IEA Teacher Education Study in Mathematics

TEDS-M PROGRESS REPORT

October, 2008

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for TEDS-M Team

TEDS-M Website (http://teds.educ.msu.edu/)

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Major Accomplishments 2007-2008

17 Countries Participating

Botswana	Norway	Spain
Canada	Oman	Switzerland
Chile	Philippines	Chinese Taipei
Georgia	Poland	Thailand
Germany	Russia	USA
Malaysia	Singapore	

Forthcoming Publications from TEDS-M

Conceptual Framework –

- **The final draft of the Conceptual Framework has been written and made available via the TEDS-M website.**
- **The final hard copy publication is forthcoming via the IEA Secretariat by end of October 2008.**
- **The final Framework will be made available electronically via the TEDS- M website and in paper.**
- TEDS-M Website (**http://teds.educ.msu.edu/**)

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Forthcoming Publications from TEDS-M

- **Teacher salary study**:

Do Countries Paying Teachers Higher Relative Salaries Have Higher Student Mathematics Achievement?

by Martin Carnoy

*Australia, Bulgaria, Botswana, Chile, Finland, France, Italy, Germany, Hong-Kong, Korea, Mexico, Norway, Philippines, Singapore, Spain, Switzerland, Chinese Taipei, Thailand, United Kingdom, United States.

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- The study compares the salaries of teachers as a profession with the salaries in mathematics-oriented professions to get a measure of how teachers teaching mathematics are paid compared to those in occupations that teachers might enter if they were well trained in mathematics.

- In addition the study estimated the relationship between student mathematics test scores on the TIMSS/PISA tests, gross domestic product (GDP) per capita, income distribution and teachers' salaries relative to the salaries of those of the same gender and similar education who are employed or trained as scientists, using the nation as the unit of observation.

- We hypothesized that students in societies with higher relative teacher pay score higher on the TIMSS and PISA mathematics tests.

Cost Study Findings

- In many of the twenty countries in the study, salaries of teachers are similar to those of professionals in mathematics-intensive occupations. However, in others this is not the case.

- The results of this analysis suggest that student performance is positively and statistically significantly related to relative teacher salaries, particularly in the case of male teachers, even when controlling for GDP per capita and income distribution.

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Triple Survey is now complete!!

- **Main Study data collection began in October 2007 and ended in June 2008.**

- **In addition to measuring background, OTL, and beliefs, the future teacher primary instruments included a total of 70 items and secondary instruments had a total of 49 items measuring mathematics and mathematics pedagogy knowledge**

- **Close to 2/3 items measured mathematics knowledge (algebra, geometry, number and data) and close to 1/3 items measured mathematics pedagogy knowledge (curriculum, planning and enacting)**

Triple Survey is now complete!!

- **Future teachers answered a two-block test that used a rotated 5-Block design for primary and 3-block design for secondary to cover all these items in 60 minutes**

- **We hope that this design will permit estimation and analysis of the full covariance matrix, and that includes enough items and score points to generate IRT (item response theory) scales and reports by sub-domain.**

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Preliminary Numbers:*

The response rates were good—

- **Surveyed 15,163 Primary Future Teachers**
- **Surveyed 9, 389 Secondary Future Teachers**
- **Surveyed 500 institutions which included**
  - **451 units preparing future primary teachers, and**
  - **339 units preparing future secondary teachers**
- **Surveyed 4837 teacher educators**

**final numbers will be available in December 2008*

Other accomplishments

- **TEDS-M Final Reports–**
- **Main Study Data Analysis Plan –**
- **Most countries have submitted country reports and route questionnaires have been submitted -**
- **We are currently receiving the data from the curriculum analysis.**

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The first scoring training session for the Main Study was delivered in Miami (November 29 – December 1, 2007) and the second in Fribourg, Switzerland (April 7-9, 2008).

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The curriculum workshop was held in Warsaw, Poland June 9-13, 2008.

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4th NRC Meeting was held in Bergen, Norway from September 1-5, 2008

COMPLEX DATA STRUCTURE, SAMPLES AND ANALYSIS PLAN OVERVIEW

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Complex Data Structure

Route	Primary	Both	Secondary
Concurrent			
Botswana	X		X
Chile		X	X
Georgia	X		X
Malaysia	X		
Norway		X	
Philippines	X		X
Poland	X	X	
Russia	X		X
Spain	X		
Switzerland	X		
USA	X		X
Consecutive and Concurrent			
Canada	X		X
C. Taipei	X		X
Malaysia			X
Norway			X
Oman			X
Singapore	X		X
Thailand		X	
Switzerland			X
Consecutive only			
Germany	X	X	X

General Types of Samples

(1) **Full censuses**: All institutions, educators and future teachers that belong to the target populations are part of the sample.

- Botswana, Georgia, Norway, Oman, Singapore, Thailand

(2) **Census of institutions, samples of educators and/or future teachers:**

- Canada, Chile, Germany (future teacher survey), Malaysia, Poland, Chinese Taipei (future teacher survey), Switzerland

(3) **Samples of institutions, educators and future teachers:**

- Germany (educator survey), Philippines, Russia, Spain, Chinese Taipei (educator survey), USA

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Sample Sizes for Future Teachers

(1) Full censuses:

All future teachers that belong to the target populations are part of the sample.

Country	Primary	Secondary
Botswana	100	60
Georgia	658	115
Norway*	1666	1766
Oman	Not studied	287
Singapore	424	431
Thailand*	667	667

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Sample Sizes for Future Teachers

(2) Census of institutions, samples of future teachers:

Canada, Chile,

Germany, Malaysia, Poland, Chinese Taipei, Switzerland

Country	Primary	Secondary
Canada	1290	1250
Chile*	952	954
Germany*	1281	975
Malaysia	647	498
Poland*	3307	498
Chinese Taipei	1024	375
Switzerland	1291	174

Sample Sizes for Future Teachers

(3) **Samples of institutions and future teachers:**

Philippines, Russia, Spain, USA

Country	Primary	Secondary
Philippines	643	769
Russia	2403	2274
Spain	1259	Not studied
USA	1177	496

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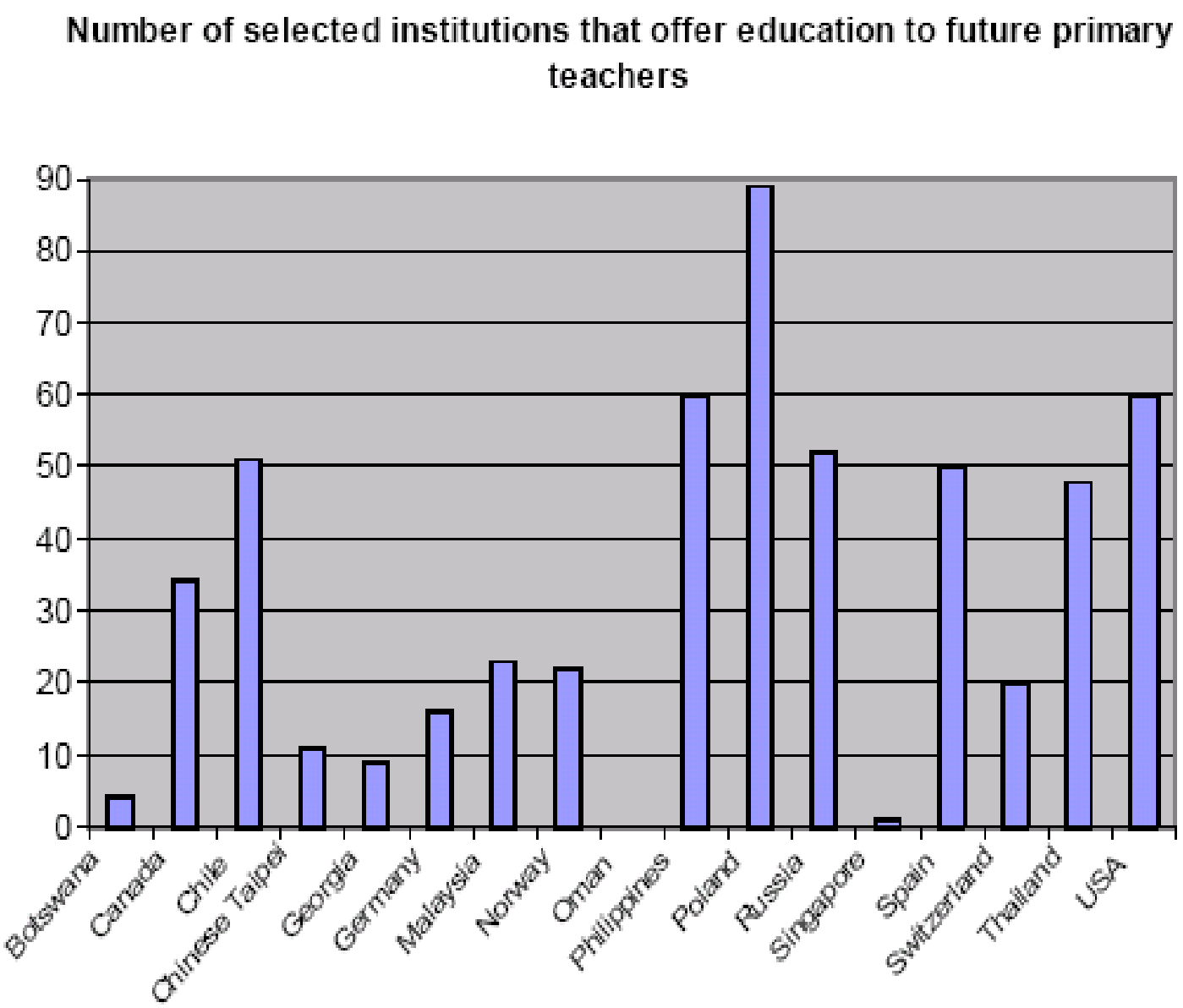

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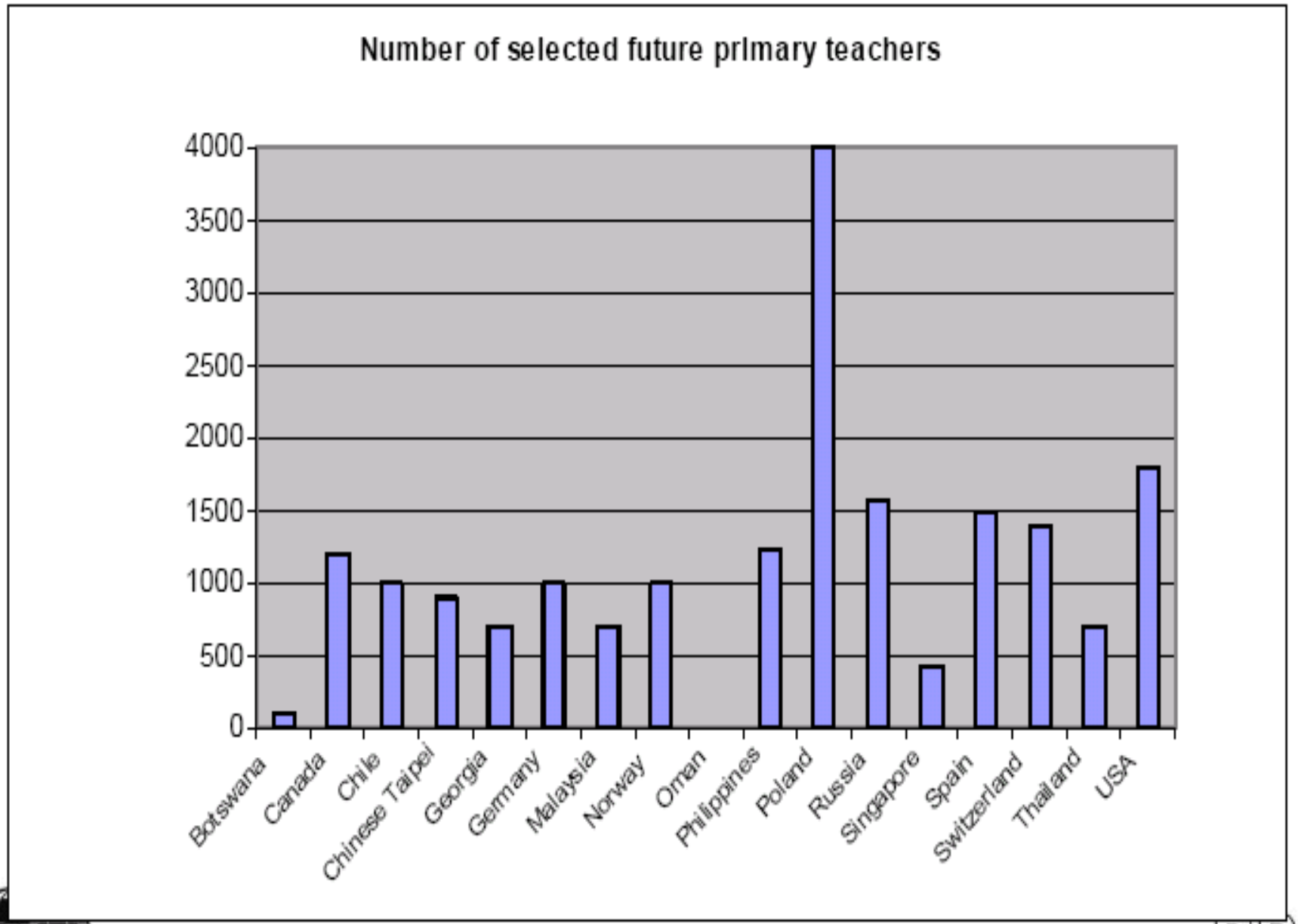

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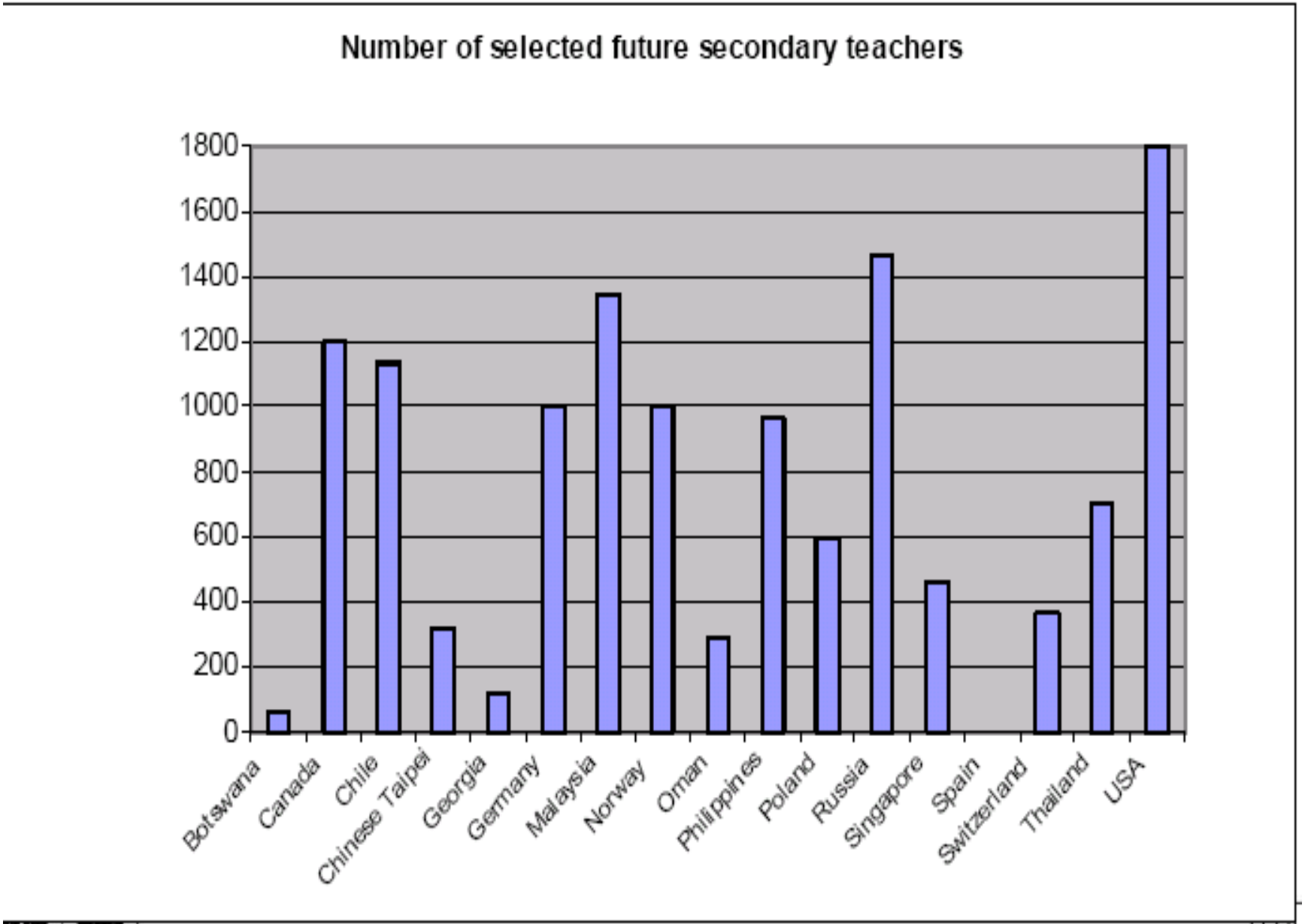

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Descriptive analysis questions

What are the characteristics of teacher education programs that prepare future teachers of mathematics effectively?

- *What is the mathematics and other related teaching knowledge that future teachers are expected to acquire across the participating countries?*
- *What depth of understanding are they expected to achieve?*
- *How are program expectations, curriculum, and standards enacted?*
- *What is the level and depth of the mathematics and related teaching knowledge attained by prospective primary and lower secondary teachers?*
- *How does this knowledge vary across countries?*

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Preliminary analyses for the three surveys (IPQ, EQ, FTQ)

- Booklet distribution information by country (e.g. count and percentage).
- Participation rate by country (e.g., total number distributed, number absent in session, number participated, number completed, etc).
- Item statistics (e.g., frequency of valid and omitted responses; frequency of response to each option per item);
- Scale statistics (item means and point-bi-serials, scale means, standard deviations and reliabilities, item maps) .

Scale development

The TEDS-M Main Study contains a number of scales that are intended to indicate outcome measures in FTQ:

- knowledge of mathematics
- knowledge of mathematics pedagogy
- beliefs about mathematics and mathematics learning
- self-assessment of preparedness
- rating of program effectiveness (a single item)

Scales will be developed by taking three primary steps

1. Items will be evaluated for functionality
2. Items will be subjected to confirmatory analysis:

   - Items will be combined into sets based on their prior intent, confirmatory factor analysis will be conducted to assess the dimensionality and the model-data fit of each scale,
   - Based on fit indices and item loadings on a factor, decisions regarding selection of items for final inclusion in scales will be considered.

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Scales will be developed by taking three primary steps

3. IRT analysis will be conducted to scale items in order to secure meaningful scale scores measuring each construct. The selection of an IRT model will be based on the model fit to data, and will also provide information about,
   - item difficulty,
   - match between items and respondents,
   - other measurement properties of the scale, including reliability.

➢ Validity-related evidence on expected relations among mathematics and belief sub-scales will be assessed using
   - within and between scale correlations,
   - instrument specifications, item pilot and analysis results, and confirmatory factory analysis.

Descriptive Curriculum Analysis

To map the content of mathematics and related knowledge covered by sampled programs by country by route we are doing content analysis of:

- Teacher education (institutional / program curriculum)
- Teacher education course syllabi (mathematics, mathematics pedagogy and general pedagogy)
- K-12 curriculum analysis of mathematics for all countries --*expectations*

Multivariate Analysis

- We expect to use the general-linear model (GLM).
- We will use BRR* to estimate variances and standard errors according to the sampling design.
- Final modeling and statistical analyses will be based on data quality and distributional characteristics.

*Balanced Repeated Replications

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Multivariate analysis: Mapping the processes and outcomes of mathematics teacher preparation

- National context
- Program structure
- Program process
- Program outcomes

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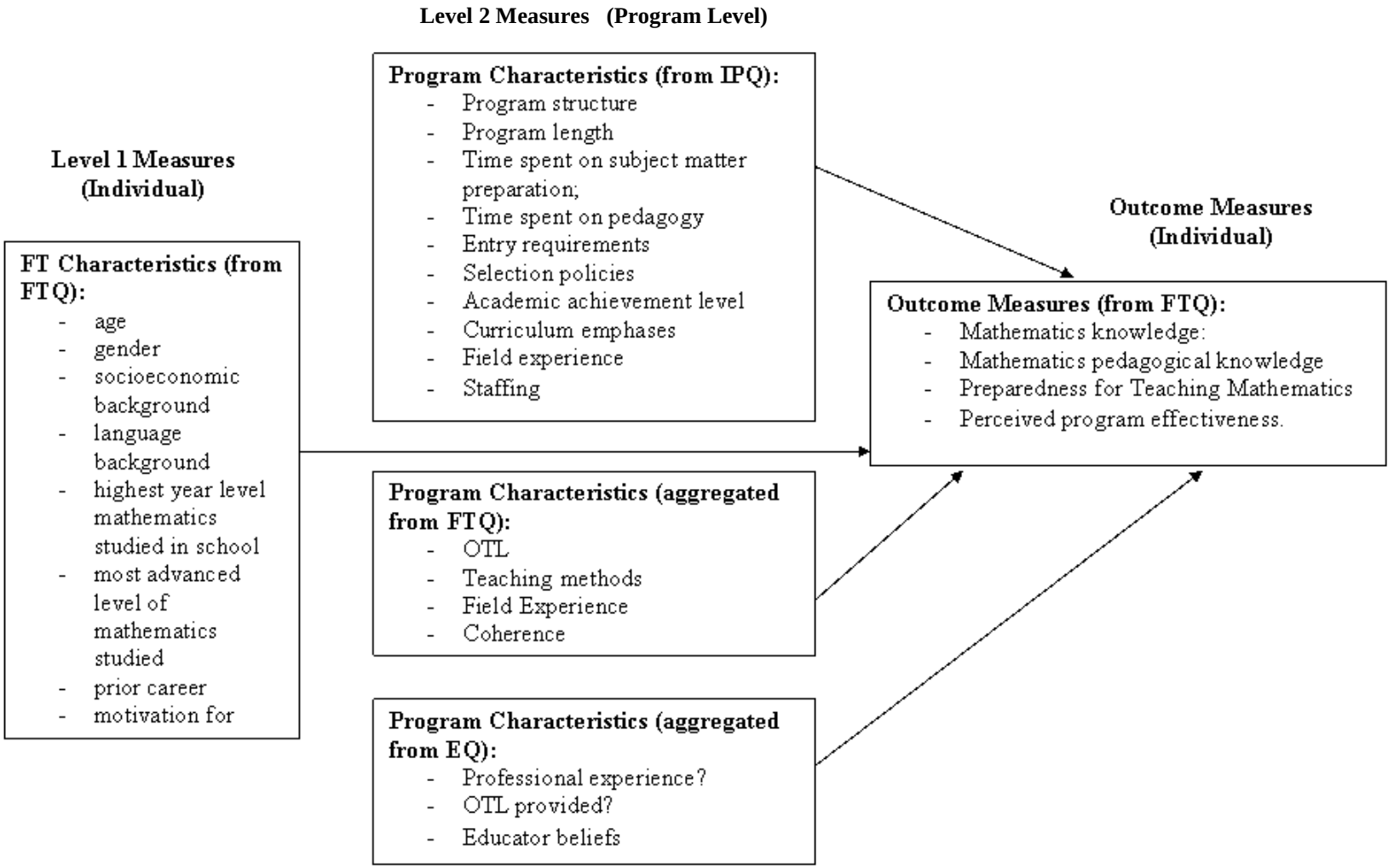
Conceptual Model



Caveat-- All modeling decisions currently planned are subject to review, depending on the completeness of the data available for each item and country.

Publications in progress

IEA Teacher Education Study in Mathematics

POLICY, PRACTICE, AND READINESS TO TEACH PRIMARY AND SECONDARY MATHEMATICS
Series Editor: Maria Teresa Tatto

- **Volume 1: NATIONAL POLICES AND REGULATORY ARRANGEMENTS FOR THE MATHEMATICS PREPARATION OF FUTURE TEACHERS IN 17 COUNTRIES**

- **Volume 2: INSTITUTIONS, PROGRAMS AND OPPORTUNITIES TO LEARN FOR THE MATHEMATICS PREPARATION OF FUTURE TEACHERS IN 17 COUNTRIES**

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- **Volume 3: MATHEMATICS AND RELATED OUTCOMES ACHIEVED AMONG PROSPECTIVE PRIMARY AND LOWER SECONDARY TEACHERS IN 17 COUNTRIES**
- **Volume 4: PROGRAM CHARACTERISTICS, OPPORTUNITIES TO LEARN AND OUTCOMES IN THE MATHEMATICS PREPARATION OF FUTURE TEACHERS**
- **Volume 5: ENCYCLOPEDIA**

- **TECHNICAL REPORT**
- **DATABASE**

Activities highlights

- November 28, 2008: DPC sends cleaned MS data to International Centers and to NRCs
- December 2008: Begin analysis of Main Study data

- March 9 – 12, 2009: 5th NRC Meeting:
  - Finalize tables
  - Finalize structure of the International Reports
  - Chicago, USA
- April – June 2009 DPC sends final data version to NRCs
- July 20 -24, 2009: 6th NRC Meeting:
  - Initial training on the use of TEDS-M International Database (DPC)
  - Final review of draft International Report
  - Santiago, Chile

Releases

January 2010:

- Release of international report

May 2010:

- Release of international data base and technical report

Organizational Leadership and Expertise

- IEA
- Michigan State University
- Australian Council for Educational R.
- IEA/DP$_R$C
- STATISTICS CANADA
- National Research Centers

TEDS-M Team

The International Study Center at Michigan State University

TEDS-M Lead Institution

- **Maria Teresa Tatto, TEDS-M director and principal investigator**
- **Sharon L. Senk and John Schwille, co-directors and co-principal investigators**
- **Kiril Bankov, University of Sofia, senior research coordinator for mathematics, mathematics pedagogy knowledge, and opportunities to learn**
- **Mark Reckase, measurement and quantitaive methods, Michigan State UNiversity**
- **Michael Rodriguez, University of Minnesota, senior research coordinator for statistics, measurement, and psychometrics**
- **Martin Carnoy, Stanford University, senior research coordinator for the cost**
- **Todd Drummond, Yang Lu, Richard Hardgreve-Resendez, research assistants**
- **Inese Berzina-Pitcher, consortium coordinator**
- **Ann Pitchford, administrative assistant.**

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TEDS-M Team

The International Study Center at the Australian Council for Educational Research (ACER)

- **Lawrence Ingvarson, co-director**
- **Ray Peck, co-director**
- **Glenn Rowley, co-director**

International Association for the Evaluation of Educational Achievement (IEA)

- **Hans Wagemaker, executive director**
- **Barbara Malak, manager membership relations**
- **Jur Hartenberger, financial manager.**

IEA Data Processing Center (DPC)

- **Dirk Hastedt, co-director**
- **Falk Brese, project coordinator**
- **Ralph Carstens, project coordinator**
- **Keith Hanmer, research assistant**
- **Sabine Meinck, sampling methodologist/coordinator.**

TEDS-M International Sampling Referee

- **Jean Dumais, Statistics Canada.**

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