

### **Purpose**

The purpose of the B-MTL instrument is to measure beliefs about mathematics teaching and learning through teacher self-report. Specifically, B-MTL is designed to measure the strength of conviction as it relates to three distinct beliefs: Transmissionist, Facts First, and Fixed Instructional Plan. The three constructs are described in [Schoen and LaVenía \(2019\)](#).

The 2021 B-MTL data were used in a multiyear randomized controlled trial that was designed to study the effect of a teacher professional development program called Cognitively Guided Instruction (CGI; [Schoen et al., 2022](#)) on teachers, teaching, and students. Annual waves of data collection occurred in 2019, 2020, 2021, and 2022.

### **Previous Versions of the Instrument**

A total of 21 items were used on the B-MTL instrument. These items were identical to those described by [Schoen and LaVenía \(2019\)](#) and in the [Beliefs about Mathematics Teaching and Learning \(B-MTL\): First Administration by Participant in 2019](#) data set.

A five-point, Likert-type scale was used for each item. The response categories were labeled: strongly agree, agree, undecided, disagree, and strongly disagree. Five of the 21 items were reverse-coded; four of which (BMTL18, BMTL06, BMTL17, and BMTL10) correspond to the Transmissionist scale, and one of which (BMTL05) corresponds to the Facts First scale.

### **Data Collection and Management**

The B-MTL questionnaire was administered through an online survey using Qualtrics software. Response data were exported from Qualtrics and cleaned using syntax in SPSS. Participant identification numbers were fully de-identified data before psychometric data analysis occurred. Only the deidentified ID numbers are included in these files.

### **Sample and Setting**

Data were collected in spring 2021 for the [Foundations for Success: Developing Effective Mathematics Educators through Cognitively Guided Instruction](#) project. The B-MTL 2021 sample includes responses from 1,352 educators before cleaning the missing data. The analytic sample used for psychometric analysis for B-MTL 2021 is composed of 1,347 educators' responses to 21 items.

Demographic information for the participants were not available at the time of publication and will be added in the future.

### **Data Analysis and Results**

#### **Dimensionality**

Dimensionality of the B-MTL 2019 scales were investigated using parallel analysis (PA). PA results suggested one dominant component for each B-MTL 2019 first administration scale, which is also consistent with the PA results of the B-MTL 2019 first administration sample.

### **Vertical Scaling Using Item-Response Theory**

Vertical scaling using Item response theory (IRT) was implemented to link the B-MTL 2021 to the B-MTL 2019 first administration so that the theta estimates could be directly compared. Because it was a relatively large sample, and the teachers in the FS B-MTL 2019 First Administration sample had not yet participated in the intervention, the FS B-MTL 2019 First Administration data set was used to establish a baseline for equating scores across this and subsequent waves of data collection.

Because Fixed Item Parameter calibration approach was used to implement the vertical scaling across the waves, item parameter estimates remained the same as in the B-MTL 2019 first administration calibration. The item discrimination index of the items in the Transmissionist, Facts First, and Fixed Instructional Plan scales ranged from 1.404 to 3.004, 1.532 to 2.642, and 1.350 to 3.181, respectively. The thresholds for each scale are provided in the output files inside the IRT folder.

The population means and standard deviations of the Transmissionist, Facts First, and Fixed Instructional Plan scales were freely estimated. The estimated population means and standard deviations of the Transmissionist, Facts First, and Fixed Instructional Plan scales are  $-0.437$  and  $1.340$ ,  $-0.425$  and  $1.057$ , and  $-0.122$  and  $1.081$ .

Both summed scores and IRT person ability estimates (i.e., theta scores) are provided in the output file containing the person-ability estimates. Summed scores were calculated as a sum of the responses to the items in each scale. Maximum Likelihood Estimation method and Expected *A Priori* method were used to estimate person locations on the latent continuum.

### **Reliability**

Reliability estimates of response pattern scores (i.e., marginal reliability) are also reported. Detailed description of the data analysis procedures, including the replication code, are available in the folders and files published in Open Science Framework.

Marginal reliabilities for response pattern scores of the Transmissionist, Facts First, and Fixed Instructional Plan scales were 0.91, 0.82, and 0.84, respectively.

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**References**

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