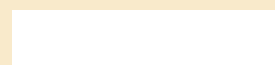
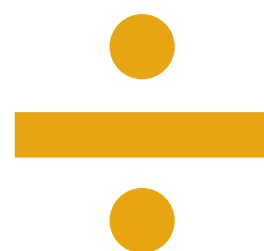




TEDS-M

TEDS-M 2008 User Guide for the International Database



Edited by Falk Brese with Maria Teresa Tatto



www.manaraa.com

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Edited by Falk Brese with Maria Teresa Tatto

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TEDS-M

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The International Association for the Evaluation of Educational Achievement, known as IEA, is an independent, international consortium of national research institutions and government research agencies, with headquarters in Amsterdam. Its primary purpose is to conduct large-scale comparative studies of educational achievement with the aim of gaining more in-depth understanding of the effects of policies and practices within and across systems of education.

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CHAPTER 1

Introduction

1.1. Overview of the Teacher Education in Mathematics Study¹

The Teacher Education Study in Mathematics or TEDS-M is a study conducted under the aegis of the International Association for the Evaluation of Educational Achievement (IEA). The lead research center for the study is the International Study Center at Michigan State University (ISC/MSU). The ISC/MSU worked from 2006 to 2011 with the International Study Center at the Australian Council for Educational Research (ACER) and the National Research Coordinators (NRCs) in 17 countries to produce this study. TEDS-M received funding from IEA, the United States of America National Science Foundation, and the collaborating countries.

1.1.1. Purpose of TEDS-M

TEDS-M focused on how teachers are prepared to teach mathematics in primary and lower-secondary school, and studied the variation in the nature and impact of teacher education programs within and across countries. TEDS-M is the first cross-national study to provide data on the knowledge that future primary and lower-secondary school teachers have acquired in their mathematics teacher education. The study collected and analyzed data from representative samples of pre-service teacher education programs, their future primary and lower-secondary teachers, and their teacher educators from participating countries to inform policy and practice in teacher education. The key research questions for the study focused on the relationships between teacher education policies, institutional practices, and future teacher mathematics and pedagogy knowledge.

1.1.2. Research Questions

What are the policies that support primary and secondary teachers' achieved level and depth of mathematics and related teaching knowledge?

The study examined the policies directed at mathematics teachers, including recruitment, selection, preparation, and certification. Specifically these comprise (a) the policies that regulate and influence the design and delivery of mathematics teacher education for elementary and lower-secondary teachers; (b) the characteristics of institutions and programs charged with implementing these policies; (c) the countries' distinctive political, historical, and cultural contexts as they influence policy and practice in mathematics teacher education; and (d) the policies in each country regarding standards for degrees, coverage of topics, certification practices, recruitment, selection, and preparation of future mathematics teachers.

¹ The first section of this introduction is a shorter version of Chapter 1 found in *Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries. Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. (Tatto, Schwille, Senk, Ingvarson, Rowley, Peck, Bankov, Rodriguez & Reckase, 2012).

What learning opportunities, available to prospective primary and lower-secondary mathematics teachers, allow them to attain such knowledge?

The study examined the intended and implemented curriculum of teacher education at the institutional level, as well as the overall opportunities to learn embedded in this curriculum. Specifically these comprise (a) the kinds of institutional and field-based opportunities provided for future primary and lower-secondary teachers; (b) the programs' enacted curriculum and standards; (c) the content taught in teacher education programs and the organization of instruction; and (d) the qualifications and prior experiences of those responsible for the implementation of these programs.

What are the level and depth of the mathematics and related teaching knowledge attained by prospective primary and lower-secondary teachers at the end of their pre-service teacher education?

The study examined the intended and achieved goals of teacher education. Specifically these comprise (a) the content knowledge of mathematics that future teachers have acquired as an outcome of teacher education; (b) the depth of understanding that they achieved; (c) the knowledge for mathematics teaching (e.g., content, pedagogy, and curriculum) that future teachers achieved at the end of their teacher education and once they are considered "ready to teach;" (d) other characteristics to help explain their ability to master this knowledge; and (e) the beliefs about the nature of mathematics and about teaching and learning mathematics at the end of their preparation.

1.1.3. TEDS-M Design

Data Sources

The first research question was addressed through individual case study country reports, questionnaires, and interviews issued by the TEDS-M International Study Center. The second and third research questions were answered via four surveys of nationally representative samples of (1) teacher education institutions and programs; (2) teacher educators; (3) future primary teachers who received preparation to teach mathematics; and (4) future lower-secondary teachers also preparing to teach mathematics.

Sample

In most countries, TEDS-M implemented a two-stage sampling design. First, the Sampling Unit of the IEA DPC, working with the national research centers in each participating country, selected samples. These were representative of the national population of teacher preparation (TP) institutions that offered education to the target population of future teachers who were prepared to teach mathematics at the primary or secondary level. Once an institution was selected, all programs associated with the mathematics preparation of future primary and lower-secondary teachers were included in the survey. Then, within these institutions and programs, samples of educators and of future teachers were surveyed. In many countries, it was necessary to select all TP institutions to reach IEA's sampling standards. In almost all countries, it was necessary to survey all eligible educators for TEDS-M. Likewise, in many countries, all eligible future teachers in the sampled institutions were surveyed. All samples were drawn using randomization. A software package (WinW3S) provided by the IEA was used in each national center to select the samples of future teachers, classes, and educators. Sampling errors were computed using balanced half-sample repeated replication (or BRR, a well-established re-sampling method). All countries participating in TEDS-M were required

to provide complete national coverage of their national desired target populations. However, in some cases, organizational or operational conditions made it difficult for some NRCs to obtain complete national coverage. The conceptual framework, design, and methodology for the study have been thoroughly documented in various documents and reports (see Tatto, Schwille, Senk, Ingvarson, Peck, and Rowley, 2008; Tatto et al., 2012).

1.1.4. Participating Countries

The 17 countries that participated in the TEDS-M study include Botswana, Canada (four provinces), Chile, Chinese Taipei, Georgia, Germany, Malaysia, Norway, Oman (lower-secondary teacher education), the Philippines, Poland, Russia, Singapore, Spain (primary teacher education), Switzerland (German-speaking cantons), Thailand, and the USA (public institutions, concurrent and consecutive routes only).

1.1.5. Target Audiences for TEDS-M

TEDS-M was designed to inform policy and practice in mathematics teacher education. For educational policymakers TEDS-M contributes data on institutional arrangements that are effective in helping teachers become sufficiently knowledgeable in mathematics and related teaching knowledge. For teacher educators who design, implement, and evaluate teacher education curriculum, TEDS-M contributes a shared language, a shared database, and benchmarks for examining teacher education design against what has proved possible and desirable to do in other settings. For mathematics educators, TEDS-M provides a better understanding of what qualified teachers of mathematics are able to learn about the content and pedagogy of mathematics, as well as the arrangements and conditions needed for acquisition of this knowledge. For educators in general and for informed laypersons, TEDS-M provides a better understanding of how and what teachers learn as they prepare to teach.

1.2. Overview of the TEDS-M International Database and the User Guide for the International Database

To support and promote secondary analyses, the IEA is making the TEDS-M international database, the TEDS-M Technical Report (Tatto, 2012) and the TEDS-M User Guide available to analysts and public users.² The database comprises future teacher preparation program-, educator-, and future teacher level data from 17 countries.

This guide has been designed to provide a basic yet thorough introduction to the TEDS-M international database and to the most commonly used descriptive and inferential analyses. The guide, however, was not designed to include and illustrate every possible analytical technique appropriate for TEDS-M and therefore does not describe, for example, the multi-level modeling of data. The guide is further limited to the use of SPSS (IBM Inc., 2011) which is a widely used package for the analysis of large-scale educational datasets. Still, users wishing to undertake advanced analysis not covered by this guide or those wishing to use another statistical software packages such as SAS, WesVar, or Stata will find sufficient information on the database and its technical aspects to successfully configure both software and statistical models.

² *Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries. Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M).* (Tatto et al., 2012) is available on the IEA website and includes a detailed description of the study, its findings, and methods.

1.2.1. Country Acronyms and Identification Numbers

Operational country acronyms and identification numbers were based on the ISO 3166-1 definition for country codes. A three-letter operational alphanumeric code is used in filenames and identifies the country associated with that file. The operational numeric code IDCNTRY is used within the data files to identify the country for each record. For countries or sub-national entities not listed in the ISO 3166-1 standard the IEA Data Processing and Research Center (DPC) derived new operational alphanumeric and associated numeric codes. In TEDS-M this applies to Norway as the three program types there (“ALU”, “ALU+”, and “PPU & Masters”) are partly overlapping populations and hence had to be identified individually. Analysis across these program types is inappropriate due to this overlap (see Appendix B of the TEDS-M International Report [Tatto et al., 2012]). To avoid the risk of inappropriate analysis, data from Norway is treated as three different entities with three different numeric country identification codes (see Table 1.1 below).

With the exceptions of Oman, where there were no future primary teachers enrolled in teacher preparation programs during the time of the TEDS-M study, and Spain, which opted to survey only programs for future primary teachers, all countries collected and submitted data for the primary and lower-secondary teacher education levels.

Table 1.1 below lists the country names and operational codes of the TEDS-M participants.

Table 1.1: Country Names and Operational Codes of the TEDS-M Participants

Alpha-3 Code	Numerical Code	Country Name
BWA	72	Botswana
CAN	124	Canada
CHL	152	Chile
TWN	158	Chinese Taipei
GEO	268	Georgia
DEU	276	Germany
MYS	458	Malaysia
OMN	512	Oman
PHL	608	Philippines
POL	616	Poland
RUS	643	Russian Federation
SGP	702	Singapore
ESP	724	Spain
CHE	756	Switzerland
THA	764	Thailand
USA	840	United States of America
NOR	57891	Norway (ALU)
NOR	57892	Norway (ALU+)
NOR	57893	Norway (PPU & Masters)

1.2.2. Limitations of the Public-use Database

There are some limitations to the use of the data that need to be carefully considered when analyzing the TEDS-M data. Researchers are strongly advised to familiarize themselves with the study design and the specifics of the national samples (see also the TEDS-M Technical Report [Tatto, 2012] for details).

General

- Canada: Data were unacceptable due to low participation rates. Data are included in the database with weights set to 0. Inferences from sample data to populations are inappropriate.
- Norway: Program types are reported separately (see 1.2.1) because the populations partly overlap; data from these program types cannot be aggregated.
- Oman: Only secondary teacher education was provided at the time of testing.
- Russian Federation: Secondary pedagogical institutions were not covered.
- Spain: Only primary teacher education was covered.
- Switzerland: Only institutions where German is the primary language of use and instruction were covered.
- USA: Only public institutions were covered.

Institutional Program Data

- Canada: Data were unacceptable.
- Chinese Taipei: Exclusion rate is greater than 5 percent (very small institutions were excluded).
- Germany: Did not authorize reporting the institutional program questionnaire data.
- Malaysia: Participation rate is 57 percent; quality of the institutional program questionnaire data is questionable.³
- Norway: Program types are reported separately (see 1.2.1) because the populations partly overlap; data from these program types cannot be aggregated.
- Oman: Only secondary teacher education was provided at the time of testing.
- Philippines: Exclusion rate is greater than 5 percent (very small institutions were excluded).
- Poland: Institutions with consecutive programs only were not covered.
- Russian Federation: Secondary pedagogical institutions were not covered.
- Spain: Only primary teacher education was covered.
- Switzerland: Only institutions where German is the primary language of use and instruction were covered.
- USA: Only public institutions were covered.

Educator Data

- Canada: Data were unacceptable.
- Chile: Combined participation rate is 54 percent.
- Germany: Combined participation rate is 56 percent; survey of institutions and future teachers are not connected with survey of educators.
- Malaysia: Combined participation rate was 57 percent.

³ IEA standards consider <60 percent as low participation rates.

- Norway: Data were unacceptable.
- Poland: Combined participation rate was between 60 and 75 percent; institutions with consecutive programs only were not covered.
- Russian Federation: Secondary pedagogical institutions were not covered.
- Spain: Only primary teacher education was covered.
- Switzerland: Combined participation rate was 52 percent; only institutions where German is the primary language of use and instruction were covered.
- United States: Data were unacceptable.

Future Primary Teacher Data

- Botswana: The sample size is small (N=86), but comes from a census of a small population.
- Canada: Data were unacceptable.
- Chile: Combined participation rate is between 60 and 75 percent.
- Germany: Due to data protection restrictions in Germany institution and program identification variables in the future teacher data files have been made unusable so that future teacher data cannot be grouped by teacher preparation institutions or programs. A list matching future teachers to their institutions and programs can be obtained on demand from the TEDS-M National Study Center (tedsm@staff.hu-berlin.de).
- Norway: Combined participation rate is between 60 and 75 percent. An exception was made to accept data from one institution because one additional participant would have brought the response rate above the 50 percent threshold. Program types “ALU” and “ALU+” are reported separately because the two populations partly overlap; data from these program types cannot be aggregated.
- Poland: Combined participation rate is between 60 and 75 percent; institutions with consecutive programs only were not covered.
- Russian Federation: Secondary pedagogical institutions were not covered.
- Switzerland: Only institutions where German is the primary language of use and instruction were covered.
- USA: Only public institutions were covered. Combined participation rate is between 60 and 75 percent. An exception was made to accept data from two institutions because, in each case, one additional participant would have brought the response rate above the 50 percent threshold. Although the participation rate for the complete sample meets the required standard, the data contain records that were completed using a telephone interview, when circumstances did not allow administration of the full questionnaire. Of the 1501 recorded as participants, the full questionnaire was administered to 1185. Bias may arise in the data because significant numbers of individuals were not administered the full questionnaire.

Future Lower-Secondary Teacher Data

- Botswana: The sample size is small (N=53), but comes from a census of a small population.
- Chile: Combined participation rate between 60 and 75 percent.
- Georgia: Combined participation rate between 60 and 75 percent; an exception was made to accept data from two institutions because, in each case, one additional participant would have brought the response rate above the 50 percent threshold.

- Germany: Due to data protection restrictions in Germany institution and program identification variables in the future teacher data files have been made unusable so that future teacher data cannot be grouped by teacher preparation institutions or programs. A list matching future teachers to their institutions and programs can be obtained on demand from the TEDS-M National Study Center (tedsm@staff.hu-berlin.de).
- Norway: Combined participation rate is 58 percent. Program types “ALU”, “ALU+”, and “PPU & Masters” are reported separately because the populations partly overlap; data from these program types cannot be aggregated.
- Poland: Combined participation rate is between 60 and 75 percent; institutions with consecutive programs only were not covered.
- Russian Federation: An unknown number of those surveyed had previously qualified to become primary teachers.
- Switzerland: Only institutions where German is the primary language of use and instruction were covered.
- USA: Only public institutions were covered. Combined participation rate is between 60 and 75 percent. An exception was made to accept data from one institution because one additional participant would have brought the response rate above the 50 percent threshold. Although the participation rate for the complete sample meets the required standards, the data contain records that were completed using a telephone interview, when circumstances did not allow administration of the full questionnaire. Of the 607 recorded as participants, the full questionnaire was administered to 502. Bias may arise in the data because significant numbers of individuals were not administered the full questionnaire.

1.2.3. TEDS-M Instruments

The study administered four questionnaires to respondents in institutions: an institutional program questionnaire, an educator questionnaire, and two different versions of the future teacher questionnaire: one for future primary level teachers and one for future lower-secondary level teachers. The latter two included achievement items as well as background questions.

All questionnaires were translated into the respective language(s) and verified for linguistic equivalence. To conduct a valid analysis of the TEDS-M data and to correctly interpret the results, it is important to be aware of adaptations to the questionnaires that might have been made by national centers. In some instances, the international version of a question or item had to be adapted by all participating countries, for example with respect to ISCED levels. In other cases, national centers adapted questions or items for socio-cultural reasons or because the international version was partly or completely not applicable in their country. All the adaptations were refereed by the International Study Center at Michigan State University to secure as much integrity and consistency as possible across questionnaires and countries. Users of the international database are encouraged to refer to Supplement 2 of this guide for more details about national adaptations in TEDS-M and potential consequences for comparability across countries.

1.3. Analyzing the TEDS-M Data

TEDS-M uses item response theory (IRT) scaling to summarize future teacher achievement on the assessment. Proficiency scores in mathematics and mathematics pedagogy content knowledge have been estimated separately for future primary and for future lower-secondary teachers. Furthermore, each future teacher record in the TEDS-M international database contains several scale scores for the opportunities to learn (OTL) and future teacher beliefs scales (see Appendix B of the TEDS-M International Report [Tatto et. al., 2012] for details).

IEA developed the International Database (IDB) Analyzer software (IEA, 2011) specifically for analyzing TEDS-M international data files. This software is designed to support users in the analysis of the TEDS-M data taking into account the sample design and providing estimates of the precision of the results. The IEA IDB Analyzer applies the balanced repeated replication (BRR) method to provide appropriate standard errors for each statistic. It also simplifies management of the TEDS-M database by providing a module for selecting subsets of countries and variables, and merging files for analysis. Chapter 4 of this user guide provides detailed instruction on how to analyze the TEDS-M data using the IEA IDB Analyzer.

1.3.1. Unit of Analysis (Program Grouping)

When analyzing TEDS-M data, users need to carefully take into account the differences in the teacher preparation programs within and across countries, with respect to content and outcome of the programs. Therefore, programs have been grouped to allow for comparison across countries (see Chapter 1.5 of Appendix B of the TEDS-M International Report [Tatto et. al., 2012] for further details). In TEDS-M analysis across countries should therefore always be at this program group level.

The variables TARGETP (for the future primary teacher data) and TARGETS (for the future lower-secondary teacher data) contain information about the grouping of the different teacher education programs for future teachers of mathematics within and across countries. Either one of these two variables should always be used as a grouping variable when comparing data across countries in TEDS-M.

Table 1.2 lists these program groups used in TEDS-M as the unit of analysis.

Table 1.2: TEDS-M Program Groups

Level	Program Group Variable	Program Group Variable Code	Program Group Name
Primary	TARGETP	1	Lower-Primary Generalists (Grade 4 maximum)
		2	Primary Generalists (Grade 6 maximum)
		3	Primary/Lower-Secondary Generalists (Grade 10 maximum)
		4	Primary Mathematics Specialists
Lower Secondary	TARGETS	5	Lower-Secondary (Grade 10 maximum)
		6	Lower & Upper Secondary (to Grade 11 and above)

1.4. Contents of the TEDS-M User Guide for the International Database

The TEDS-M User Guide describes the content and format of the TEDS-M international database. In addition to this introduction the TEDS-M User Guide includes the following chapters:

- **Chapter 2** describes the structure and the content of the TEDS-M international database.
- **Chapter 3** provides information about the sampling weights and variance estimation procedures.
- **Chapter 4** introduces the IEA International Database (IDB) Analyzer software (IEA, 2011) and presents examples of analyses of TEDS-M data using this software in conjunction with SPSS.

The TEDS-M User Guide is accompanied by the following supplements:

- **Supplement 1** comprises the international version of the TEDS-M questionnaires.
- **Supplement 2** describes any adaptations to the questions in the questionnaires made by the TEDS-M participants.
- **Supplement 3** lists all indices and other derived variables created for reporting the TEDS-M questionnaire data.
- **Supplement 4** includes those items of the TEDS-M primary and lower-secondary mathematics and mathematics pedagogy knowledge assessment that have been released to the public.

1.5. Contents of the TEDS-M International Database Package

In addition to the data files from the TEDS-M survey from participating countries, the TEDS-M international database contains supplementary material and documentation supporting users of the international database and providing necessary and complementary information for analysis:

Data:	Institutional program, educator, and future teacher data in SPSS and SAS format
User Guide:	This user guide with supplements
Codebooks:	Codebook files with descriptive information on all variables in the international database files
Almanacs:	Data almanacs with summary statistics for the future teacher knowledge items and contextual questionnaire variables
Programs:	SPSS syntax programs and macros to support analysis

The TEDS-M international database and the IEA IDB Analyzer are available at the IEA study data repository at:

<http://www.iea.nl/data.html>

References

IBM Inc. (2011). *SPSS for Windows* (version 19.0). Chicago, IL: SPSS Inc.

IEA (2011). *International Database Analyzer* (version 2.0). Hamburg, Germany: International Association for the Evaluation of Educational Achievement (IEA) Data Processing and Research Center.

Tatto, M. T. (Ed.) (2012). *Teacher Education and Development Study in Mathematics (TEDS-M): Technical Report*. Amsterdam: IEA .

Tatto, M. T., Schwille, J., Senk, S., Ingvarson, L., Peck, R., & Rowley, G. (2008). *Teacher Education and Development Study in Mathematics (TEDS-M): Conceptual framework*. Amsterdam: IEA.

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M. & Reckase, M. (2012): *Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries. Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam: IEA.

CHAPTER 2

The TEDS-M International Database Files

2.1. Overview

The TEDS-M international database contains future teacher knowledge scores and future teacher, educator, and institutional program contextual data collected in 17 countries. This chapter describes the contents of the database.

The data are made available as separate files for each country and each population (future primary and lower-secondary teachers, and future teacher educators) or level (programs within institutions).

Measures were implemented for the public-use international database to protect the identity of respondents and to maintain the confidentiality of the information for all participating countries (see Chapter 10 of the TEDS-M Technical Report [Tatto, 2012]). Individual country procedures were implemented in compliance with internal regulations.

2.2. TEDS-M Main Data Files

The TEDS-M database includes the actual data from all questionnaires administered to the institutions, educators, and future teachers. These data files also include the knowledge scores estimated for participating future teachers, as well as background variables derived for reporting in the TEDS-M international reports.

This section describes the contents and format of the TEDS-M data files. The data files are provided in SPSS format (.SAV) and SAS export format (.EXP). Data files are provided for each country that participated in TEDS-M. The file names given to the various data file types are shown in Table 2.1. For each file type, a separate data file is provided for each participating country. For example, DIGCHLT1.SAV is an SPSS file that contains Chile's TEDS-M institutional program questionnaire data. All data files and the variables they contain are described in the following sections.

The SPSS files include full dictionary and meta information, i.e. variable name, format (type, width, and decimals), label, value labels, missing values, and the measurement level set (nominal, ordinal, or scale). The dictionary information can be accessed as a list through the SPSS **View** ▾ **Variables** menu or in SPSS output format selecting the **File** ▾ **Display Data File Information** menu.

Table 2.1 TEDS-M Data File Names

File Names	Description
DIG•••T1	Institutional Program Data file
DEG•••T1	Educator Questionnaire Data file
DPG•••T1	Future Primary Teacher Questionnaire Data file
DSG•••T1	Future Lower-Secondary Teacher Questionnaire Data file
DPR•••T1	Reliability Scoring Future Primary Teacher Questionnaire Data file
DSR•••T1	Reliability Scoring Future Lower-Secondary Teacher Questionnaire Data file

••• = 3-character alphanumeric country code based on the ISO 3166 coding scheme (see Table 1.1)

2.2.1. TEDS-M Future Teacher Data Files

The TEDS-M future teacher files consist of both responses to background questions and individual achievement items. Each future teacher questionnaire consists of four different parts. Parts A, B, and D are the same for all future teachers and only Part C – containing the assessment items – is different for future primary and lower-secondary teachers.

Part A: General background

Part B: Opportunity to learn

Part C: Mathematics and mathematics pedagogy content knowledge for teaching; consisting of either items for future primary or lower-secondary teachers

Part D: Beliefs about mathematics and teaching

Future primary teachers who participated in TEDS-M were administered one of five assessment booklets, and future lower-secondary teachers answered one of three assessment booklets. Assessment items were multiple-choice, complex multiple-choice, and constructed-response items. The future teacher data files contain the actual responses to the multiple-choice and complex multiple-choice items and the scores assigned to the constructed-response items.

2.2.2. TEDS-M Teacher Educator Data Files

The educators with regular, repeated responsibility for teaching the future teachers who were sampled for TEDS-M were administered a questionnaire with questions about their background and their teaching practices in the courses they taught to future teachers.

Note that the educator data file cannot and should not be merged with the future teacher data files because there is no direct link between them and samples for both populations were drawn independently. Some of the surveyed educators might never have taught or seen the future teachers who participated in TEDS-M. Merging institutional program and educator data is also not possible. In most countries, some educators teach in more than one program or even institution (see the TEDS-M Technical Report [Tatto, 2012]). For reference, the variable **TPUIDS** in the educator data files lists the programs educators teach in with their program identification number (**IDTPU**).

Chapter 4 of this user guide describes some analyses with educator data using the IEA IDB Analyzer software.

2.2.3. TEDS-M Institutional Program Data Files

The institutional program data files contain program specific responses from institutions to the questions in the TEDS-M institutional program questionnaire. Although institution level analyses with the institutions as the units of analysis can be performed, it is preferable to analyze institution-level variables as attributes of future teachers. To perform future teacher level analyses with institutional data, the institutional program data files must be disaggregated to future teacher level and merged with the future teacher data files using the country and institution identification variables. Details of the merging procedure using the IEA IDB Analyzer are described in Chapter 4 of this user guide.

2.2.4. Knowledge Assessment Items

Survey Items in Part C of the Future Teacher Booklets

The assessment items have been assigned a special nomenclature for identification (e.g., MFC604A1).

- The **first** character represents the study phase. It is “M” for Main Study for all international variables.
- The **second** character, “F”, indicates that the item is located in the future teacher questionnaire.
- The **third** character indicates the part of the questionnaire where the item is located:
 - C: Part C
- The **fourth** character indicates the number of the booklet where the item is located:
 - 1: Booklet PM1 (Future Primary Teacher Booklet 1)
 - 2: Booklet PM2 (Future Primary Teacher Booklet 2)
 - 3: Booklet PM3 (Future Primary Teacher Booklet 3)
 - 4: Booklet PM4 (Future Primary Teacher Booklet 4)
 - 5: Booklet PM5 (Future Primary Teacher Booklet 5)
 - 6: Booklet SM1 (Future Lower-Secondary Teacher Booklet 1)
 - 7: Booklet SM2 (Future Lower-Secondary Teacher Booklet 2)
 - 8: Booklet SM3 (Future Lower-Secondary Teacher Booklet 3)
- The **fifth** and **sixth** characters indicate the number of the item within the booklet.
- The **seventh** character represents the sub-item within the item number (if applicable).
- The **eighth** character indicates the sub-part of the sub-item (if applicable).

Item Response Code Values

A series of conventions were adopted to code the data included in the TEDS-M data files. This section describes these conventions for the knowledge items. The values assigned to each of the knowledge item variables also depend on the item format. For multiple-choice items, numerical values from 1 through 5 are used to correspond to the response options A through E, respectively. For these items, the correct response is included in the codebook file (“MEAS_CLASS” in *.sdb file and “CAT” in *.pdf file).

As a result of psychometric analysis, some derived variables have been added to the future teacher data files that combine two or three items and for which a score has been

assigned depending on the response of the items to be combined. If the single items were multiple-choice, the codes for the derived variables were 2 if all single items were answered correctly (“correct response”) and 1 if at least one of the single items was answered correctly (“partially correct response”).

Each constructed-response item had its own scoring guide that relied on a two-digit scoring scheme to provide diagnostic information. The first digit designated the correctness level of the response: 2 for a two-point response, 1 for a one-point response, and 7 for an incorrect response. The second digit, combined with the first, represented a diagnostic code used to identify specific types of approaches, strategies, or common errors and misconceptions in responding to the item. A second digit of 0 through 5 was used for pre-defined international codes at each correctness level, while a second digit of 9 corresponded to “other” types of responses that fell within the appropriate correctness level, but did not fit any of the pre-defined international codes. A special code, 99, was used for completely blank responses.

Code for Missing Values

Omitted or Invalid Response

The response to a question is coded as omitted when the question was administered but not answered or when an invalid response was given. The following cases are coded as an omitted or invalid response:

- **Question/item non-response:** The question was administered but no response was provided.

The code for “omitted/invalid” responses in SPSS files is “9” or “99” (depending on the field length of the variable). The code for “omitted/invalid” responses in SAS files is “.”.

Not Administered

A response to a question is coded as “not administered” when:

- **Unit non-response:** All variables in not returned or empty questionnaire are coded as “not administered.”
- **Questions or parts not administered:** A country may have chosen not to administer a certain question in their national questionnaire as documented in the national adaptation form (NAF) that lists all agreed-upon deviations from the international version of the questionnaire. The variable(s) corresponding to the left out question are coded as “not administered.”
- **Item left out or misprinted:** If a particular question or item (or maybe a whole page) was misprinted or left out of a questionnaire, or for other reasons was not available for the respondent to answer, the corresponding variable(s) are coded as “not administered.”

The code for “not administered” questions in SPSS files is “SYSMIS” (.). The code for “not administered” questions in the SAS files is “.A”.

Not Reached (Part C of Future Teacher Booklets)

A special missing code was assigned to questions that were deemed “not reached” to further distinguish them from “omitted” responses during item calibration and scoring. “Omitted” questions are those that a respondent most likely read, but either consciously decided not to answer or accidentally skipped; that is, the respondent started answering the questions but stopped answering before the end of the questionnaire, most likely

due to a lack of time. “Not reached” variables are exclusively located towards the end of questionnaire. “Not reached” questions can be seen as a variation or sub-class of omitted questions. To code an item as “not reached” in TEDS-M, the following algorithm was used:

- The last valid answer provided by the respondent in Part C was identified.
- The first omitted response after this last response was coded as “omitted”.
- All following responses until the end of Part C were then coded as “not reached.”
 - For example, in SPSS files the response pattern “1 9 1 2 9 9 9 9 9” (where “9” represents “omitted”) is recoded to “1 9 1 2 9 6 6 6 6 6” (where “6” represents “not reached”).
 - When recoding “omitted” values to “not reached,” all “not administered” values were maintained. For example the pattern “3 1 4 2 9 9 9 . 9 9” would be recoded to “3 1 4 2 9 6 6 . 6 6.”

In SPSS files, “not reached” variables are coded as “6”, “96”, “996”, and so on (depending on the field length of the variable). In SAS data files the code for “not reached” is “.R”.

TEDS-M Knowledge of Mathematics and Mathematics Pedagogy Scores

In TEDS-M, future teachers’ knowledge of mathematics and mathematics pedagogy was assessed. Item Response Theory (IRT) was used to estimate the mathematics content knowledge (variable MCK) and mathematics pedagogy content knowledge (variable MPCK) of future teachers. The MCK and MPCK scale scores were calculated on the logit scale and then standardized to have a mean of 500 and a standard deviation of 100 for equally weighted countries (see Appendix B of the TEDS-M Technical Report (Tatto, 2012) for more information on the scaling procedures).

NOTE: Although standardized to the same mean and standard deviation, the MCK scores for future primary teachers are not comparable to the MCK scores for future lower-secondary teachers as they answered different items according to whether they were expected to become qualified to teach at the primary or lower-secondary level. Thus scaling was done separately for both populations. The same applies to the MPCK scores.

TEDS-M International Benchmarks of Knowledge (Anchor Points)

To help readers interpret scores on these scales, TEDS-M researchers identified key points on the scales, called anchor points. The anchor points do not represent a priori judgments about whether a given scale score is good or bad. Rather, they are descriptions of the performance of future teachers with scores at specific points on the scale. Items at the anchor points were determined by the probability that a person with that score would get the item right. Future teachers with scores at the anchor point 1 are able to provide correct answers to items classified at that point or below with a probability of 0.70 or greater. Hence, sets of such items were used to develop descriptions of what future teachers at (or above) the anchor points were likely to achieve. Items in anchor point 2 were items that future teachers were likely to answer correctly with a probability of less than 0.50. A panel of mathematicians and mathematics educators analyzed the items classified at these anchor points and formulated descriptions of the knowledge of future teachers at each point.

Two anchor points were defined for the primary level MCK scale. Anchor point 1 represents a lower level of MCK and corresponds to a scale score of 431. Anchor point 2 represents a higher level of knowledge corresponding to a scale score of 516. Because of the relatively small number of items measuring mathematics pedagogy content knowledge, only one anchor point was defined at the primary level MPCK scale. It represents a score of 544 on the MPCK scale.

Similarly, two anchor points were selected for the lower-secondary MCK scale. Anchor point 1 represents a lower level of performance and corresponds to a scale score of 490. Anchor point 2 represents a higher level and corresponds to a scale score of 559. As was true for the primary level, because of the relatively small number of items measuring mathematics pedagogy content knowledge, only one anchor point for MPCK was defined at the lower-secondary level. It corresponds to a scale score of 509.

For more details about the development and meaning of the anchor points see Chapter 5 and Appendix B of the TEDS-M International Report (Tatto et al., 2012) and the TEDS-M Technical Report (Tatto, 2012).

2.2.5. Questionnaire Variables

Survey Questionnaire Naming Convention

All variables created to enter the responses in the survey instruments follow naming conventions tailored to the type of survey instrument from which they originate.

Institutional Program

The variables (or questions) in the institutional program questionnaire have been assigned a special nomenclature for identification (e.g., MIB003A2).

- The **first** character represents the study phase; it is “M” for Main Study for all international variables.
- The **second** character indicates the type of questionnaire. “I” stands for the institutional program questionnaire.
- The **third** character indicates the part of the questionnaire. There are Parts A, B, C, D, E, F, G, H, and I.
 - A: Part A: Program Description
 - B: Part B: Future Teacher Background
 - C: Part C: Selection Policies
 - D: Part D: Program Content
 - E: Part E: Field Experience
 - F: Part F: Program Accountability and Standards
 - G: Part G: Staffing
 - H: Part H: Program Resources
 - I: Part I: Reflections on the Program
- The **fourth** to **eighth** characters indicate the number of the question in the questionnaire.

Educators

The variables (or questions) in the educator questionnaire have been assigned a special nomenclature for identification (e.g., MEA003E).

- The **first** character represents the study phase; it is “M” for Main Study for all international variables.
- The **second** character indicates the respondent. The letter “E” is used for educators.
- The **third** character indicates the part of the questionnaire:
 - A: Part A: General and Academic Background
 - B: Part B: Teaching Background
 - C: Part C: Professional Experience
 - D: Part D: Research Experience
 - E: Part E: Field-Based Instruction
 - F: Part F: Opportunities to Learn in Your <Course>
 - G: Part G: Opportunities to Learn (Mathematics and Mathematics <Pedagogy> Educators)
 - H: Part H: Opportunities to Learn (General <Pedagogy> Educators)
 - I: Part I: Opportunities to Learn (All Educators)
 - J: Part J: Coherence of the Teacher Preparation Program (All Educators)
 - K: Part K: Beliefs about Mathematics (All Educators)
 - L: Part L: Preparedness for Teaching Mathematics (All Educators)
- The **fourth** to **eighth** characters indicate the number of the question within the questionnaire.

Future Teachers – Context Questions (Part A, B, and D)

The variables (or questions) in the future teacher questionnaire were assigned a special nomenclature for identification (e.g., MFA004D).

- The **first** character represents the study phase. It is “M” for Main Study for all international variables.
- The **second** character indicates the respondent. The letter “F” is used for future teachers.
- The **third** character indicates the part of the questionnaire:
 - A: Part A: General Background
 - B: Part B: Opportunities to Learn
 - D: Part D: Beliefs about the Nature of Mathematics
- The **fourth** to **eighth** characters indicate the number of the question within the questionnaire.

Survey Questions Response Code Values

There are three different types of questions in the TEDS-M survey questionnaires:

- **Categorical questions:** Numerical values which corresponded to the response options of the question were entered (1st option -1, 2nd option -2,...).
- **Non categorical questions:** The exact values given by the respondents were entered.
- **Open ended text responses:** These responses are not part of the international database and were only used for national purposes.

Codes for Missing Values

Omitted or Invalid Response

The response to a question is coded as omitted when the question was administered but not answered or when an invalid response was given. The following cases are coded as an omitted or invalid response:

- **Question/item non-response:** The question was administered but no response was provided.
- **Uninterpretable/invalid:** The respondent selected more than the expected number of checkboxes or gave an uninterpretable or otherwise invalid response to a question.

The code for “omitted/invalid” responses in SPSS files is “9”, “99”, “999”, and so on (depending on the field length of the variable). The code for “omitted/invalid” responses in SAS files is “.”.

Not Administered

A response to a question is coded as “not administered” when:

- **Unit non-response:** All variables in not returned or empty questionnaire are coded as “not administered.”
- **Questions or parts not administered:** A country may have chosen not to administer a certain question in their national questionnaire as documented in the NAF. The variable(s) corresponding to the left out question is coded as “not administered.”
- **Item left out or misprinted:** If a particular question or item (or maybe a whole page) was misprinted or left out of a questionnaire, or for other reasons was not available for the respondent to answer, the corresponding variable(s) is coded as “not administered.”

The code for “not administered” questions in SPSS files is “SYSMIS” (.). The code for “not administered” questions in the SAS files is “.A”.

Logically Not Applicable (Institutional Program and Educator Questionnaires, Parts A, B, and D of Future Teacher Booklets)

The response to a variable is coded as “logically not applicable” if:

- The previous filter question has been answered in a way that makes a response to the dependent questions logically impossible; in other words the respondent skipped the dependent questions.

“Logically not applicable” responses are coded in the SPSS files as “6”, “96”, “996”, and so on (depending on the field length of the variable). The code for logically not applicable responses in SAS files is “.B”.

2.2.6. Summary Indices and Derived Variables¹

- **MEG2APRA** - Mathematics Education Pedagogy - Assessment Practice
- **MEG2IPRA** - Mathematics Education Pedagogy - Instructional Practice
- **MEH1IMPR** - Teaching For Improving Practice
- **MEH2DVRS** - Teaching For Diversity
- **MEH2REFL** - Teaching For Reflecting On Practice
- **MEI1PART** - Mathematics Education Pedagogy - Class Participation

¹ Details on the calculation and composition of the scales are provided in Supplement 3 of this TEDS-M IDB User Guide. For information about the scaling procedures please refer to the TEDS-M Technical Report (Tatto, 2012).

- **MEI1READ** - Mathematics Education Pedagogy - Class Reading
- **MEI2CLP** - School Experience - Connecting Classroom Learning to Practice
- **MEI3AUSE** - Mathematics Education Pedagogy - Assessment Uses
- **MEI3IPLA** - Mathematics Education Pedagogy - Instructional Planning
- **MEI5SOLV** - Mathematics Education Pedagogy - Solving Problems
- **MEJ1COH** - Program Coherence
- **MEK1RULE** - Nature Of Mathematics As Rules And Procedures
- **MEK1PROC** - Nature Of Mathematics As Process Of Inquiry
- **MEK2TEAC** - Learning Mathematics Through Teacher Direction
- **MEK2ACTV** - Learning Mathematics Through Active Learning
- **MEK3FIXD** - Mathematic Achievement As Fixed Ability
- **MEL1PREP** - Preparedness For Teaching Mathematics
- **MFB1GEOM** - Tertiary Level Mathematics - Geometry
- **MFB1DISC** - Tertiary Level Mathematics - Discrete Structures & Logic
- **MFB1CONT** - Tertiary Level Mathematics – Continuity & Functions
- **MFB1PRST** - Tertiary Level Mathematics – Probability & Statistics
- **MFB2SLMN** - School Level Mathematics – Numbers & Measurement & Geometry
- **MFB2SLMF** - School Level Mathematics – Functions & Probability & Calculus
- **MFB4FOUN** - Mathematics Education Pedagogy - Foundations
- **MFB4INST** - Mathematics Education Pedagogy - Instruction
- **MFB5PART** - Mathematics Education Pedagogy Class Participation
- **MFB5READ** - Mathematics Education Pedagogy - Class Reading
- **MFB5SOLV** - Mathematics Education Pedagogy - Solving Problems
- **MFB6IPRA** - Mathematics Education Pedagogy - Instructional Practice
- **MFB6IPLA** - Mathematics Education Pedagogy - Instructional Planning
- **MFB6AUSE** - Mathematics Education Pedagogy - Assessment Uses
- **MFB6APRA** - Mathematics Education Pedagogy - Assessment Practice
- **MFB7EPSS** - Education Pedagogy - Social Science
- **MFB7EPAP** - Education Pedagogy - Application
- **MFB8DVRS** - Teaching For Diversity
- **MFB8REFL** - Teaching For Reflecting On Practice
- **MFB9IMPR** - Teaching For Improving Practice
- **MFB13CLP** - School Experience - Connecting Classroom Learning to Practice
- **MFB14STR** - Supervising Teacher Reinforcement of University Goals for Practicum
- **MFB14STF** - Supervising Teacher Feedback Quality
- **MFB15COH** - Program Coherence
- **MFD1PROC** - Nature Of Mathematics As Process Of Inquiry
- **MFD1RULE** - Nature Of Mathematics As Rules And Procedures
- **MFD2TEAC** - Learning Mathematics Through Teacher Direction
- **MFD2ACTV** - Learning Mathematics Through Active Learning
- **MFD3FIXD** - Mathematic Achievement As Fixed Ability
- **MFD4PREP** - Preparedness For Teaching Mathematics
- **MFD5QUAL** - Quality Of Instruction
- **MCK** - Mathematics Content Knowledge
- **MPCK** - Mathematics Pedagogy Content Knowledge

2.2.7. Structure and Design Variables in TEDS-M Data Files

Identification Variables

Due to confidentiality reasons the ID variables in the TEDS-M International Database are not connected to the IDs used during data collection preventing the re-identification of individuals.

- **IDCOUNTRY** – This numerical variable indicates the ID code for the respective country based on the ISO-3166 country code standard. Labels for IDCOUNTRY are available in the SPSS export files based on alphanumeric three-letter acronyms and official country names.
- **IDINST** – This is the numerical unique ID of the institution that the teacher preparation unit is linked to.
- **IDTPU** – This is a 4-digit numerical variable that uniquely identifies each participating teacher preparation unit.
- **IDEDU** – The educator ID identifies individual educators.
- **IDFUT** – The future teacher ID uniquely identifies each future teacher in the sample. The future teacher ID is used in all the future teacher data files.
- **IDSCORA/IDSCORR** – The scorer ID variables are used to uniquely identify personnel who scored the constructed-response open-ended items. While IDSCORR available in the scoring reliability files identifies the scorer for the reliability scoring, IDSCORA available in the future teacher data files identifies the scorer for the main scoring. Using these variables permits the identification of systematic errors made by individual scorers.
- **ITEDUGRP** – Group to which the educator belongs
 - **Code 1:** Mathematics and mathematics pedagogy educator
 - **Code 2:** Educator who has both responsibilities (mathematics and mathematics pedagogy as well as general pedagogy)
 - **Code 3:** Pedagogy educator
- **TPUIDS** – This character variable indicates all TPU IDs that a future teacher educator is teaching in and corresponds to the IDTPU values in the DIG file. Multiple values are comma-separated, e.g. “1011,1012.”
- **IDBOOK** – Each future teacher is administered one of five booklets for future primary teachers or one of three booklets for future lower-secondary teachers. This variable identifies the booklet that was administered to each future teacher during the survey session.

Tracking Variables

- **ITPART** – Final participation indicator
- **TARGETP** – Level at which primary graduates qualify to teach.
- **TARGETS** – Level at which lower-secondary graduates qualify to teach.
- **TPULEVEL** – Level of future teacher training.
- **ITLANG** – This variable indicates in which language the questionnaire was administered. This variable has been coded to “1” for all countries having administered the survey in one administration language only.

- **ILRELIAB** – This binary variable indicates whether the future teacher booklet was used for reliability scoring.
 - **Code 0:** Booklet not used for reliability scoring
 - **Code 1:** Booklet used for reliability scoring

Weights (refer to Chapter 3)

- **INSRWI1 to INSRWI32** – BRR replicated weights 1-32 (final institution weight - teacher preparation unit)
- **FINRWI1 to FINRWI32** – BRR replicated weights 1-32 (final teacher preparation unit weight)
- **INSWGTI** – Final institution weight - teacher preparation unit
- **FINWGTI** – Final teacher preparation unit weight
- **INSRWE1 to INSRWE32** – BRR replicated weights 1-32 (final institution weight - educator)
- **FINRWE1 to FINRWE32** – BRR replicated weights 1-32 (final educator weight)
- **INSWGTE** – Final institution weight (educator)
- **FINWGTE** – Final educator weight
- **INSRWP1 to INSRWP32** – BRR replicated weights 1-32 (final institution weight - future primary teacher)
- **FINRWP1 to FINRWP32** – BRR replicated weights 1-32 final future teacher weight (future primary teacher)
- **INSWGTP** – Final institution weight (future primary teacher)
- **FINWGTP** – Final future teacher weight (future primary teacher)
- **INSRWS1 to INSRWS32** – BRR replicated weights 1-32 (final institution weight - future lower-secondary teacher)
- **FINRWS1 to FINRWS32** – BRR replicated weights 1-32 final future teacher weight (future lower-secondary teacher)
- **INSWGTS** – Final institution weight (future lower-secondary teacher)
- **FINWGTS** – Final future teacher weight (future lower-secondary teacher)
- **TPUPROGR** – Program name of teacher preparation unit
- **TPUPNUM** – Program type number
- **TPURNUM** – Route number of teacher preparation unit
- **INTED08** – Indicates if record is part of the international database

2.3. TEDS-M Within-Country Scoring Reliability Data Files

The TEDS-M within-country scoring reliability data files contain data that can be used to investigate the reliability of the TEDS-M constructed-response item scoring. The scoring reliability data files contain one record for each booklet that was double scored during the within-country scoring reliability exercise. For each constructed-response item in the Part C of the future teacher questionnaire, the following three variables are included in the scoring reliability data files:

- **Original score:** two-digit score assigned by the first scorer
- **Second score:** two-digit score assigned by the second scorer
- **Score agreement:** degree of agreement between the two scorers

It should be noted that the second score data were used only to evaluate within-country scoring reliability and were not used in computing the achievement scores included in the database and presented in the international reports.

2.3.1. Scoring Reliability Variable Naming Convention

The variable names for the original score, second score, and score agreement variables are based on the same naming convention as for the achievement item variables shown earlier. The first character in the variable name differentiates between the three reliability variables:

- The original score variable has the letter “M” as the first character, in accordance with the achievement item naming convention (e.g., MFC105B)
- The second score variable has the letter “R” as the first character (e.g., RFC105B)
- The score agreement variable has the letter “I” as the first character (e.g., IFC105B).

2.3.2. Scoring Reliability Variable Score Values

The values contained in both the original score and second score variables are the two-digit diagnostic codes assigned using the TEDS-M scoring guides. The score agreement variable may have one of three values, depending on the degree of agreement between the two scorers.

- **Code 0:** Identical codes (both digits in the original and second scores)
- **Code 1:** Identical score levels, but different diagnostic codes (first digit of both scores are the same; second digits are different)
- **Code 2:** Different score levels (first digit of both scores are different)

2.4. TEDS-M Codebook Files

All information related to the structure of the TEDS-M data files, as well as the source, format, descriptive labels, and response option codes for all variables is contained in the codebook files. Each data file type in the database is accompanied by a codebook file. The codebooks are provided in *.sdb (structural database) and *.pdf format.

2.4.1. dBase Format (*.SDB)

These dBase style files contain the information from the codebook as provided to the NRCs for data entry with the IEA Windows Data Entry Manager (WinDEM) software. After data processing, all added or changed variables are reflected in these final codebooks. This format can be read for instance with dBase, MS Access, or WinDEM. The abbreviation SDB stands for Structural Data Base.

The following final main study codebook files are included in the TEDS-M international database:

- **DIGTEDT1.SDB:** Institutional program codebook file
- **DEGTEDT1.SDB:** Educator questionnaire codebook file
- **DPGTEDT1.SDB:** Future primary teacher codebook file
- **DPRTEDT1.SDB:** Future primary teacher reliability codebook file
- **DSGTEDT1.SDB:** Future lower-secondary teacher codebook file
- **DSRTEDT1.SDB:** Future lower-secondary teacher reliability codebook file

2.4.2. Portable Document Format (*.PDF)

The portable document format (PDF) is a file containing the information from the codebook in a printout format. This format can be read with the freely available Acrobat Reader® or other PDF viewers. The information for each variable is presented in several lines of text. The lines for each variable are properly labeled.

The following codebook files are provided:

- **DIGTEDT1.PDF:** Institutional program codebook file
- **DEGTEDT1.PDF:** Educator questionnaire codebook file
- **DPGTEDT1.PDF:** Future primary teachers codebook file
- **DPRTEDT1.PDF:** Future primary teacher reliability codebook file
- **DSGTEDT1.PDF:** Future lower-secondary teachers codebook file
- **DSRTEDT1.PDF:** Future lower-secondary teacher reliability codebook file

2.5. TEDS-M Data Almanac Files

The almanacs provide weighted summary statistics for each program group and the participating country where programs exist in that group on each individual item included in the TEDS-M assessments. There are separate almanacs for assessment items and questions, which are further separated by file type. There are a total of six files:

- TEDS-M_ItemAlmanac_DPG.pdf
- TEDS-M_ItemAlmanac_DSG.pdf
- TEDS-M_QuestionAlmanac_DIG.pdf
- TEDS-M_QuestionAlmanac_DEG.pdf
- TEDS-M_QuestionAlmanac_DPG.pdf
- TEDS-M_QuestionAlmanac_DSG.pdf

The almanacs also display the international averages for each item within a program group, with each applicable country weighted equally.

2.5.1. TEDS-M Knowledge Data Almanac Files

The knowledge data almanacs display the content and cognitive domains of each item, the item block it belongs to, a brief description of the item, its variable name, whether it is a multiple-choice or constructed-response item type, and the correct response key if it is a multiple-choice item.

There are two types of displays in the achievement data almanacs, depending on whether an item is a multiple-choice item or a constructed-response item. The statistics displayed in these almanacs are as follows:

- **N:** The number of future teachers to whom the survey was administered.
- **Valid N:** The number of future teachers to whom the survey was administered minus the number of future teachers to whom the specific item was not administered.
- **DIFF:** Percentage of future teachers who responded correctly to a multiple-choice item.
- **1–4:** The percentage of future teachers choosing each one of the response options of a multiple-choice item (up to 4 response options).
- **Scoring Guide Codes (10, 11, 21, 22, 70, 71, etc.):** The percentage of future teacher responses assigned to each of the codes in the scoring guide for a constructed-response item.

- **OMITTED:** The percentage of future teachers who omitted to respond to the item.
- **NOT REACHED:** The percentage of future teachers who did not reach the item (i.e., they did not proceed to the item because the session time was over).
- **V1, V2:** The percentage of future teachers who scored 1 point (V1) or 2 points (V2) on the item.

2.5.2. TEDS-M Question Data Almanac Files

The question data almanacs display the distribution of responses per country to each of the questions, separate by program group.

- **N:** The number of future teachers to whom the survey was administered.
- **Valid N:** The number of future teachers to whom the survey was administered minus the number of future teachers to whom the specific question was not administered.
- **MEAN, STDDEV, MODE:** These columns correspond to the mean, standard deviation, and mode of the distribution of responses to the question. If the variable has multiple modes, the cell reads “.”.
- **MIN, P5, P10, Q1, MEDIAN, Q3, P90, P95, MAX:** In case of a non-categorical question, information on the variable values at certain points of the distribution is presented. The columns correspond to the minimum point, the 5th, 10th, 25th, 50th, 75th, 90th, 95th percentiles, and the maximum point in the distribution of responses.
- **[CATEGORIES - VALUE LABELS]:** For categorical questions, the percentages of respondents per category are shown. The column headers display the value label of all possible answer categories in the order of the values assigned to the categories.
- **NOT APPLICABLE:** The percentage of observations with “logically not applicable” codes.
- **NOT ADMINISTERED:** The percentage of observations with “not administered” codes.
- **OMITTED:** The percentage of observations with “omitted” codes.

2.6. TEDS-M Syntax Files

The TEDS-M International Database contains SPSS syntax files to perform variable recodes required for the proper execution of example analyses using the IEA IDB Analyzer. They are described in Chapter 4 of this TEDS-M IDB User Guide. In addition, the file **SYNTAX_for_International_Report_OTL_Data.sps** and its accompanying **README** text file provide syntax and instructions to recode the OTL data according to the results reported in the TEDS-M International Report (Tatto et al., 2012). All these SPSS programs are part of the TEDS-M International Database available on the IEA Study Data Repository webpage at <http://rms.iaa-dpc.org/>.

References

Tatto, M. T. (Ed.) (2012): *Teacher Education and Development Study in Mathematics (TEDS-M): Technical Report*. Amsterdam: IEA.

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M. & Reckase, M. (2012): *Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries. Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam: IEA.

CHAPTER 3

Sampling Weights and Variance Estimation in TEDS-M

3.1. Sampling Weights

3.1.1. Why Weights are Needed

The TEDS-M study includes populations of future primary and secondary school mathematics teachers within the participating countries, their educators, and their institutions. The data comprised in the international database are obtained from random representative samples or censuses of these populations.¹ The estimation weights reflect the complex sample designs that were applied in this study. Estimation weights have to be used for data analysis in order to obtain design-unbiased estimates of population features, instead of merely reflecting sample data (Lohr, 1999).

Estimation weights reflect and compensate the different selection probabilities and the different non-response patterns at the various sampling stages. All base weights and non-response adjustment factors were computed separately for each of the four target populations and result in four different final (or “estimation”) weights.

Response units with small selection probabilities received large weights, and, conversely, response units with large selection probabilities received small weights. To give an example, in countries where all institutions were asked to take part, the selection probability at this first sampling stage was equal to one. Then, within the small institutions, all future teachers were asked to participate. Thus, the selection probability at this second sampling stage was again one. In large institutions however, only 30 future teachers were sampled. Therefore, these individuals had selection probabilities below one. This fact is accounted for by assigning larger weights to future teachers in larger institutions. In more specific terms, the base weight is calculated as the inverse of the selection probability.

Given that in some sampled institutions, future teachers and educators refused or were unable to participate in the study, it was necessary to adjust the base weights to compensate for the sample size loss. Thus, the base weights were multiplied by non-response adjustments. The final (estimation) weights are the product of all weight and adjustment factors. They display how many units in the population are represented by each participating unit. Consequently, the overall sum of the final weights of all respondents is an estimation of the size of the corresponding population. Weighting each respondent by its final weight in all analyses ensures that the respondent contributes to the analyses in accordance with the number of units in the population it represents.

Details about the general sampling design are reported in Chapter 7 of the TEDS-M Technical Report (Dumais & Meinck, in Totto [2012 a]). Details about national implementation can be found in the Appendix entitled *Characteristics of National*

¹ Even in the cases where full censuses of the respective populations were intended, not all sampled institutions or targeted individuals agreed to participate in the survey. Further, as a basis for scientific generalization, censuses can be seen as random samples from superpopulations. The concept of superpopulations was first described by Deming & Stephan (1941), and is applied in all IEA surveys.

Samples: Implementation of the International Sampling Design in Participating Countries of the TEDS-M Technical Report (Meinck & Dumais, in Tatto [2012]). All procedures to calculate weights are explained in Chapter 11 of the TEDS-M Technical Report (Dumais & Meinck, in Tatto [2012 b]).

3.1.2. Selecting the Appropriate Weight Variable

Each database is supplied with the appropriate set of weights.

- For analyses of the institutional program questionnaire (institutional program files, DIG), the final teacher preparation unit² (TPU) weight FINWGTI must be used.
- For analyses of the educator questionnaire (educator file, DEG), the final educator weight FINWGTE must be used.
- For analyses of data collected from future primary teachers (DPG file), the final future teacher weight (primary) FINWGTP must be used.
- For analyses of data collected from future lower-secondary³ teachers (DSG file), the final future teacher weight (secondary) FINWGTS must be used.

Moreover, each file type (DIG, DEG, DPG, and DSG) will contain a final institution weight (INSWGTI, INSWGTE, INSWGTP, and INSWGTS). For a given institution, this final institution weight may differ between the different file types. This difference is due to the fact that an institution can count as having participated in, say, the survey of future primary teachers, but not in the survey of educators. In such cases, non-response adjustments at the institutional level differ with the surveyed population. The final institution weight has to be applied if a file is aggregated by institution (or by TPU in the case of the two future teacher populations) for further analysis.

If researchers plan to analyze data from more than one target population, they must carefully choose the correct weight.

- Analyzing combined data from future primary (or lower-secondary) teachers and data from the institutional program files is straightforward with the IEA IDB Analyzer (see Chapter 4 of this user guide). The software can be used to easily add program level data to future teacher data. In this way, program information becomes an attribute of future teachers, and the user can analyze information from both files. For example, the research question could be of the type: “What percentage of future primary teachers attends programs with a particular attribute?” FINWGTP must be used for this type of data analysis. The use of FINWGTI is inappropriate in this case and the IEA IDB Analyzer automatically chooses the correct weight.
- If future teacher information is regarded as an attribute of the program information, for example, the research questions could state: “What percentage of programs with a particular characteristic contain no/any/mostly/only future teachers with a particular characteristic?” This analysis cannot be performed with the IEA IDB Analyzer. The researcher must use other software (e.g., SPSS, SAS) first to aggregate the future teacher data and then to merge the future teacher information to the institutional program file. When statements are made about programs that have aggregated future teacher information attached, FINWGTI must be used.

² Institutions were separated by the different programs they offered. For the sake of clarity, these programs were referred to as teacher preparation units (TPU). All in-scope future teachers were allocated to exactly one TPU within their institutions. See Dumais & Meinck (in Tatto, 2012) for more information.

³ Note that some surveyed future teachers were aiming for a certificate to teach lower-secondary and upper secondary students (see program grouping in Chapter 1.3.1).

- If educator information is regarded as an attribute of the program information, for example, the research questions could state: “What percentage of programs with a particular characteristic employ no/any/mostly/only educators with a particular characteristic?” This analysis also cannot be performed with the IEA IDB Analyzer. The researcher must use other software (e.g., SPSS, SAS) first to aggregate the educator data⁴ and then to merge the educator information to the institutional program file. When statements are made about programs that have aggregated educator information attached, FINWGTI must be used.

It should be noted that any annotation referring to either of the combined populations will then also apply to the combined file. Furthermore, potential instances of missing data due to the combination of two file types may jeopardize the validity of any results.

It is neither possible nor meaningful to combine other file types for various reasons.

- Future primary teacher files cannot be combined with future lower-secondary teacher files because:
 - The future teachers constitute two separate target populations and received different assessments;
 - The two populations partially or fully overlap in some participating countries⁵, and the final weights account for this overlap. Combining the two files would lead to a severe overestimation of the total population size of future primary and lower-secondary teachers in the particular countries, as well as introduce bias into any other estimates obtained from such a combined file.
- Future teacher files cannot be combined with educator files because educators and future teachers are neither conceptually nor organizationally linked to each other. In fact, educators participating in the survey may never have taught the participating future teachers.

3.1.3. Example for Analyzing Weighted Data

Not using weights in data analysis can lead to severely biased results. The following example illustrates the importance of using weights in research with TEDS-M data.

A researcher may be interested in finding out whether there were any circumstances that hindered future teachers during their teacher preparation program. For example, consider primary mathematics specialists (DPG file, variable TARGETP = 4) in Germany. The analysis variables are MFA012A, MFA012B, and MFA012C. The results of this analysis, using unweighted vs. weighted data, are displayed in Table 3.1. Let us focus on the variable MFA012A. Neglecting the different selection probabilities, one might think that almost every third future teacher in the population of interest had family responsibilities (29.8%), while in actual fact, this is only the case for about every fifth student (18.7%) once the selection probabilities are taken into account and the data are weighted.

⁴ Aggregating educator information to the program level is not straightforward. An educator could teach in different programs in a given institution. The string variable TPUIDS in the educator file contains all program identification numbers (the corresponding identification number in the institutional program file is IDTPU), separated by commas, for any program an educator stated he or she taught during the survey administration period.

⁵ Chile, Germany, Norway, Poland, Thailand, United States.

Table 3.1: Example of Incorrect (Unweighted) and Correct (Weighted) Analyses

Variable		Unweighted, % (Biased Estimate)	Weighted, % (Unbiased Estimate)
MFA012A	Yes	29.8	18.7
"Had family responsibilities that made it difficult to do my best"	No	70.2	81.3
MFA012B	Yes	18.3	23.3
"Had to borrow money"	No	81.7	76.7
MFA012C	Yes	51.1	45.5
"Had to work at a job"	No	48.9	54.5

3.2. Variance Estimation

3.2.1. Why Variance Estimation is Needed

All estimates, statements, and inferences in TEDS-M are based on data derived from random samples. Randomness is naturally associated with a certain risk of "error". The sampling variance (or the sampling error as the square root of the sampling variance) is a measure of the uncertainty due to random sampling. Every generalization made from a sample should be reported along with its sampling error in order to make the reader aware of the precision of the result.

Due to the complex sampling design applied in TEDS-M, it is not possible to correctly calculate sampling errors or to perform significance tests that yield correct results with standard procedures available in software packages such as SPSS. These programs assume that the data are derived from simple random samples. But this is not the case for TEDS-M data. Instead, various sampling designs were applied in participating countries (see Meinck & Dumais, in Tatto [2012], for more information). Some countries implemented multistage stratified sample designs. Such sampling designs, being convenient and cost-effective on the one hand, are known to be less efficient in terms of precision, on the other hand (Kish, 1987). In other words, compared to a simple random sample with equal sample size, the sampling variance in cluster samples tends to be higher. In other countries however, stratified simple random samples were selected. In these cases, the precision of the estimates can be even higher compared to a simple random sampling design. This is the case if the stratification variables are correlated with the variables of interest.

A variance estimation method called "balanced repeated replication" (BRR), more specifically Fay's variation of BRR (Fay, 1989; Judkins, 1990; Lohr, 1999), needs to be applied when estimating variances of TEDS-M data. This method takes into account the complexity of the sample designs and will deliver (approximately) design-unbiased variance estimates (Wolter, 1985). The international database contains variables that allow for the use of this variance estimation method. These variables are referred to as BRR replicate weights. The BRR technique has been implemented in the IEA IDB Analyzer software (IEA, 2010). This method of variance estimation is also recognized by other software packages.⁶ For details about the BRR technique used for TEDS-M,

⁶ WesVar (Westat Inc., 2008), SAS 9.2 (SAS Institute Inc., 2008), SUDAAN 10 (RTI, 2008), and Stata 10 (StataCorp LP, 2009)

i.e. how replicate weights were computed, how the sampling variance was computed, and how estimates can be compared, please refer to Chapter 11 of the Technical Report (Dumais & Meinck, in Tatto [2012 b]).

3.2.2. Selecting the Appropriate Variance Estimation Variables

The procedure to select the appropriate variance estimation variables follows.

A set of replicate weights were calculated

- Separately for each participating country and each target population;
- Separately for both final weights (final population and final institution weight, see Section 3.2).

Thirty-two replicate weights per set were calculated, and form part of the data files; these replicate weights must be used for variance estimation. The “zone” and “replicate” markers which users of other large-scale surveys may be expecting are not required for the TEDS-M international database.

- For analyses of the institutional program questionnaire (institutional program files, DIG), the replicate weights FINRWI1 to FINRWI32 must be used.
- For analyses of the educator questionnaire (educator file, DEG), the replicate weights FINRWE1 to FINRWE32 must be used.
- For analyses of data collected from future primary teachers (DPG file), the replicate weights FINRWP1 to FINRWP32 must be used.
- For analyses of data collected from future lower-secondary teachers (DSG file), the replicate weights FINRWS1 to FINRWS32 must be used.

The IEA IDB Analyzer makes use of these replicate weights for variance estimation by default.

If data is aggregated by institution (or by TPU in case of the two future teacher populations) and will be used in this format for further analysis, the replicate weights corresponding to the respective final institution weight must be applied. They are labeled as follows:

- Institutional program files (DIG): INSRWI1 to INSRWI32
- Educator files (DEG): INSRWE1 to INSRWE32
- Future primary teachers files (DPG): INSRWP1 to INSRWP32
- Future lower-secondary teachers files (DSG): INSRWS1 to INSRWS32.

Consequently, each file contains 64 replicate weight variables in total.

3.2.3. Example for Variance Estimation

Failing to apply the BRR method may lead to severe bias in the estimation of sampling error. In the following example, sampling error estimates incorrectly assuming simple random sampling are compared with sampling error estimates that correctly consider the complex sample design through the use of BRR. The differences should illustrate the importance of using the correct variance estimation method for any analysis.

For instance researchers might be interested in the average mathematics content knowledge (variable MCK) of lower-primary generalist teachers. Table 3.2 presents the results for three countries. The difference between the correct (unbiased) and the incorrect (biased) estimate is rather small in Georgia and Switzerland – these two

countries conducted censuses of institutions and applied simple random sampling within institutions for this particular future teacher cohort. However, the unbiased sampling error estimate for Russia is five times as large as the biased one because Russia selected a clustered sample. The main reason for the increased sampling error is the fact that future teachers belonging to the same institution are more likely to have similar mathematics content knowledge than future teachers from different institutions. This effect is taken into account when applying BRR for variance estimation.

Table 3.2: Example of Incorrect and Correct Variance Estimation

MCK (Mathematics Content Knowledge) Lower-Primary Generalists (Grade 4 maximum)	Mean (Weighted)	S.E. (Mean) (Biased Estimate, Assumption: SRS Sampling)	S.E. (Mean) (Unbiased Estimate Derived from BRR)
Georgia	344.7	3.80	3.85
Switzerland	512.2	5.76	6.43
Russia	535.5	1.92	9.89

One may also be interested in cross-country comparisons. It can be seen that the performance of lower-primary generalists in Georgia is lower than the corresponding performance in Switzerland or Russia. However, quite a substantial difference in the variable of interest seems to exist also between Switzerland and Russia (23.3 points). The t-test, performed in SPSS (computing the sampling error of the difference between the two means under the [incorrect] assumption of SRS), gives the incorrect result that there is a statistically significant difference ($p=0.2\%$)⁷. If the estimates are compared accounting for designs and weights, then there is no statistically significant difference ($p=5\%$).

⁷ More precisely, 99.8% of all possible samples would also detect a difference between the two countries.

References

- Deming, W. E. & Stephan, F. F. (1941). On the interpretation of censuses as samples. *Journal of the American Statistical Association*, 36, 45–49.
- Dumais, J. & Meinck, S. (2012 a). Sampling design. In M. T. Tatto (Ed.), *Teacher Education and Development Study in Mathematics (TEDS-M): Technical Report*. East Lansing, MI: Teacher Education and Development International Study Center, College of Education, Michigan State University.
- Dumais, J. & Meinck, S. (2012 b). Estimation weights, participation rates, and sampling error. In M. T. Tatto (Ed.), *Teacher Education and Development Study in Mathematics (TEDS-M): Technical Report*. Amsterdam: IEA.
- IEA (2011). *International Database Analyzer (version 2.0)*. Hamburg, Germany: International Association for the Evaluation of Educational Achievement (IEA) Data Processing and Research Center.
- Kish, L. (1987). *Statistical design for research*. New York: John Wiley & Sons.
- Lohr, S. (1999). *Sampling: Design and analysis*. New York: Duxbury Press.
- Meinck, S. & Dumais, J. (2012). Characteristics of national samples: Implementation of the international sampling design in participating countries, Appendix. In M. T. Tatto (Ed.), *Teacher Education and Development Study in Mathematics (TEDS-M): Technical Report*. Amsterdam: IEA.
- RTI (2008), *SUDAAN 10*, Computer software. Research Triangle Park, NC: Research Triangle Institute.
- SAS Institute Inc. (2008), *SAS 9.2*. Computer software. Cary, NC: SAS Institute Inc.
- StataCorp LP (2009), *Stata 10*. College Station, TX: StataCorp LP.
- Westat Inc. (2008), *WesVar (version 5.1)*. Replication-Based Variance Estimation for Analysis of Complex Survey Data. Computer software. Rockville, MD: Westat Inc., http://www.westat.com/westat/statistical_software/wesvar/index.cfm.
- Wolter, K.M. (1985), *Introduction to Variance Estimation*, New York: Springer-Verlag.

CHAPTER 4

Using the IEA IDB Analyzer to Analyze the TEDS-M International Database

4.1. Overview

This chapter describes the use of the IEA International Database (IDB) Analyzer software (IEA, 2011) for analyzing the TEDS-M international data files. Example analyses will illustrate the capabilities of the IEA IDB Analyzer to compute a variety of statistics, including percentages of future teachers in specified subgroups, average mathematics content knowledge in these subgroups, as well as correlations and regression coefficients. The examples use data from the future teacher, educator, and institutional program questionnaires to replicate some of the TEDS-M results included in the TEDS-M International Report (Tatto et al., 2012), as well as other useful analyses for investigating policy-relevant research questions.

The IEA IDB Analyzer uses the SPSS data files as well as the SPSS syntax files (Syntax_MFA002.SPS and Recode_MIC002B.SPS) that are printed in the corresponding section to recode variables used in an example regression analysis presented later in this chapter.

4.2. The IEA IDB Analyzer

Developed by the IEA Data Processing and Research Center (IEA DPC), the IEA IDB Analyzer software uses the Statistical Package for the Social Sciences (SPSS, 2011) as an engine for statistical computations. The IEA IDB Analyzer enables users to combine SPSS data files from IEA's large-scale assessments and conduct analyses using SPSS without actually writing programming code. The IEA IDB Analyzer generates SPSS syntax that takes into account information from the sampling design for the computation of statistics and their standard errors.

The IEA IDB Analyzer consists of two modules—the merge module and the analysis module, which are executed as independent applications. The merge module is used to create datasets for analysis by combining data files of different types and from different countries, and selecting subsets of variables for analysis. The analysis module provides procedures for computing various statistics and their standard errors for variables of interest. These procedures can be applied for a country and for specific subgroups within a country. Both modules can be accessed through the START menu in Windows:

Start ⇨ All Programs ⇨ IEA ⇨ IDB Analyzer ⇨ Merge Module / Analysis Module

4.3. Merging Files with the IEA IDB Analyzer

The TEDS-M data files are stored in the database separately for each country and by file type as described in Chapter 2. In addition to allowing users to combine datasets from similar respondent populations from more than one country for cross-country analyses, the merge module allows for the combination of data from different sources. However, due to the study design, the IEA IDB Analyzer supports only two combinations of TEDS-M data files – institutional program data and future primary teacher data (DIG and DPG), and institutional program data and future lower-secondary teacher (DIG

and DSG) data files. Other combinations of the TEDS-M file types would violate the study design and are thus not supported by the IEA IDB Analyzer. Future teacher data cannot be merged with educator data directly, because there is no direct link between the two. Both populations were sampled independently of each other. Even if educators were from the same institutions, some might never have taught the future teachers who were surveyed. Merging institutional program and educator data is also not possible with the IEA IDB Analyzer. In most countries, some educators teach in more than one program or even institution (see Tatto et al., 2012). For reference, the variable **TPUIDS** in the educator data files lists the programs educators teach in with their program identification number (**IDTPU**).

4.3.1. Merging Future Primary or Lower-Secondary Teacher and Institutional Program Data

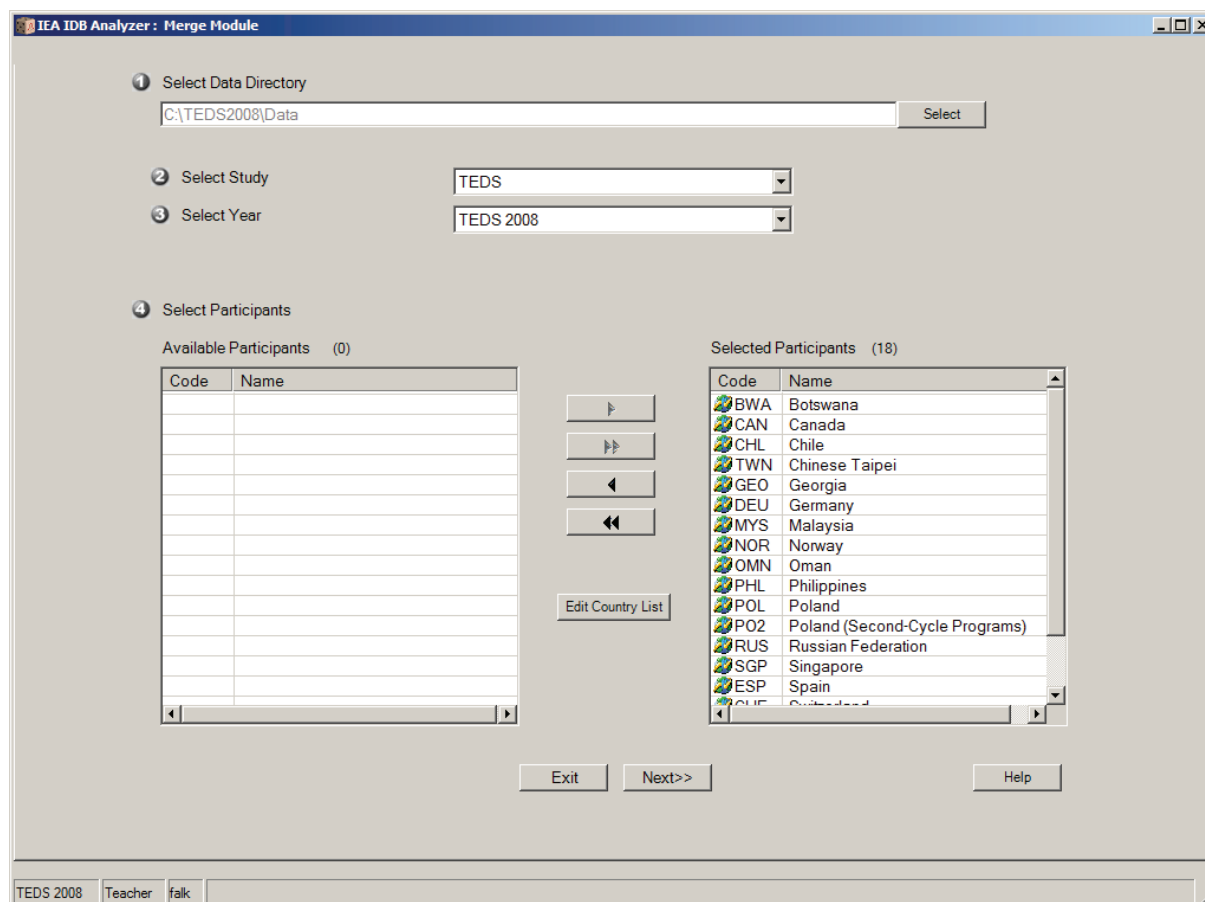
This IDB user guide includes a detailed description of the procedure for merging future teacher and institutional program data files only. As explained above, the future teacher and program data represent the single straightforward merge of data from different levels in TEDS-M.

For the examples that follow all countries participating in TEDS-M will be merged and included in the analysis. Data from Norway does not permit national-level analyses, however. Norwegian program types are reported separately because the populations partly overlap and therefore data from these program types cannot be aggregated. This is why in all analysis outputs Norway will appear as Norway (ALU), Norway (ALU +), and Norway (PPU & MASTERS) for each of the different program types available.

The following steps will create an SPSS data file with data from multiple countries and multiple file types. In this example we will merge future primary teacher data with institutional program data. Merging the future lower-secondary teacher data with institutional program data follows the same logic.

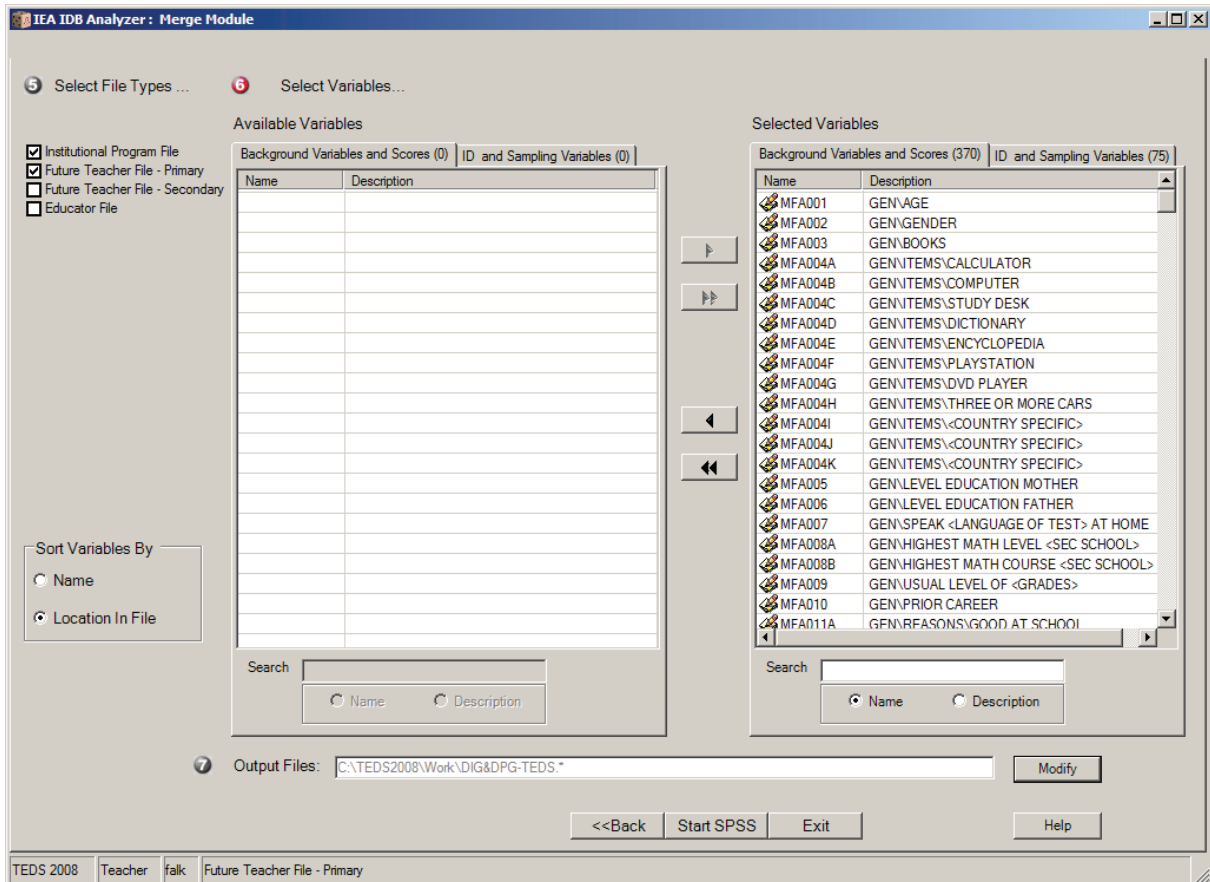
- 1) Open the Merge Module of the IEA IDB Analyzer.
- 2) In the **Select Data Directory** field, browse to the folder where all SPSS data files are located. For example, in Figure 4.1, all SPSS data files are located in the “C:\TEDS2008\Data” folder. The program will automatically recognize and complete the **Study Type** and **Survey Type** fields and list all countries available in this folder as possible candidates for merging. If the folder contains data from more than one IEA study, or from more than one population and cycle, the IEA IDB Analyzer will prompt users to select files from the desired study and population for analyses. In Figure 4.1, the TEDS-M study is selected.
- 3) Select the countries of interest from the **Available Participants** list. To select multiple countries, hold the CTRL key of the keyboard when selecting the countries and then press the single-arrow button (▶) to move them in the **Selected Participants** list on the right. In the current example all countries participating in TEDS-M are selected for merging. Simply press the double-arrow button (▶▶) to select all available data. Figure 4.1 shows the IEA IDB Analyzer screen after selecting all countries for merging.

Figure 4.1 IEA IDB Analyzer Merge Module: Selecting Countries



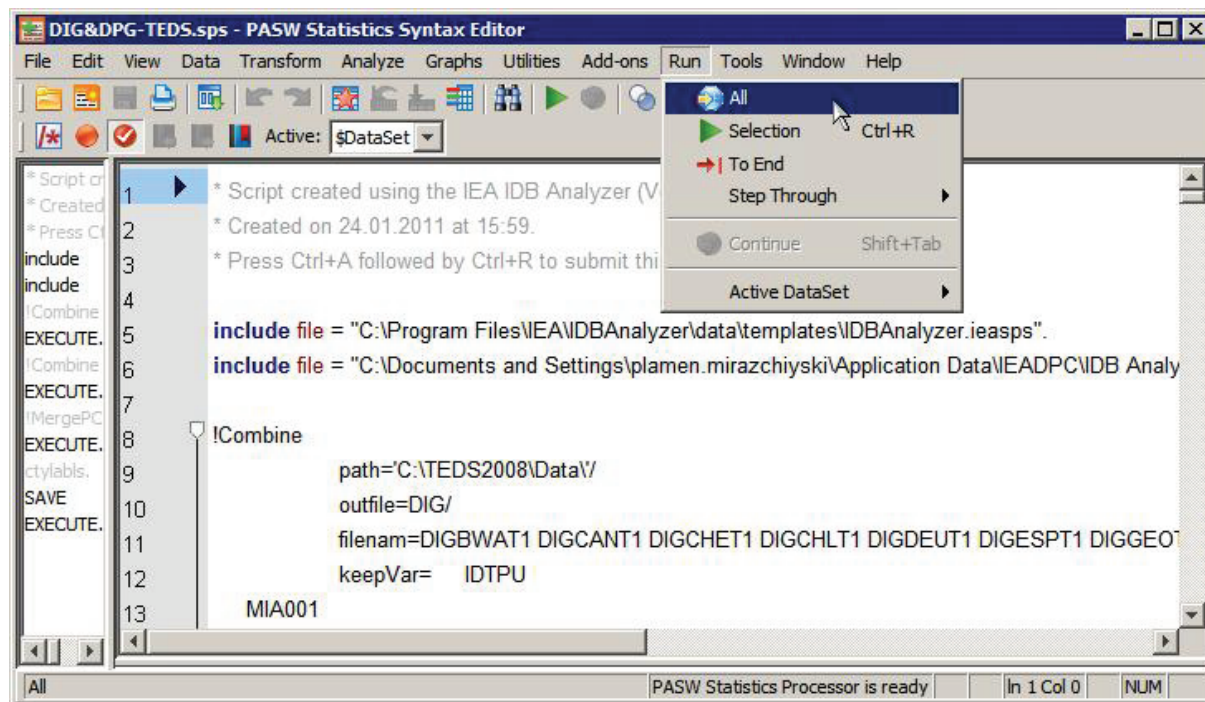
- 4) Press the **Next>>** button to proceed. The software will open the second window of the merge module, as shown in Figure 4.2, to select the file types and the variables to be included in the merged data file.
- 5) **Select the File Types** (in this case the **Future Teacher File — Primary** and the **Institutional Program File**) for merging by checking the appropriate boxes to the left of the window.
- 6) For each file type, select the desired variables from the list of background variables available in the left panel. You can select and move separate variables from the **Available Variables** to the **Selected Variables** list by holding the control key, pressing the left mouse button, and then clicking the arrow button (▶). If you want to select all variables and move them to the **Selected Variables** list, use the double-arrow key (▶▶). In our example we will select all variables from both the **Institutional Program File** and the **Future Teacher File — Primary** for merging. Please note that all identification and sampling variables are selected automatically by the IEA IDB Analyzer.
- 7) Specify the desired name of the merged data file and the folder where it will be stored in the **Output Files** field. The IEA IDB Analyzer will create an SPSS syntax file (*.SPS) with the same name and in the same folder with the code necessary to perform the merge. In the example shown in Figure 4.2, the syntax file DIG&DPG-TEDS.SPS and the merged file DIG&DPG-TEDS.SAV will both be stored in the “C:\TEDS2008\Work” folder after running the syntax. The merged data file will contain both future primary teacher and institutional program data with the variables shown in the “Selected Variables” panel to the right.

Figure 4.2 IEA IDB Analyzer Merge Module: Selecting File Types and Variables



- 8) Click on the **Start SPSS** button. The IEA IDB Analyzer will show a warning before overwriting an existing file with the same name in the specified folder. The IEA IDB Analyzer creates the SPSS syntax file with the specified name, stores it in the specified folder, and opens it in an SPSS syntax window ready for execution. The syntax file must be executed by opening the **Run** menu of SPSS and selecting the **All** menu option as shown on Figure 4.3.

Figure 4.3 IEA IDB Analyzer Merge Module: Run SPSS Script for Merging Data



Be sure to check the resulting SPSS output file for possible warnings. If warnings appear, check them carefully as they might indicate that the merge process was not performed properly and the resulting merged data file might not have been created as expected.

4.3.2. Merging Data Files for the Examples

To carry out the analysis examples that follow in this chapter, the following merged data files should be created with all available background variables and scores included:

DIG&DPG-TEDS.SAV Merge the institutional program (DIG) and future primary teacher (DPG) data files from all countries

DEG-TEDS.SAV Merge the educator (DEG) data files from all countries

4.4. Performing Analysis with the IEA IDB Analyzer

The analysis module of the IEA IDB Analyzer can be used to analyze any data files of the TEDS-M international database and all files created with the IEA IDB Analyzer merge module. For TEDS-M data the IEA IDB Analyzer analysis module can perform the following statistical procedures:

Percentages and Means

Computes percentages, means, and standard deviations for selected variables by subgroups defined by grouping variable(s)

Percentages Only

Computes percentages by subgroups defined by grouping variable(s)

Regression

Computes regression coefficients for selected variables to predict a dependent variable by subgroups defined by grouping variable(s)

Correlations

Computes means, standard deviations, and correlation coefficients for selected variables by subgroups defined by grouping variable(s)

All statistical procedures offered within the analysis module of the IEA IDB Analyzer make use of appropriate sampling weights. Standard errors are computed using the balanced repeated replication (BRR) with Fay's modification for estimation of the variances (see Chapter 3 for more details). The **Percentages and Means, Regression, and Correlations** procedures can be performed either with background variables or knowledge scores. Knowledge scores are Rasch scores produced using Item Response Theory. See the TEDS-M Technical Report (Tatto, 2012) for details about the scaling procedures.

To identify the variables for analysis the reader is advised to look either into the codebooks provided along with the data or in the questionnaires and released knowledge items contained in Supplements 1 and 4 respectively in this guide.

For TEDS-M data the IEA IDB Analyzer requires the selection of the following variables, depending on the statistical procedure selected:

Grouping Variables

This is a list of variables to define subgroups. The list must consist of at least one grouping variable. By default, the IEA IDB Analyzer includes IDCNTRY. Because of the design of TEDS-M results regarding future teachers should be reported at the program group level only. Hence, the program group variable (TARGETP for future primary teacher data and TARGETS for future lower-secondary teacher data) should always be selected as a **Grouping Variable** in addition to the country identifier IDCNTRY. Additional variables may be selected from the available list. If the **Exclude Missing from Analysis** option is checked, only cases that have non-missing values in the grouping variables will be included in the analysis.

Analysis Variables

This is a list of variables for which means or percentages are to be computed, or the independent variables of a regression analysis. More than one analysis variable can be selected.

Dependent Variable

This is the variable to be used as the dependent variable of a regression analysis. Only one dependent variable can be listed. Dependent variables can be either contextual variables or knowledge scores.

Weight Variable

This variable accounts for different selection probabilities of the participants and will be used in the analysis. The IEA IDB Analyzer automatically selects the appropriate weight variable for analysis based on the file types included in the merged data file. FINWGTP (final future primary teacher weight) or FINWGTS (final future lower-secondary teacher weight) will be selected automatically when analyzing future primary or lower-secondary teacher data only, or with institutional program variables combined. The final institution weight (INSWGTI, INSWGTE, INSWGTP, and INSWGTS for the respective populations) has to be applied if a file is aggregated by institution (or

by TPU in the case of the two future teacher populations) and should serve in this format for further analysis. FINWGTI (Final Teacher Preparation Unit Weight) will be selected automatically when analyzing institutional program data only. FINWGTE (final educator weight) will be selected automatically when analyzing educator data (for more information on weights included in the different TEDS-M data sets and their use, please see Chapter 3).

Replicate Weights

BRR replicate weights are used for estimating the sampling variances (see Chapter 3). All 32 replicate weights are available readily in the data files and are selected by the IEA IDB Analyzer automatically, depending on the weight variable, and cannot be changed.

4.5. TEDS-M Analysis with Future Teacher Level Variables

This section presents examples of analysis using the TEDS-M future teacher level data, including analysis used to produce tables from the TEDS-M International Report (Tatto et al., 2012) as well as additional examples of analysis not included in the report.

4.5.1. Percentages Only

The first example will analyze whether future primary teachers from different teacher preparation programs had the opportunity to study functions as part of their teacher preparation. Since we want to report the proportion of future primary teachers (with their appropriate standard errors) that studied functions, relations, and equations as an area of their upper level of school mathematics in each program group, we will be computing percentages of future primary teachers for each of the mathematical topics and within each program group.

We need to undertake a number of steps for this analysis. After reviewing the future primary teacher data codebook, we identify the variable MFB002D as the categorical variable containing the information on the opportunity to study functions. We also need to select the variable TARGETP as a grouping variable that identifies the primary teacher preparation program groups within the country.

We will use one of the merged data files mentioned above for the analysis and perform the following steps using the analysis module of the IEA IDB Analyzer:

- 1) Open the Analysis Module of the IEA IDB Analyzer.
- 2) Select the merged data file DIG&DPG-TEDS.sav as the **Analysis File**.
- 3) Select **Percentages only** as the **Analysis Type**. Note that there is one option available to check, **Exclude Missing from Analysis**, which should be checked. This option is checked by default to exclude cases with data missing for the grouping variables.
- 4) The variable IDCNTRY is selected automatically as **Grouping Variable**. Additionally we need to add the variables TARGETP and MFB002D as **Grouping Variables**.
- 5) The **Weight Variable** is automatically defined by the software. As this example analysis uses future primary teacher data, FINWGTP is selected automatically by default. The replicate weights FINRWP1 to FINRWP1 also are selected automatically, by default.
- 6) Specify the name and folder of the output files in the **Output Files** field. The IEA IDB Analyzer will use this name and folder to create three output files: an SPSS syntax file that contains the code for performing the analysis, an SPSS data file with the results, and an Excel file with these same results. Set the number of decimals to zero.

- 7) Press the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If the syntax file already exists, the IEA IDB Analyzer will prompt you to confirm overwriting the file.

Figure 4.4 presents the screen of the analysis module with all selections completed for our example.

Figure 4.4 IEA IDB Analyzer Setup for Example Future Teacher Level Percentages only Analysis

The screenshot shows the 'IEA IDB Analyzer: Analysis Module' window. It is configured for an analysis of 'Future Teacher Level Percentages only'. The analysis file is 'C:\TEDS2008\Work\DIG&DPG-TEDS.sav'. The 'Select Analysis Type' section has 'Percentages only' selected. Under 'Select Variables', 'MFB002D' is chosen. The 'Grouping Variables' section includes 'IDCNTY', 'TARGETP', and 'MFB002D'. The 'Weight Variable' is 'FINWGTP', and the 'Replicate Weights' variable is 'FINRWP1'. The 'Number of Decimals' is set to 1. The 'Output Files' section shows 'C:\TEDS2008\Work\Table_5-6.*'. Buttons for 'Start SPSS', 'Exit', and 'Help' are located at the bottom right.

The results for this analysis are displayed in Figure 4.5. The example shows each country's proportion of future primary teachers per program group and each country's proportion of sampled future primary teachers that reported studying different mathematics topics. The countries are identified in the first column as IDCNTY is the first grouping variable. The second column represents the names of the different program groups (variable TARGETP) as the second grouping variable. The third column represents the answer categories of the third grouping variable, MFB002D. The fourth column reports the number of cases per country, program group and the future primary teachers' answers. The fifth column reports the sum of weights of the sampled future primary teachers, followed by the percentage for each category accompanied by its BRR standard error.

From the output presented in Figure 4.5 we can see that for the program group "Lower Primary Generalist (Grade 4 maximum)" the topic functions was studied by 91.8% of Russian future primary teachers. In Germany the proportion is 34.1% in that program

group. When interpreting the results the standard errors need to be taken into account. For example the standard errors for the “Primary Mathematics Specialist” program group in Germany (8.6%) are much higher than the standard errors for the “Lower Primary Generalist” program group in Germany (1.9%). The standard errors always need to be taken into account when comparing the results for the same program groups across countries if you want to test for statistical significance of the differences. In this case the reason for the large standard error for the “Primary Mathematics Specialists” in Germany is the small number of cases per group (“Primary Mathematics Specialist”, studied – $n=55$, not studied – $n=42$) and their population estimates (“Primary Mathematics Specialist”, studied – $n=696$, not studied – $n=396$).

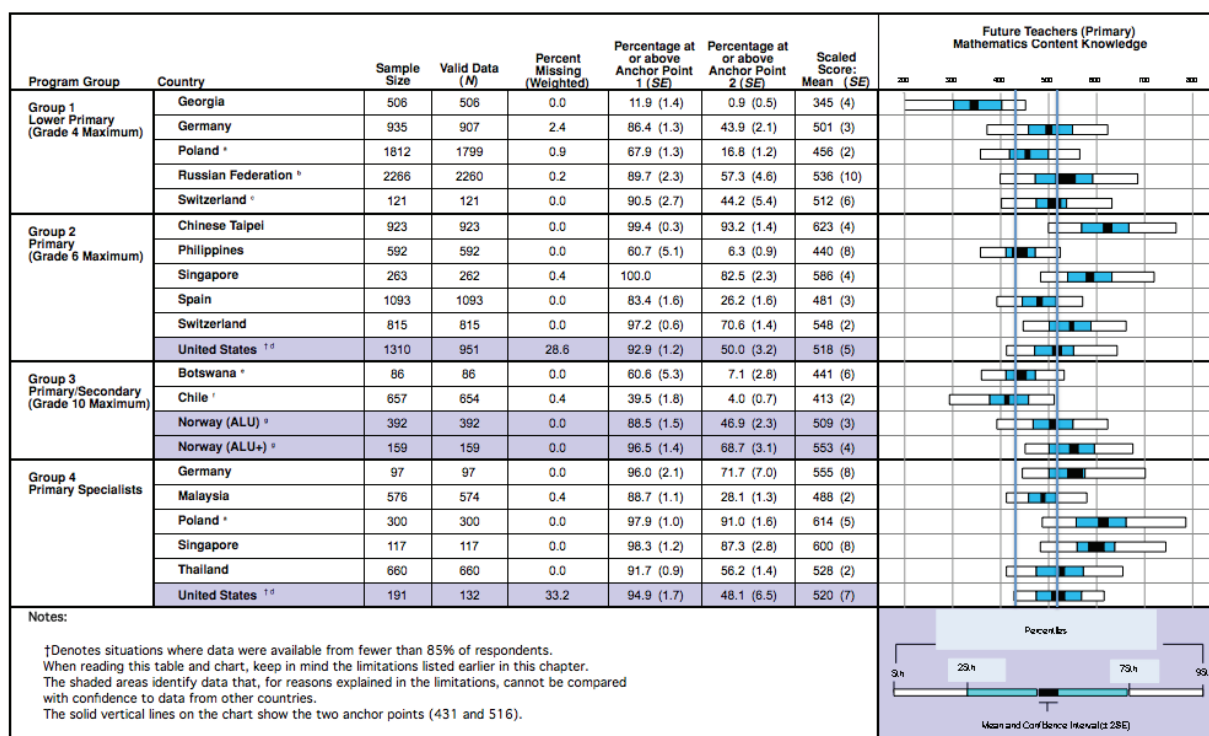
Figure 4.5 Output for Example Future Primary Teacher Level Percentages only Analysis

Percentages by (IDCNTY TARGETP MFB002D)							
COUNTRY ID	*LEVEL AT WHICH GRADUATES QUALIFY TO TEACH - PRIM*	GEN\STUDY MATH TOPIC SCH\FUNCTIONS	N of Cases	Sum of FINWGTP	Percent	Percent (s.e.)	
Botswana	PRIMARY/LOWER SECONDARY GENERALISTS (GRADE 10 MAXIMUM)	STUDIED	82	95	96.3	2.2	
		NOT STUDIED	3	4	3.7	2.2	
Chile	PRIMARY/LOWER SECONDARY GENERALISTS (GRADE 10 MAXIMUM)	STUDIED	367	1118	55.8	1.7	
		NOT STUDIED	285	886	44.2	1.7	
Chinese Taipei	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	590	2313	64.4	1.3	
		NOT STUDIED	332	1279	35.6	1.3	
Georgia	LOWER PRIMARY GENERALISTS (GRADE 4 MAXIMUM)	STUDIED	401	522	81.7	1.7	
		NOT STUDIED	89	117	18.3	1.7	
Germany	LOWER PRIMARY GENERALISTS (GRADE 4 MAXIMUM)	STUDIED	335	1745	34.1	1.9	
		NOT STUDIED	590	3378	65.9	1.9	
	PRIMARY MATHEMATICS SPECIALISTS	STUDIED	55	696	63.7	8.6	
		NOT STUDIED	42	396	36.3	8.6	
Malaysia	PRIMARY MATHEMATICS SPECIALISTS	STUDIED	387	421	67.7	1.8	
		NOT STUDIED	184	201	32.3	1.8	
Philippines	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	560	2761	94.8	2.2	
		NOT STUDIED	29	151	5.2	2.2	
Poland	LOWER PRIMARY GENERALISTS (GRADE 4 MAXIMUM)	STUDIED	673	1839	38.5	1.7	
		NOT STUDIED	1121	2934	61.5	1.7	
	PRIMARY MATHEMATICS SPECIALISTS	STUDIED	292	1283	97.7	.7	
		NOT STUDIED	8	31	2.3	.7	
Russian Federation	LOWER PRIMARY GENERALISTS (GRADE 4 MAXIMUM)	STUDIED	2051	7823	91.8	1.0	
		NOT STUDIED	203	699	8.2	1.0	
Singapore	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	149	167	56.5	2.7	
		NOT STUDIED	114	129	43.5	2.7	
	PRIMARY MATHEMATICS SPECIALISTS	STUDIED	60	67	52.0	4.6	
		NOT STUDIED	57	61	48.0	4.6	
Spain	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	682	2429	63.3	1.6	
		NOT STUDIED	408	1410	36.7	1.6	
Switzerland	LOWER PRIMARY GENERALISTS (GRADE 4 MAXIMUM)	STUDIED	45	66	41.0	4.2	
		NOT STUDIED	76	94	59.0	4.2	
	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	297	394	36.2	1.5	
		NOT STUDIED	514	693	63.8	1.5	
Thailand	PRIMARY MATHEMATICS SPECIALISTS	STUDIED	635	1313	96.5	.7	
		NOT STUDIED	23	47	3.5	.7	
United States	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	954	16634	74.8	2.1	
		NOT STUDIED	334	5615	25.2	2.1	
	PRIMARY MATHEMATICS SPECIALISTS	STUDIED	154	2919	81.0	4.0	
		NOT STUDIED	33	685	19.0	4.0	
Norway (ALU)	PRIMARY/LOWER SECONDARY GENERALISTS (GRADE 10 MAXIMUM)	STUDIED	380	1393	97.4	.8	
		NOT STUDIED	12	37	2.6	.8	
Norway (ALU +)	PRIMARY/LOWER SECONDARY GENERALISTS (GRADE 10 MAXIMUM)	STUDIED	159	433	100.0	.0	
x. International Average	LOWER PRIMARY GENERALISTS (GRADE 4 MAXIMUM)	STUDIED	.	.	17.9	.3	
		NOT STUDIED	.	.	13.3	.3	
	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	STUDIED	.	.	24.4	.3	
		NOT STUDIED	.	.	13.1	.3	
	PRIMARY/LOWER SECONDARY GENERALISTS (GRADE 10 MAXIMUM)	STUDIED	.	.	21.8	.2	
		NOT STUDIED	.	.	3.2	.2	
PRIMARY MATHEMATICS SPECIALISTS	STUDIED	.	.	28.7	.7		
	NOT STUDIED	.	.	8.8	.7		

4.5.2. Percentages and Means

In our second example, we want to replicate results presented in the TEDS-M International Report (Tatto et al., 2012). This example examines the mean mathematics content knowledge of future primary teachers per program group per country. These results, presented in Table 5.10 of the TEDS-M International Report (Tatto et al., 2012), are shown in Figure 4.6 below. In this example the mathematics content knowledge (MCK) scores will be used. MCK is a single continuous variable for which we want to calculate the mean for each program group and country.

Figure 4.6 Example of Percentage and Means with Achievement Scores Taken from the TEDS-M International Report (Exhibit 5.10)



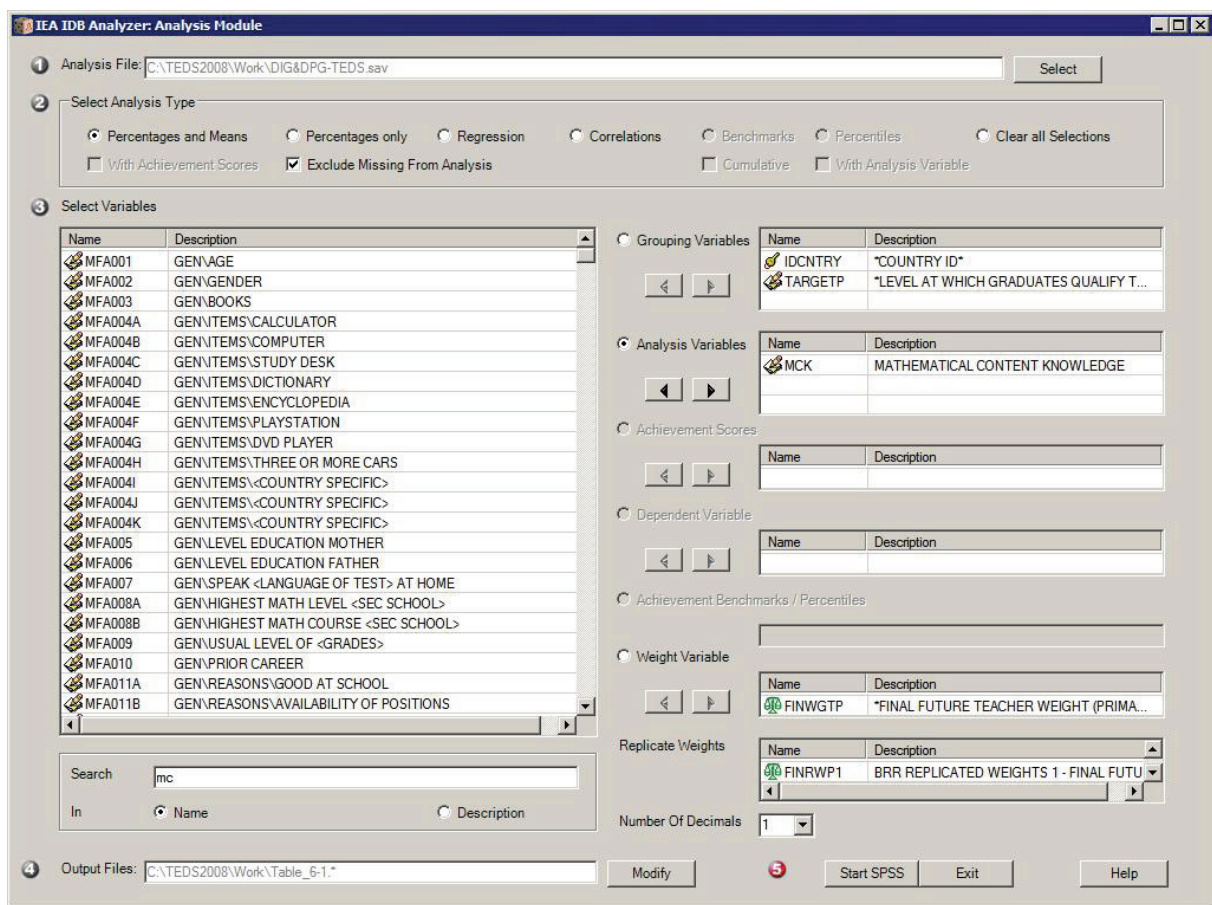
With TEDS-M data we can use any continuous variable as an **Analysis Variable** in the **Percentages and Means** analysis procedure. Proceed as follows:

- 1) Open the IEA IDB Analyzer analysis module
- 2) Select the DIG&DPG-TEDS.sav data file as the **Analysis File**
- 3) Select **Percentages and Means** as the **Analysis Type**. By default, the program will exclude records with missing grouping variables from the analysis.
- 4) Add the variable TARGETP as a second **Grouping Variable** (IDCOUNTRY will be selected automatically).
- 5) Specify the knowledge scores to be used for the analysis. Click the **Analysis Variable** and select the variable MCK from the list of available variables and move it to the analysis variables field by clicking the right arrow button in this section.
- 6) The **Weight Variable** is automatically identified by the software. As this example analysis uses future primary teacher data, FINWGTP is selected by default. The **Replicate Weights** variables FINRWP1 to FINRWP32 also are selected automatically.
- 7) Change the **Number Of Decimals** to 1.

- 8) Specify the name and folder of the output files in the **Output Files** field.
- 9) Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If the syntax file already exists, the IEA IDB Analyzer will prompt you to confirm overwriting the file.

Figure 4.7 below displays the analysis module with the proper settings for this example analysis.

Figure 4.7 IEA IDB Analyzer Setup for Example Percentages and Means Analysis



The output for this setup is shown in Figure 4.8. In this example, each country's results are presented on one or more lines depending on the number of available programs within the country. The countries are identified in the first column and the second column describes the category of TARGETP being reported. The third column reports the number of valid cases and the fourth the sum of weights of the sampled future primary teachers. The next two columns report the percentage of future primary teachers in each category (in this case each category represents a different program group) and its standard error, followed by the estimated mean mathematics knowledge and its standard error per program group. The standard deviation of the knowledge scores and its standard error are reported in the following two columns. The last column shows the percent of missing data.

Figure 4.8 Output for Example Future Primary Teacher Level Percentages and Means Analysis

Average for MCK by (IDCNTRY TARGETP)								PAGE	1	
COUNTRY ID	*LEVEL GRADS. QUAL TO TEACH-PRIM*	N of Cases	Sum of FINWGTP	Percent	Percent (s.e.)	MCK (Mean)	MCK (s.e.)	Std.Dev.	Std.Dev. (s.e.)	Percent Missing
Botswana	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	86	100	100.0	.0	441.2	5.9	48.1	3.0	.0
Chile	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	654	2009	100.0	.0	413.0	2.1	64.9	2.4	.4
Chinese Taipei	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	923	3595	100.0	.0	623.2	4.2	84.2	3.2	.0
Georgia	LOWER PRIMARY GEN. (GRADE 4 MAXIMUM)	506	659	100.0	.0	344.7	3.9	85.3	3.4	.0
Germany	LOWER PRIMARY GEN. (GRADE 4 MAXIMUM)	907	5025	82.1	.3	500.7	2.9	82.0	3.7	2.4
	PRIMARY MATHEMATICS SPECIALISTS	97	1093	17.9	.3	555.2	7.5	73.9	5.5	.0
Malaysia	PRIMARY MATHEMATICS SPECIALISTS	574	625	100.0	.0	488.4	1.8	53.5	4.0	.4
Philippines	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	592	2921	100.0	.0	439.6	7.6	51.7	3.6	.0
Poland	LOWER PRIMARY GEN. (GRADE 4 MAXIMUM)	1799	4788	78.5	.2	456.2	2.3	67.3	2.2	.9
	PRIMARY MATHEMATICS SPECIALISTS	300	1313	21.5	.2	614.2	4.8	92.2	4.5	.0
Russian Federation	LOWER PRIMARY GEN. (GRADE 4 MAXIMUM)	2260	8545	100.0	.0	535.5	9.9	91.1	4.1	.2
Singapore	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	262	295	69.7	.5	586.3	3.7	72.4	3.8	.4
	PRIMARY MATHEMATICS SPECIALISTS	117	128	30.3	.5	599.6	7.8	76.1	6.3	.0
Spain	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	1093	3845	100.0	.0	481.3	2.6	56.6	1.6	.0
Switzerland	LOWER PRIMARY GEN. (GRADE 4 MAXIMUM)	121	160	12.8	.2	512.2	6.4	62.8	4.7	.0
	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	815	1092	87.2	.2	547.9	1.9	65.0	1.8	.0
Thailand	PRIMARY MATHEMATICS SPECIALISTS	660	1364	100.0	.0	528.1	2.3	75.1	2.4	.0
United States	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	951	16159	86.9	5.3	517.5	4.5	70.0	4.1	28.6
	PRIMARY MATHEMATICS SPECIALISTS	132	2433	13.1	5.3	520.0	6.6	63.0	3.8	33.2
Norway (ALU)	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	392	1429	100.0	.0	508.7	3.6	69.3	2.8	.0
Norway (ALU +)	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	159	433	100.0	.0	552.8	5.8	74.0	6.6	.0
x.International Average	LOWER PRIMARY GEN. (GRADE 4 MAXIMUM)	.	.	23.3	.0	469.9	2.6	77.7	1.7	.
	PRIMARY GENERALISTS (GRADE 6 MAXIMUM)	.	.	34.0	.3	532.6	1.8	66.7	1.3	.
	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	.	.	25.0	.0	478.9	2.3	64.1	2.0	.
	PRIMARY MATHEMATICS SPECIALISTS	.	.	17.7	.3	550.9	2.3	72.3	1.9	.

4.5.3. Regression

The IEA IDB Analyzer is able to calculate multiple linear regressions between dependent variables and a set of independent variables. This section demonstrates an example for a regression analysis with variables from the example merged data file DIG&DPG-TEDS.sav.

With TEDS-M data the IEA IDB Analyzer can also be used to compute regression analysis with any variable included in the future teacher questionnaires or in the assessment such as the knowledge scores (MCK or MPCK). In this section a regression analysis will be performed using the mathematics content knowledge (variable MCK) as the dependent variable and future primary teachers' gender (variable MFA002) as its predictor. The weighting variable FINWGTP will be selected automatically.

For this example, variable MFA002 (future primary teacher gender) is recoded into a "dummy" variable REGMFA002 (with a value of "0" or "1" for ease of interpretation). This recoded variable can be created by running the SPSS syntax file Recode_MFA002.SPS. Figure 4.9 provides the syntax. By using this recoded variable, the intercept or constant will be the estimated average mathematics knowledge for females, whereas the regression coefficient (REGMFA002 [estimate]) will be the estimated difference in mathematics knowledge between females and males. This also allows a t-test to determine if the average mathematics knowledge is significantly different between females and males. After computing the new variable, the syntax file will save the data file with a new name: DIG&DPG-TEDS_REG.SAV.

Figure 4.9 Example SPSS Program to Recode Variable MFA002 for Future Primary Teacher Level Regression Analysis

```
GET FILE = "C:\TEDS2008\Work\DIG&DPG-TEDS.sav".
* Compute new variable REGMFA002 from MFA002.
RECODE MFA002 (1=0) (2=1) (else=copy) INTO REGMFA002.
EXECUTE.
VALUE LABELS REGMFA002 0 'Female'
                1 'Male'.
VARIABLE LABELS REGMFA002 "Recoded MFA002 (Female = 0; Male = 1)".
SAVE OUTFILE = "C:\TEDS2008\Work\DIG&DPG-TEDS_REG.sav".
```

The example regression analysis is performed by the analysis module of the IEA IDB Analyzer with the completed analysis window shown in Figure 4.10, using the following steps:

- 1) Run the SPSS syntax file Recode_MFA002.SPS to create the variable REGMFA002 and the file DIG&DPG-TEDS_REG.SAV.
- 2) Open the Analysis Module of the IEA IDB Analyzer.
- 3) Specify the data file DIG&DPG-TEDS_REG.SAV as the **Analysis File**.
- 4) Select **Regression** as the **Analysis Type**.
- 5) The variable IDCNTRY is selected automatically as a **Grouping Variable**. To reflect the differences between the programs, the program grouping variable for the future primary teacher data TARGETP needs to be added as a **Grouping Variable**.

- 6) Click on the **Analysis Variables** selection box to activate the section and select REGMFA002 as the analysis variable. This is done by selecting REGMFA002 from the list of available variables and moving it to the **Analysis Variables** field by clicking the right arrow button in this section.

Figure 4.10 IEA IDB Analyzer Setup for Future Example Primary Teacher Level Regression Analysis

1 Analysis File: C:\TEDS2008\Work\DIG&DPG-TEDS_REG.sav

2 Select Analysis Type

Percentages and Means Percentages only Regression Correlations Benchmarks Percentiles Clear all Selections

With Achievement Scores Exclude Missing From Analysis Cumulative With Analysis Variable

3 Select Variables

Name	Description
MFA001	GEN\AGE
MFA002	GEN\GENDER
MFA003	GEN\BOOKS
MFA004A	GEN\ITEMS\CALCULATOR
MFA004B	GEN\ITEMS\COMPUTER
MFA004C	GEN\ITEMS\STUDY DESK
MFA004D	GEN\ITEMS\DICTIONARY
MFA004E	GEN\ITEMS\ENCYCLOPEDIA
MFA004F	GEN\ITEMS\PLAYSTATION
MFA004G	GEN\ITEMS\DVD PLAYER
MFA004H	GEN\ITEMS\THREE OR MORE CARS
MFA004I	GEN\ITEMS\<COUNTRY SPECIFIC>
MFA004J	GEN\ITEMS\<COUNTRY SPECIFIC>
MFA004K	GEN\ITEMS\<COUNTRY SPECIFIC>
MFA005	GEN\LEVEL EDUCATION MOTHER
MFA006	GEN\LEVEL EDUCATION FATHER
MFA007	GEN\SPEAK <LANGUAGE OF TEST> AT HOME
MFA008A	GEN\HIGHEST MATH LEVEL <SEC SCHOOL>
MFA008B	GEN\HIGHEST MATH COURSE <SEC SCHOOL>
MFA009	GEN\USUAL LEVEL OF <GRADES>
MFA010	GEN\PRIOR CAREER
MFA011A	GEN\REASONS\GOOD AT SCHOOL
MFA011B	GEN\REASONS\AVAILABILITY OF POSITIONS

Search: mck

In: Name Description

4 Output Files: C:\TEDS2008\Work\Regression.*

5 Start SPSS Exit Help

Grouping Variables: IDCNTY "COUNTRY ID"

Analysis Variables: REGMFA002 Recoded ITSEX (Female = 0; Male = 1)

Achievement Scores:

Dependent Variable: MCK MATHEMATICAL CONTENT KNOWLEDGE

Achievement Benchmarks / Percentiles:

Weight Variable: FINWGTP "FINAL FUTURE TEACHER WEIGHT (PRIMA..."

Replicate Weights: FINRWP1 BRR REPLICATED WEIGHTS 1 - FINAL FUTU

Number Of Decimals: 2

- 7) Click on the **Dependent Variables** selection box and select the variable MCK from the list of available variables and move it to the **Dependent Variable** field by clicking the right arrow button in this section.
- 8) The **Weight Variable** is automatically defined by the software. As this example analysis uses future primary teachers data, FINWGTP is selected by default. The **Replicate Weights** FINRWP1 to FINRWP32 also are selected by default.
- 9) Specify the name and folder of the output files in the **Output Files** field.
- 10) Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If necessary, the IEA IDB Analyzer will prompt you to confirm overwriting of already existing files.

The results of this analysis are presented in Figure 4.11 where we can see that the differences between females and males for the “Primary Mathematics Specialist” program group in Poland are substantial (14.50 score points), but also the standard errors for the constant and the slope are very large (7.76 and 23.97) which is a result of the very small number of cases in this program group – only 300. As a result we cannot claim that

there are statistically significant differences between female and male students in this program group in Poland even if differences exist. Germany has a much lower estimate of differences between females and males in both program groups (1.41 and 2.69) and the standard errors of the differences are much higher than the estimated differences themselves (5.16 and 5.64). Results for Botswana, United States, and Norway (ALU+) are similar. The large standard errors could be due to the small sample sizes. This is why the estimates should be always considered together with their standard error. Note that Georgia has an estimate of zero. This is due to the fact that only female future primary teachers were available in the Georgian sample and the variance is therefore equal to zero. Most of the countries show statistically significant results at a 95% confidence level since the t-test value is greater than 1.96 (two tailed).

Figure 4.11 Output for Example Future Primary Teacher Level Regression Analysis with Achievement Scores

Predictors: REGMFA002 / Predicted: MCK													
COUNTRY ID	*LEVEL GRADUATES QUALIFY TO TEACH-PRIM*	N of Cases	Constant (estimate)	Constant (s.e.)	REGMFA002 (estimate)	REGMFA002 (s.e.)	REGMFA002 (t-test)	REGMFA002 (s.e.)	REGMFA002 (t-test)	REGMFA002 (s.e.)	REGMFA002 (t-test)	REGMFA002 (s.e.)	REGMFA002 (t-test)
Botswana	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	86	433.71	8.91	18.37	10.58	1.74						
Chile	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	654	412.32	2.49	3.88	7.09	.55						
Chinese Taipei	PRIMARY GENERALISTS (GRADE 6 MAX)	923	618.04	4.32	18.39	6.69	2.75						
Georgia	LOWER PRIMARY GEN. (GRADE 4 MAX)	506	345.16	3.85	-6.23	2.16	-2.89						
Germany	LOWER PRIMARY GEN. (GRADE 4 MAX)	907	500.57	2.97	1.41	5.16	.27						
	PRIMARY MATHEMATICS SPECIALISTS	97	554.64	7.12	2.69	5.64	.48						
Malaysia	PRIMARY MATHEMATICS SPECIALISTS	574	490.64	2.14	-4.87	1.84	-2.64						
Philippines	PRIMARY GENERALISTS (GRADE 6 MAX)	592	438.06	6.84	8.08	7.50	1.08						
Poland	LOWER PRIMARY GEN. (GRADE 4 MAX)	1799	455.78	2.31	18.41	8.06	2.28						
	PRIMARY MATHEMATICS SPECIALISTS	300	610.65	7.76	14.50	23.97	.61						
Russian Federation	LOWER PRIMARY GEN. (GRADE 4 MAX)	2260	535.03	9.91	5.15	4.23	1.22						
Singapore	PRIMARY GENERALISTS (GRADE 6 MAX)	262	578.92	3.67	30.47	8.87	3.44						
	PRIMARY MATHEMATICS SPECIALISTS	117	588.49	7.25	36.98	17.62	2.10						
Spain	PRIMARY GENERALISTS (GRADE 6 MAX)	1093	474.50	2.27	34.71	4.24	8.18						
Switzerland	LOWER PRIMARY GEN. (GRADE 4 MAX)	121	513.61	6.43	-32.11	40.74	-.79						
	PRIMARY GENERALISTS (GRADE 6 MAX)	815	544.75	1.99	19.16	5.47	3.50						
Thailand	PRIMARY MATHEMATICS SPECIALISTS	660	523.48	3.56	17.60	9.70	1.81						
United States	PRIMARY GENERALISTS (GRADE 6 MAX)	951	516.20	4.16	15.17	11.14	1.36						
Norway (ALU)	PRIMARY MATHEMATICS SPECIALISTS	132	518.71	6.51	8.46	6.21	1.36						
Norway (ALU +)	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	392	498.34	4.08	43.70	9.25	4.72						
	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	159	544.69	5.34	25.23	15.79	1.60						
x.International	LOWER PRIMARY GEN. (GRADE 4 MAX)	.	470.03	2.60	-2.67	8.42	-.32						
Average	PRIMARY GENERALISTS (GRADE 6 MAX)	.	528.41	1.71	21.00	3.12	6.72						
	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	.	472.26	2.86	22.80	5.57	4.09						
	PRIMARY MATHEMATICS SPECIALISTS	.	547.77	2.49	12.56	5.41	2.32						

4.5.4. Correlations

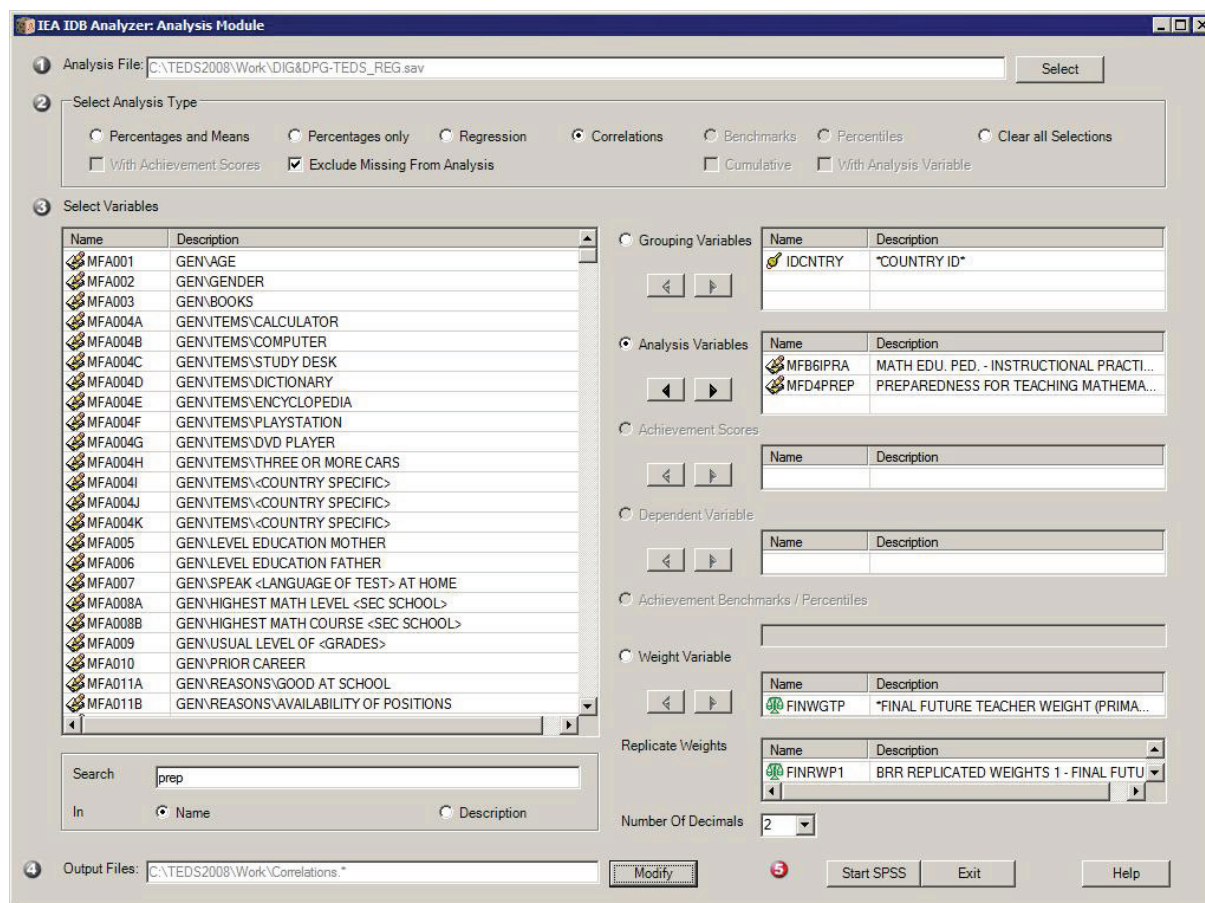
The IEA IDB Analyzer is also able to compute correlations between two background variables, and between background variables and knowledge scores. As the TEDS-M scores are also single variables (and not a set of plausible values as in other IEA studies) the procedure for calculating correlations between two background variables and between background variable and knowledge scores is the same. The steps for conducting a correlation analysis are the same as those described previously: first select the grouping variables, then select the analysis variables (either one or two variables and/or the knowledge score). For each group defined by the grouping variables the output will display the correlation coefficients for each pair of variables. Note that the grouping variables are not displayed with their labels in the SPSS output, but the labels are displayed in the Excel output file and in the output SPSS system file.

In this example, we correlate two derived background variables. Assume that for this example we are interested in the relationship between an opportunity to learn scale (mathematics education pedagogy – instructional practice) and a belief scale (beliefs about preparedness to teach mathematics). To perform this analysis, proceed as follows:

- 1) Open the Analysis Module of the IEA IDB Analyzer.
- 2) Specify the data file DIG&DPG-TEDS.SAV as the **Analysis File**.
- 3) Select **Correlations** as the **Analysis Type**. By default, the program will exclude records with missing grouping variables from the analysis.
- 4) The variable IDCNTRY is selected automatically as a **Grouping Variable**. To reflect the differences between the programs, the program grouping variable for the future primary teacher data TARGETP needs to be added as a **Grouping Variable**.
- 5) Click on the **Analysis Variable** and select variables MFD4PREP (the OTL scale) and MFB6IPRA (the belief scale) from the list of available variables and move it to the **Analysis Variables** field by clicking the right arrow button in this section.
- 6) The **Weight Variable** is automatically defined by the software. As this example uses future primary teacher data, FINWGTP is selected by default. The replicate weights variables FINRWP1 to FINRWP32 also are selected automatically.
- 7) Specify the name and folder of the output files in the **Output Files** field.
- 8) Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If the syntax file already exists, the IEA IDB Analyzer will prompt you to confirm overwriting it.

Figure 4.12 below displays the analysis module with the proper settings for this example analysis.

Figure 4.12 IEA IDB Analyzer Setup for Example Future Primary Teacher Level Correlations Analysis



The output for this setup is shown in Figure 4.13. Each country's results are presented in a separate table for each program group as defined by the grouping variable TARGETP. Please note that country labels are not displayed, only their values (for instance IDCNTRY=840 for the United States of America¹). The countries are identified in the line above each table together with the program groups. The variable names are displayed in the first column. The sum of weights is displayed in the second column. The mean, the standard error of the mean, the standard deviation, and its standard error are displayed in the third to sixth columns. The remaining columns contain the correlation coefficients and their standard errors with the first two values in each row representing the correlation coefficient and the standard error of the variable correlated with itself (which are always 1 and 0 respectively). The two upper right numbers of the last two columns in each table contain the correlation estimate between the variables and its standard error.

In Figure 4.13, we see that in all countries strong correlations exist between the instructional practice as an opportunity to learn and the belief of being prepared for teaching mathematics. The United States (IDCNTRY=840) show the highest correlation coefficient (0.61 with SE=0.06) and Germany (IDCNTRY=276) shows the lowest correlation coefficient (0.33 with SE=0.14) for the "Primary Mathematics Specialist" program group (TARGETP=4) among all countries. Note that the correlation coefficient for Germany is almost as twice as low, but the standard error is more than as twice as high compared to United States.

¹ See the country codes listed in Table 1.1 of Chapter 1.

Figure 4.13 Output for Example Future Primary Teacher Level Correlations Analysis

Correlation matrix for: IDCNTRY= 72 * TARGETP=3 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	87.52	12.75	.182	1.39	.125	1.0000	.0000	.3977	.1288	
MFB6IPRA	87.52	11.61	.135	1.47	.105			1.0000	.0000	
Correlation matrix for: IDCNTRY= 152 * TARGETP=3 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	1884.53	12.19	.079	1.99	.051	1.0000	.0000	.5102	.0404	
MFB6IPRA	1884.53	11.95	.069	1.82	.060			1.0000	.0000	
Correlation matrix for: IDCNTRY= 158 * TARGETP=2 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	3583.47	10.74	.044	1.31	.041	1.0000	.0000	.4772	.0283	
MFB6IPRA	3583.47	10.36	.053	1.62	.041			1.0000	.0000	
Correlation matrix for: IDCNTRY= 268 * TARGETP=1 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	429.15	11.00	.084	2.13	.081	1.0000	.0000	.4443	.0553	
MFB6IPRA	429.15	10.03	.100	1.88	.082			1.0000	.0000	
Correlation matrix for: IDCNTRY= 276 * TARGETP=1 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	4825.09	10.12	.084	2.00	.098	1.0000	.0000	.5689	.0435	
MFB6IPRA	4825.09	8.56	.084	2.12	.065			1.0000	.0000	
Correlation matrix for: IDCNTRY= 276 * TARGETP=4 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	1056.55	10.54	.133	1.12	.104	1.0000	.0000	.3295	.1350	
MFB6IPRA	1056.55	9.51	.187	1.38	.138			1.0000	.0000	
Correlation matrix for: IDCNTRY= 458 * TARGETP=4 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	601.42	12.63	.105	2.01	.079	1.0000	.0000	.4605	.0391	
MFB6IPRA	601.42	11.29	.071	1.73	.055			1.0000	.0000	
Correlation matrix for: IDCNTRY= 608 * TARGETP=2 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	2762.03	12.92	.141	1.57	.060	1.0000	.0000	.3554	.0402	
MFB6IPRA	2762.03	12.11	.188	1.54	.066			1.0000	.0000	
Correlation matrix for: IDCNTRY= 616 * TARGETP=1 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	4615.52	10.58	.040	1.75	.045	1.0000	.0000	.4278	.0254	
MFB6IPRA	4615.52	10.00	.059	1.88	.057			1.0000	.0000	
Correlation matrix for: IDCNTRY= 616 * TARGETP=4 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	1283.72	10.78	.117	1.63	.119	1.0000	.0000	.4423	.0465	
MFB6IPRA	1283.72	10.29	.112	1.66	.064			1.0000	.0000	
Correlation matrix for: IDCNTRY= 643 * TARGETP=1 *										
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.				
MFD4PREP	8274.53	11.76	.083	1.31	.033	1.0000	.0000	.3718	.0441	
MFB6IPRA	8274.53	10.86	.118	1.78	.048			1.0000	.0000	

Figure 4.13 Output for Example Future Primary Teacher Level Correlations Analysis (contd.)

Correlation matrix for: IDCNTRY= 702 * TARGETP=2 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	292.66	11.68	.080	1.59	.096	1.0000	.0000 .4941 .0548
MFB6IPRA	292.66	11.28	.093	1.43	.080		1.0000 .0000
Correlation matrix for: IDCNTRY= 702 * TARGETP=4 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	128.00	11.84	.167	1.64	.107	1.0000	.0000 .3766 .0798
MFB6IPRA	128.00	11.09	.091	1.35	.095		1.0000 .0000
Correlation matrix for: IDCNTRY= 724 * TARGETP=2 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	3759.15	11.25	.120	2.06	.065	1.0000	.0000 .4335 .0616
MFB6IPRA	3759.15	10.17	.189	1.94	.117		1.0000 .0000
Correlation matrix for: IDCNTRY= 756 * TARGETP=1 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	153.58	11.29	.118	1.26	.066	1.0000	.0000 .5309 .0819
MFB6IPRA	153.58	10.17	.116	1.26	.076		1.0000 .0000
Correlation matrix for: IDCNTRY= 756 * TARGETP=2 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	1070.64	10.82	.037	1.29	.040	1.0000	.0000 .4708 .0330
MFB6IPRA	1070.64	9.94	.037	1.28	.035		1.0000 .0000
Correlation matrix for: IDCNTRY= 764 * TARGETP=4 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	1316.99	12.12	.045	1.48	.046	1.0000	.0000 .4859 .0296
MFB6IPRA	1316.99	11.36	.077	1.71	.055		1.0000 .0000
Correlation matrix for: IDCNTRY= 840 * TARGETP=2 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	17071.40	12.54	.132	1.99	.054	1.0000	.0000 .5698 .0337
MFB6IPRA	17071.40	11.78	.136	1.89	.056		1.0000 .0000
Correlation matrix for: IDCNTRY= 840 * TARGETP=4 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	2697.84	12.18	.185	2.04	.177	1.0000	.0000 .6096 .0581
MFB6IPRA	2697.84	11.56	.085	1.67	.097		1.0000 .0000
Correlation matrix for: IDCNTRY=57891 * TARGETP=3 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	1387.41	10.62	.060	1.46	.069	1.0000	.0000 .4454 .0500
MFB6IPRA	1387.41	9.90	.063	1.38	.069		1.0000 .0000
Correlation matrix for: IDCNTRY=57892 * TARGETP=3 *							
Variable	Sum of Wgts	Mean	s.e.	StdDev	s.e.	Correlations and s.e.	
MFD4PREP	400.90	10.38	.093	1.22	.124	1.0000	.0000 .5422 .0862
MFB6IPRA	400.90	10.02	.086	1.23	.111		1.0000 .0000

4.6. TEDS-M Analysis with Educator Data

For an example of an analysis using educator data, we will replicate Exhibit 4.6 from the TEDS-M International Report (Tatto et al., 2012), reproduced in Figure 4.14 below. We will use the **Percent Only** analysis type to estimate the number and estimated percentages of the disciplines taught by teacher educators.

As with the previous examples, we first proceed to identify the variables relevant to the analysis in the appropriate files. We can look either into the codebook provided along with the data or in the educator questionnaire. Variable ITEDUGRP contains the information about the disciplines taught by educators.

The merged data file DEG-TEDS.SAV containing only educator data will be used for this example. The variable that identifies the country (IDCNTY), plus the variable of interest (ITEDUGRP) will be used as **Grouping Variables** in the IEA IDB Analyzer. The **Weight Variable** containing the educator sampling weights (FINWGTE) and the corresponding replicate weights (FINRWE1 to FINRWE32) are selected automatically by the software.

Figure 4.14 Example Educator Level Analysis Taken from the TEDS-M International Report (Exhibit 4.6)

Exhibit 4.6: Disciplines taught by teacher educators (estimated percent)

Country	n	A. Mathematics and Mathematics Pedagogy		B. General Pedagogy		Both Areas A. and B.	
		Est. %	(SE)	Est. %	(SE)	Est. %	(SE)
Botswana	43	36.4	(0.0)	63.6	(0.0)	0.0	(0.0)
Chile ^a	392	18.0	(0.3)	58.8	(0.6)	23.1	(0.7)
Chinese Taipei	195	40.4	(4.1)	59.0	(4.1)	0.6	(0.2)
Georgia	62	65.6	(1.8)	31.3	(0.3)	3.1	(2.2)
Germany ^b	482	12.1	(3.2)	62.0	(5.9)	25.9	(4.6)
Malaysia ^c	255	59.1	(0.1)	13.4	(0.0)	27.5	(0.1)
Oman ^d	84	62.1	(0.1)	35.9	(0.1)	1.9	(0.0)
Philippines	589	29.5	(3.0)	46.0	(5.9)	24.5	(5.4)
Poland ^e	734	64.9	(0.3)	32.7	(0.2)	2.4	(0.1)
Russian Federation ^f	1212	76.7	(2.4)	20.6	(1.9)	2.7	(0.9)
Singapore	77	33.0	(0.0)	67.0	(0.0)	0.0	(0.0)
Spain ^g	533	20.8	(0.7)	76.1	(2.2)	3.1	(2.4)
Switzerland ^h	220	18.5	(0.5)	81.3	(0.4)	0.2	(0.2)
Thailand	312	39.0	(0.1)	36.3	(0.1)	24.8	(0.1)

Notes:

When reading this table, keep in mind the limitations listed earlier in this chapter and denoted in the table above by footnote letters.

The shaded areas identify data that, for reasons explained in the list of limitations, cannot be compared with confidence to data from other countries.

To perform this analysis, proceed as follows (leading to the IEA IDB Analyzer configuration as in Figure 4.15):

- 1) Open the analysis module of the IEA IDB Analyzer.
- 2) Specify the data file DEG-TEDS.SAV as the **Analysis File**.
- 3) Select **Percentages only** as the **Analysis Type**.
- 4) The variable IDCNTY is pre-selected as **Grouping Variable** by default. Add the variable ITEDUGRP as a second **Grouping Variable**.
- 5) The **Weight Variable** is automatically identified by the software. As this example analysis uses educator data, FINWGTE is selected by default. The **Replicate Weights** variables FINRWE1 to FINRWE32 also are selected by default.
- 6) Specify the name and folder of the output files in the **Output Files** field.
- 7) Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If the syntax file already exists, the IEA IDB Analyzer will prompt you to confirm overwriting it.

Figure 4.15 IEA IDB Analyzer Setup for the Example Educator Level Analysis

The screenshot shows the 'IEA IDB Analyzer: Analysis Module' window with the following configuration:

- Analysis File:** C:\TEDS2008\Work\DEG-TEDS.sav
- Select Analysis Type:** Percentages only (selected), Percentages and Means, Regression, Correlations, Benchmarks, Percentiles, Clear all Selections. Sub-options: With Achievement Scores (unchecked), Exclude Missing From Analysis (checked), Cumulative (unchecked), With Analysis Variable (unchecked).
- Select Variables:**
 - Grouping Variables:** IDCNTY (*COUNTRY ID*), ITEDUGRP (*EDUCATOR GROUP*)
 - Analysis Variables:** (empty)
 - Achievement Scores:** (empty)
 - Dependent Variable:** (empty)
 - Achievement Benchmarks / Percentiles:** (empty)
 - Weight Variable:** FINWGTE (*FINAL EDUCATOR WEIGHT*)
 - Replicate Weights:** FINRWE1 (BRR REPLICATED WEIGHTS 1 (FINAL EDUC.)), FINRWE2, FINRWE3, FINRWE4, FINRWE5, FINRWE6, FINRWE7, FINRWE8, FINRWE9, FINRWE10, FINRWE11, FINRWE12, FINRWE13, FINRWE14, FINRWE15, FINRWE16, FINRWE17, FINRWE18, FINRWE19, FINRWE20, FINRWE21, FINRWE22, FINRWE23, FINRWE24, FINRWE25, FINRWE26, FINRWE27, FINRWE28, FINRWE29, FINRWE30, FINRWE31, FINRWE32
- Output Files:** C:\TEDS2008\Work\DEG_DisciplinesTaught.*
- Number Of Decimals:** 1
- Buttons:** Start SPSS, Exit, Help

The results of this analysis are presented in Figure 4.16. The results by country comprise up to three lines, depending on the existence of educators with responsibility for mathematics and mathematics pedagogy or general pedagogy in the programs selected for the study. The results are presented in the same manner as in the previous examples, with countries identified in the first column and the second column describing the categories of ITEDUGRP.

Figure 4.16 shows that 65.6% of the educators in Georgia teach mathematics and mathematics pedagogy; 31.3% are general pedagogy educators; and 3.1% of the educators in Georgia have responsibilities to teach in both disciplines. The appropriate standard errors are presented in the last column of Figure 4.16 under the label “Percent (s.e.)”.

Figure 4.16 Output for Educator Level Analysis Example

Percentages by (IDCNTRY ITEDUGRP)						
COUNTRY ID	*EDUCATOR GROUP*	N of Cases	Sum of FINWGTE	Percent	Percent (s.e.)	
Botswana	MATH AND MATH PEDAGOGY EDUCATOR	16	16	36.4	.0	
	PEDAGOGY EDUCATOR	27	28	63.6	.0	
Chile	MATH AND MATH PEDAGOGY EDUCATOR	83	131	18.0	.3	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	57	169	23.1	.7	
	PEDAGOGY EDUCATOR	252	429	58.8	.6	
Chinese Taipei	MATH AND MATH PEDAGOGY EDUCATOR	85	137	40.4	4.1	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	2	2	.6	.2	
	PEDAGOGY EDUCATOR	108	200	59.0	4.1	
Georgia	MATH AND MATH PEDAGOGY EDUCATOR	41	42	65.6	1.8	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	1	2	3.1	2.2	
	PEDAGOGY EDUCATOR	20	20	31.3	.3	
Germany	MATH AND MATH PEDAGOGY EDUCATOR	115	476	12.1	3.2	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	142	1022	25.9	4.6	
	PEDAGOGY EDUCATOR	225	2445	62.0	5.9	
Malaysia	MATH AND MATH PEDAGOGY EDUCATOR	165	270	59.1	.1	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	69	125	27.5	.1	
	PEDAGOGY EDUCATOR	21	61	13.4	.0	
Oman	MATH AND MATH PEDAGOGY EDUCATOR	51	64	62.1	.1	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	2	2	1.9	.0	
	PEDAGOGY EDUCATOR	31	37	35.9	.1	
Philippines	MATH AND MATH PEDAGOGY EDUCATOR	194	840	29.5	3.0	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	116	698	24.5	5.4	
	PEDAGOGY EDUCATOR	279	1309	46.0	5.9	
Poland	MATH AND MATH PEDAGOGY EDUCATOR	455	766	64.9	.3	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	24	28	2.4	.1	
	PEDAGOGY EDUCATOR	255	386	32.7	.2	
Russian Federation	MATH AND MATH PEDAGOGY EDUCATOR	920	2405	76.7	2.4	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	17	85	2.7	.9	
	PEDAGOGY EDUCATOR	275	646	20.6	1.9	
Singapore	MATH AND MATH PEDAGOGY EDUCATOR	25	30	33.0	.0	
	PEDAGOGY EDUCATOR	52	61	67.0	.0	
Spain	MATH AND MATH PEDAGOGY EDUCATOR	120	160	20.8	.7	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	13	24	3.1	2.4	
	PEDAGOGY EDUCATOR	400	586	76.1	2.2	
Switzerland	MATH AND MATH PEDAGOGY EDUCATOR	51	77	18.5	.5	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	1	1	.2	.2	
	PEDAGOGY EDUCATOR	168	338	81.3	.4	
Thailand	MATH AND MATH PEDAGOGY EDUCATOR	121	138	39.0	.1	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	74	88	24.8	.1	
	PEDAGOGY EDUCATOR	117	128	36.3	.1	
x.International Average	MATH AND MATH PEDAGOGY EDUCATOR	.	.	36.0	.4	
	EDUCATOR WHO HAS BOTH RESPONSIBILITIES	.	.	8.7	.5	
	PEDAGOGY EDUCATOR	.	.	42.8	.6	

4.7. TEDS-M Analysis with Institution or Program Level Data

Analysis of the institutional-level data can be used, for example, to make statements about the number or percentages of future teachers attending specific programs in certain institutions with certain characteristics. In this sense, the characteristics of the specific programs at the institution become an attribute of the future teachers. Our example of institution or program level analysis will investigate the mathematics pedagogy content knowledge of future teachers with regards to the importance given to their performance on the admission examination that they took when applying to the institution. The knowledge scores are included in the future primary teacher data file and the information about the importance of the admission examination results is included in the institutional program data file.

To conduct this analysis, we will use the **Percentages and Means** analysis type available from the analysis module of the IEA IDB Analyzer. The first step in our analysis is to identify the variables of interest from the questionnaires and review the documentation about specific national adaptations to the questions of interest (see Supplements 1 and 2 of this IDB User Guide). The variable MIC002C in the institutional program data file contains information on how important the future teachers' admission examination result is judged to be by the institution for their selection in the respective teacher preparation program. The mathematics pedagogy content knowledge from the future primary teacher data file will be used as the analysis variable. This way we will calculate the mean mathematics pedagogy content knowledge of future teachers studying in programs for which admission examinations results were "not considered", or were considered "not very important", "somewhat important", and "very important" for the selection of the candidates.

The data to be used comprise the combined future primary teacher and institutional program data for all countries (DIG&DPG-TEDS.SAV). The variable that identifies the country (IDCOUNTRY) is selected automatically by the IEA IDB Analyzer, as well as the weight variables that contain the sampling information used to generate the replicate weights for the analysis.

To perform this analysis, proceed as follows (see the IEA IDB Analyzer configuration in Figure 4.17):

- 1) Open the analysis module of the IEA IDB Analyzer.
- 2) Specify the data file DIG&DPG-TEDS.SAV as the **Analysis File**.
- 3) Select **Percentages and Means** as the **Analysis Type**.
- 4) Make sure the **Exclude Missing From Analysis** check box is marked.
- 5) Add the variable TARGETP as a second **Grouping Variable** (in addition to IDCOUNTRY). Furthermore, add variable MIC002C as another **Grouping Variable**.
- 6) Click on the **Analysis Variables** and select the variable MPCK from the list of available variables and move it to the **Analysis Variables** field by clicking the right arrow button in this section.
- 7) The **Weight Variable** is automatically defined by the software. Because this example analysis uses combined institutional program and future primary teacher data with institutional program data disaggregated to the future teacher level, the future primary teacher data weight (FINWGTP) is selected by default. The associated future primary teacher **Replicate Weights** (FINRWP1 to FINRWP32) also are selected by default.

- 8) Specify the name and folder of the output files in the **Output Files** field.
- 9) Click the **Start SPSS** button to create the SPSS syntax file and open it in an SPSS syntax window. The syntax file will be executed by opening the **Run** menu of SPSS and selecting the **All** menu option. If the syntax file already exists, the IEA IDB Analyzer will prompt you to confirm overwriting the file.

Figure 4.17 IEA IDB Analyzer Setup for Example of Institutional Program Level Analysis

The screenshot shows the 'IEA IDB Analyzer: Analysis Module' window. It is configured for an analysis of the TEDS-M database. The 'Analysis File' is set to 'C:\TEDS2008\Work\DIG&DPG-TEDS.sav'. Under 'Select Analysis Type', 'Percentages and Means' is selected, and 'Exclude Missing From Analysis' is checked. The 'Select Variables' section shows a list of variables, with 'TARGETP' and 'MIC002C' selected as grouping variables and 'MPCK' as an analysis variable. The 'Weight Variable' is set to 'FINWGTP' and 'Replicate Weights' to 'FINRWP1'. The 'Number Of Decimals' is set to 2. The 'Output Files' field is 'C:\TEDS2008\Work\Admission_Exam&MPCK*'. The 'Start SPSS' button is highlighted.

The results of this analysis are presented in Figure 4.18. In this example, each country's results are separated by program group and presented on up to four lines, one for each value of the MIC002C variable that occurs in the data. The results are presented in the same manner as in the previous examples, with countries identified in the first column, program groups in the second, and the categories of MIC002C in the third column. Figure 4.18 shows that in the majority of countries future primary teachers are in general not likely to have higher mathematics pedagogy content knowledge with increasing importance given to admission examinations in the institutions. In Georgia the results of entrance examinations were considered very important by 100% of the institutions, whereas in Singapore and Norway (ALU) all future primary teachers were from institutions that did not consider admission examination results at all. In Chile, Chinese Taipei, the Philippines, and Norway (ALU) the mathematics pedagogy content knowledge of future primary teachers is lower, with increased importance placed on the results of admission examinations. Botswana, Poland, Russian Federation, Thailand, and the United States show no consistent pattern. In Spain mathematics

pedagogy content knowledge is almost the same regardless of the importance placed on examination results. In Malaysia and Switzerland mathematics pedagogy content knowledge scores tend to increase as the importance placed on admission examinations increases. However, the standard errors have to be taken into account. It should be noted that this type of analysis does not show whether the differences between groups are statistically significant.

Figure 4.18 Output for Example Institutional Program Level Analysis

Average for MPCK by (IDCNTRY TARGETP MIC002C) ALL\SELECT\CHAR\INSTITUT *COUNTRY ID* *LEVEL GRADUATES QUALIFY TO TEACH - PRIM*		EXAMINATION	N of Cases	Sum of FINWGETP	Percent (s.e.)	MPCK (Mean)	MPCK (s.e.)	PAGE Std.Dev.	1 Std.Dev. (s.e.)	Percent Missing
Botswana	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	NOT CONSIDERED	43	54	54.00	447.26	12.69	74.88	12.72	.00
		NOT VERY IMPORTANT	17	19	19.00	458.03	13.09	69.65	13.64	.00
		VERY IMPORTANT	26	27	27.00	442.98	18.12	79.27	18.35	.00
Chile	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	NOT CONSIDERED	604	1851	96.72	426.88	3.54	88.71	3.74	.48
		VERY IMPORTANT	23	63	3.28	378.87	20.62	110.32	8.99	.00
Chinese Taipei	PRIMARY GENERALISTS (GRADE 6 MAX)	NOT CONSIDERED	503	1911	53.16	592.06	3.26	66.54	3.81	.00
		SOMEWHAT IMPORTANT	91	432	12.03	603.43	7.11	72.82	6.70	.00
		VERY IMPORTANT	329	1252	34.82	588.70	5.26	69.19	2.92	.00
Georgia	LOWER PRIMARY GEN. (GRADE 4 MAX)	VERY IMPORTANT	506	659	100.00	345.14	4.93	99.72	3.69	.00
Malaysia	PRIMARY MATHEMATICS SPECIALISTS	NOT CONSIDERED	34	37	13.37	455.60	12.64	66.43	8.13	.00
		SOMEWHAT IMPORTANT	47	53	19.40	502.85	9.12	63.67	8.46	2.35
		VERY IMPORTANT	172	184	67.23	499.33	4.22	59.67	3.90	.00
Philippines	PRIMARY GENERALISTS (GRADE 6 MAX)	NOT CONSIDERED	12	54	1.90	489.57	31.21	64.24	11.21	.00
		NOT VERY IMPORTANT	10	75	2.63	449.20	1.04	54.31	16.51	.00
		SOMEWHAT IMPORTANT	84	506	17.67	457.04	4.84	53.50	5.37	.00
		VERY IMPORTANT	461	2226	77.79	457.33	12.70	69.94	6.70	.00
Poland	LOWER PRIMARY GEN. (GRADE 4 MAX)	NOT CONSIDERED	1268	3194	70.19	437.71	2.64	93.60	2.67	1.23
		NOT VERY IMPORTANT	28	68	1.49	423.66	13.70	86.95	10.27	.00
		SOMEWHAT IMPORTANT	117	324	7.12	472.37	7.38	73.94	6.89	.00
		VERY IMPORTANT	282	964	21.19	490.40	4.18	69.98	4.66	.00
	PRIMARY MATHEMATICS SPECIALISTS	NOT CONSIDERED	187	738	63.11	569.47	5.53	83.90	5.51	.00
		NOT VERY IMPORTANT	16	136	11.58	620.87	16.09	59.60	5.91	.00
		SOMEWHAT IMPORTANT	6	12	1.05	573.98	20.69	60.14	14.79	.00
		VERY IMPORTANT	59	284	24.25	583.19	7.96	59.45	6.69	.00
Russian Federation	LOWER PRIMARY GEN. (GRADE 4 MAX)	NOT CONSIDERED	247	992	12.84	489.77	18.32	77.50	11.28	.00
		SOMEWHAT IMPORTANT	40	117	1.52	528.43	13.64	52.81	4.55	.00
		VERY IMPORTANT	1829	6619	85.64	512.00	9.41	84.81	6.12	.27
Singapore	PRIMARY GENERALISTS (GRADE 6 MAX)	NOT CONSIDERED	262	295	100.00	588.30	4.10	73.32	4.40	.38
	PRIMARY MATHEMATICS SPECIALISTS	NOT CONSIDERED	117	128	100.00	603.70	7.04	65.71	4.68	.00
Spain	PRIMARY GENERALISTS (GRADE 6 MAX)	NOT CONSIDERED	903	2940	81.13	492.63	2.22	61.51	2.82	.00
		SOMEWHAT IMPORTANT	53	105	2.91	490.49	12.35	64.23	9.29	.00
		VERY IMPORTANT	106	579	15.96	495.09	7.40	73.29	14.18	.00

Figure 4.18 Output for Example Institutional Program Level Analysis (contd.)

Switzerland	LOWER PRIMARY GEN. (GRADE 4 MAX)	97	132	82.50	.29	521.47	6.44	71.76	12.83	.00
	VERY IMPORTANT	24	28	17.50	.29	507.02	14.69	69.07	9.74	.00
	PRIMARY GENERALISTS (GRADE 6 MAX)	644	807	92.65	.15	538.08	2.15	60.23	1.95	.00
	VERY IMPORTANT	50	64	7.35	.15	556.57	9.11	71.94	15.77	.00
Thailand	PRIMARY MATHEMATICS SPECIALISTS	72	149	12.28	.18	526.68	6.53	63.24	6.61	.00
	NOT VERY IMPORTANT	18	37	3.04	.01	483.73	11.62	59.39	11.53	.00
	SOMEWHAT IMPORTANT	251	517	42.72	.02	503.24	3.36	64.10	4.04	.00
	VERY IMPORTANT	244	508	41.96	.18	501.54	4.65	75.22	6.76	.00
United States	PRIMARY GENERALISTS (GRADE 6 MAX)	423	7812	50.07	8.82	546.05	5.67	70.86	4.37	34.39
	NOT VERY IMPORTANT	73	905	5.80	3.09	536.44	2.57	73.10	3.56	20.79
	VERY IMPORTANT	385	6885	44.13	8.72	541.08	5.03	61.34	2.92	19.56
	PRIMARY MATHEMATICS SPECIALISTS	43	320	14.26	10.42	555.47	9.77	43.44	2.71	30.69
	SOMEWHAT IMPORTANT	17	269	11.96	8.41	534.29	22.86	59.89	11.90	40.08
	VERY IMPORTANT	58	1657	73.78	15.79	543.30	7.62	81.27	11.07	18.07
Norway (ALU)	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	331	1226	100.00	.00	540.28	3.31	59.01	2.22	.00
Norway (ALU +)	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	141	390	92.41	.01	565.06	6.46	69.92	3.86	.00
	VERY IMPORTANT	14	32	7.59	.01	551.19	20.11	74.36	17.98	.00
x-International Average	LOWER PRIMARY GEN. (GRADE 4 MAX)	.	.	11.04	.46	482.98	6.53	80.96	5.77	.
	NOT VERY IMPORTANT	.	.	.10	.00	423.66	13.70	86.95	10.27	.
	SOMEWHAT IMPORTANT	.	.	.58	.08	500.40	7.75	63.38	4.13	.
	VERY IMPORTANT	.	.	14.96	.44	463.64	4.65	80.90	3.24	.
	PRIMARY GENERALISTS (GRADE 6 MAX)	.	.	25.26	.71	541.11	5.38	66.12	2.30	.
	NOT VERY IMPORTANT	.	.	.56	.29	492.82	1.39	63.71	8.44	.
	SOMEWHAT IMPORTANT	.	.	2.17	.63	516.99	5.02	63.52	4.22	.
	VERY IMPORTANT	.	.	12.00	.89	527.75	3.75	69.14	4.52	.
	PRIMARY/LOWER SEC. GEN. (GRADE 10 MAX)	.	.	22.88	.00	494.87	3.76	73.13	3.50	.
	NOT VERY IMPORTANT	.	.	1.27	.00	458.03	13.09	69.65	13.64	.
	VERY IMPORTANT	.	.	2.52	.00	457.68	11.34	87.99	9.07	.
	PRIMARY MATHEMATICS SPECIALISTS	.	.	13.54	.70	542.19	3.89	64.54	2.60	.
	NOT VERY IMPORTANT	.	.	.97	.04	552.30	9.92	59.50	6.48	.
	SOMEWHAT IMPORTANT	.	.	5.01	.56	528.59	8.08	61.95	5.29	.
	VERY IMPORTANT	.	.	13.81	1.05	531.84	3.17	68.90	3.78	.

References

IBM Inc. (2011). *SPSS for Windows* (version 19.0). Chicago, IL: SPSS Inc.

IEA (2011). *International Database Analyzer* (version 2.0). Hamburg, Germany: International Association for the Evaluation of Educational Achievement (IEA) Data Processing and Research Center.

Tatto, M. T., (Ed.) (2012). *Teacher Education and Development Study in Mathematics (TEDS-M): Technical Report*. Amsterdam: IEA.

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M. & Reckase, M. (2012). *Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries. Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam: IEA.

