SCHOEN RESEARCH

FCR STEM

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 LaVenia (2019).

The 2020 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. Subsequent waves of data collection were planned for spring 2021 and spring 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 LaVenia (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 before psychometric data analysis occurred. Only the deidentified ID numbers are included in these files.

Sample and Setting

Data were collected in spring 2020 for the Foundations for Success: Developing Effective Mathematics Educators through Cognitively Guided Instruction project. The B-MTL 2021 sample includes responses from 1,388 educators. The analytic sample used for psychometric analysis for B-MTL 2020 remained the same with 1,388 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 2020 scales were investigated using parallel analysis (PA). PA results suggested one dominant component for each B-MTL 2020 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 2020 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 for the B-MTL 2020 sample were found to be –0.387 and 1.232, –0.347 and 1.084, and –0.174 and 1.053.

Both summed scores and IRT person ability estimates (i.e., theta scores) are provided in the output files 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

The reliabilities 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 0.90, 0.82, and 0.83, respectively.

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References

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