Draw a Mathematician Task & Rubric
Our Mathematical World R&D Team
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This task indirectly measures children's thinking about mathematicians, including who mathematicians are and what they do.

Purpose

- The "Draw a Mathematician" task measures how students perceive mathematicians.
- Drawings and responses provide information regarding stereotypes and biases students hold around mathematics and mathematicians, as well as how they position mathematicians in relation to their own self-concept (a facet of mathematical identity).

Measure Details

- This measure consists of a prompt and a coding rubric for responses.
- The students are asked to draw a picture of a mathematician using colored markers and to provide a written description of their drawing.
- Student responses to the prompt are coded for the presence of mathematical features:
    - Symbols of Knowledge, such as idea "lightbulbs" or phrases, books
    - Symbols of Research, such as STEM laboratory equipment
    - Technology, such as computers or tablets
    - Math Symbols, such as symbols for addition or multiplication operations
    - Teaching Symbols, such as a whiteboard or chalkboard
    - Math Difficulty
        - Basic Arithmetic, such as addition and subtraction
        - Advanced Arithmetic, such as multiplication, division, fractions, and decimals
        - Algebra, such as pre-algebra, algebra, and calculus
        - Geometry, such as triangles, circles, angles, line graphs, and bar graphs
    - Emotional Valence (positive, negative, and/or neutral elements)
- Student drawings and descriptions are also coded for the inclusion of any gender markers:
    - Gender Appearance, such as a male, a female, or a non-gendered mathematician, based on the representation of typical gender expression
    - Gender Salience, such as a male or a female mathematician, based on the mention of gender or use of gendered pronouns/language in the written descriptions

Contribution to the Field

- Research substantiates that gender stereotypes around performance and belonging in STEM fields can impact students' interests and motivation around their own ability (Master et al., 2021) as well as their future performance and long term learning trajectory (e.g., Riegle-Crumb, 2021). In addition to explicit measures of stereotypes,

which ask students to report their beliefs on gender performance in STEM, indirect measures can elicit biases that may be unconscious or less preferential.
- "Draw a Scientist" tasks have been used to assess how students understand scientist roles and characteristics, and have been used in multiple studies with younger students (e.g., Chambers, 1983; Miller et al., 2018). There are also some efforts to investigate student thinking and stereotypes using "Draw a Mathematician" tasks (e.g., Kim et al., 2023, 2025; Picker & Berry, 2000; Rock & Shaw, 2000), though many focus on early elementary (kindergarten through third grades) or teen students.
- This version of the "Draw a Mathematician" task was primarily used with a demographically diverse student population in grades 3-5, and was also tested with students in 7th grade.

Development History and Previous Uses

- The "Draw a Mathematician" task has been used in several researcher-led efficacy studies of Our Mathematical World, an elementary math product which interweaves complex problem solving, executive function skills, and connections between mathematics and the real world to build students' math identity and math belonging.
- As the task has been administered, analyses have been conducted to explore its measurement structure and scoring protocols.

Accessing the Measure

- For additional information and to access the measure, please contact:
    - Dr. Caroline Hornburg at chornburg@vt.edu

Associated Publications

Kim, J., Hornburg, C. B., McElveen, T., Grose, G. E., Berry, C. A., Elardo, G. C., Begley, C. V., Mayes, A. S., Miller-Cotto, D., Andres-Salgarino, M. B., Powell, S. R., Schmitt, S. A., & Purpura, D. J. (2023, March). *Examining gender differences in children's math identity and representations of mathematicians across elementary grades* [Poster Presentation]. Biennial Meeting of the Society for Research in Child Development (SRCD), Salt Lake City, UT.

Varnell, S. C., Kumar, S., Joy, A. J., McElveen, T. L., Miller-Cotto, D., Prishker, N., Wilkey, E. D., Ribner, A. D., Kim, J. , Valdivia, I., Grose, G. E., Powell, S. R., Schmitt, S. A., & Purpura, D. J., & Hornburg, C. B., (2025, May). *How children's drawings of mathematicians relate to their gender and math identity* [Poster Presentation]. Biennial Meeting of the Society for Research in Child Development (SRCD), Minneapolis, MN.