schools, teachers and places
- Absence of clear authoritative directive
- Language of instruction
- Laws on citizenship, registration, work permit, resident permit

Immediate factors
- Birth certification
- Citizenship
- Residence permit
- Work permit
- Legal ID card
- Poverty – household income
- (Fear of deportation)
- Language barrier
Testing the effect of a third variable
Path Analysis using partial correlation or multiple regression

Case 1: starting point: a bi-variate correlation

\[ \text{Access} = a + b \text{(Citizenship)} + u \]

\[ \text{Access} = \beta \text{(Citizenship)} + \mu \]

\[ R_{ac} \neq 0 \]
Testing the effect of a third variable
Path Analysis using partial correlation or multiple regression

Case 2: Urban/rural setting has an **Irrelevant effect**: the level of participation for Thai and non-Thai respectively, and the difference between Thai and non-Thai are the same in the urban or rural environments.

\[
\text{Citizenship} = \beta \text{Urban} + \mu, \text{ where } \beta = 0
\]

\[
\text{Access} = \beta_1 \text{Citizenship} + \beta_2 \text{Urban} + \mu, \text{ where } \beta_2 = 0
\]
Case 3: Concurrent effect:

- The enrolment rate differs for both groups and zones -- participation of Thai is greater than that of non-Thai, regardless of the environment, but for both groups respectively, participation is greater in the urban than the rural environment.

$$\text{Citizenship} = \beta \text{Urban} + \mu, \text{ where } \beta = 0$$

$$\text{Access} = \beta_1 \text{Citizenship} + \beta_2 \text{Urban} + \mu$$

Citizenship

Urban/rural environment

Access/Participation
Tabular analysis for causal interpretation

<table>
<thead>
<tr>
<th>Case 3</th>
<th>Thai</th>
<th>Non-Thai</th>
<th>%diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>80</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td>No ID</td>
<td>40</td>
<td>10</td>
<td>30</td>
</tr>
<tr>
<td>%diff</td>
<td>40</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

**Concurrent effect:** difference between citizens and also between ID ownership; therefore, both are relevant
Graphical display for causal interpretation

Case 3: Concurrent effect

Enrolment rate

Urban  Rural

Boys  Girls
Case 4: Conditional/interaction effect:

- The difference between Thai and non-Thai is magnified in the urban than in the rural areas. Among Thai, enrolment is higher in the urban areas; among non-Thai, it is higher in the rural areas; producing opposite effects. More likely the other way round?

\[
\text{Citizenship} = \beta \text{Urban} + \mu, \text{ where } \beta = 0
\]

\[
\text{Access} = \beta_1 \text{Citizenship} + \beta_2 \text{Urban} + \beta_3 \text{UxC} + \mu
\]
Tabular Analysis

<table>
<thead>
<tr>
<th>Case 4</th>
<th>Thai</th>
<th>Non-Thai</th>
<th>%diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID</td>
<td>80</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>No ID</td>
<td>50</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>%diff</td>
<td>30</td>
<td>-10</td>
<td></td>
</tr>
</tbody>
</table>

**Conditional effect:**
Differences are accentuated by combined effects - big advantage for Thais with legal IDs and some advantage for Thais in rural areas, resulting in opposite effects of ID ownership on respective groups.
Graphical displays for causal interpretation

Case 4: Conditional/Interaction effect

- Boys
- Girls

Enrollment rate

Urban
Rural
Case 5: Intervening/common effect:

- The difference is between the urban and rural areas, not between Thai and non-Thai (spurious effect), due either to the intervening or common effects of the environment.

\[ R_{Citizenship \times Access.Urban} \neq 0 \]

\[ Access = \beta_1 \text{Citizenship} + \beta_2 \text{Urban} + \mu, \text{ where } \beta_1 = 0 \]
The effect of the Urban-Rural settings

Case 2: Irrelevant

Case 3: Concurrent

Case 4: Conditional / Interaction

Case 5: Intervening / common effect
Exercise: interpret the Thai data tables, using:

MODAL PATTERNS OF TABULAR ANALYSIS

<table>
<thead>
<tr>
<th>ANALYSIS RESULTS</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Case 1</strong></td>
<td><strong>GENDER</strong></td>
</tr>
<tr>
<td>ENROLLED?</td>
<td>Boys</td>
</tr>
<tr>
<td>Yes%</td>
<td>70</td>
</tr>
<tr>
<td>No%</td>
<td>30</td>
</tr>
</tbody>
</table>

Enrolment ratio varies with gender: higher proportion of boys enroll in school than that of girls

The following are alternative interpretations of the role of a third analytical variable (zones):

<table>
<thead>
<tr>
<th>ZONE</th>
<th>% Enrolment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 2</td>
<td>Boys</td>
</tr>
<tr>
<td>Urban</td>
<td>70</td>
</tr>
<tr>
<td>Rural</td>
<td>70</td>
</tr>
<tr>
<td>%diff</td>
<td>0</td>
</tr>
</tbody>
</table>

**Irrelevant effect:** difference between gender but none between zones; therefore, variable zone is irrelevant