Students' academic achievement can be influenced by various factors. Individual context: social skills, climate, motivation, perceived difficulty, or belief in the value of the subject. School context: school characteristics (e.g., location, size, resources, or teacher's characteristics). Previous studies showed mixed results on the factors influencing academic achievements. Limited research examined factors affecting students' math achievement using Multilevel Structural Equation Modeling (MSEM).

This study aims to investigate influential factors on students' math achievement using MSEM.

METHODS

Data
- Trends in International Mathematics and Science Study (TIMSS) 2019 US Data
- 8th grade students (Level-1): 5,068
- Schools (Level-2): 225
- Average number of students in schools (Range): 22.5 [3, 47]

Analysis
- SEM in each level to explore factors that affect students' math achievement
- Multilevel SEM (MSEM) with both Student and School Sampling Weights
- Maximum Likelihood estimation with Robust standard error (MLR)

Statistical Software
- Mplus ver. 8.9 (Muthén & Muthén, 2017)
- R ver. 4.3.0 (R Core Team, 2022)
- Dire ver. 2.1.1 (Bailey et al., 2023)
- EdSurvey ver. 3.1.0 (Bailey et al., 2023)

RESULTS
- Using SEM for each level, five influential factors were found in US 8th grade students' math achievement.
- Student level factors (3): school climate, perceived difficulty in math, and math class climate
- School level factors (2): school resources for math and school discipline and safety
- Intraclass Correlation Coefficients for math achievement ranged from .265 to .281.
- Global fit indices of the MSEM model are shown in Table 1.

DISCUSSION
- MSEM approach can reduce measurement error.
- The data structure (students are nested in their schools) is taken into account in MSEM.
- Limitations
  - Small sample size of the teacher level (65 teachers)
  - Convergence issue when the variables were defined as categorical

REFERENCES