Adapted Tomoji Emotion Scale
Fraction Ball R&D Team
Last updated 11.04.25

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This scale measures students' self-reported perceptions of their emotions during a mathematics activity.

Purpose

- The adapted Tomoji Emotion scale provides insight to students' math-related emotions over time when participating in a math learning activity, Fraction Ball.
- Emotions are critical indicators of students' receptivity to and motivation during learning activities; mathematics learning may present a unique context that shapes students' affective experiences. Understanding how students' emotional profiles are engaged during a mathematics activity can provide insight to the efficacy of that activity's design, as well as informing instructional practice.

Measure Details

- The seven items in this measure each capture students' perceptions of a different emotion during a math activity: happy, bored, challenged, excited, nervous, frustrated, and hopeful.
- The measure uses "tomoji" (tomato emoji) icons to represent the emotion for each item, and students' respond using a 5-point Likert scale ("not at all [emotion]", "a tiny bit [emotion]", "kind of [emotion]", "[emotion]", and "very [emotion]").
- In analyses, the item scores for happy, excited, and hopeful emotions are able to be combined into a Positive Math-Related Emotion composite score, and the bored, nervous, and frustrated emotions make up a Negative Math-Related Emotion composite score; these combinations are informed in part through valence analyses from Karamarkovich & Rutherford (2021).

Contribution to the Field

- This scale was adapted from a more extensive survey assessment aligned with the Control-Value Theory of Achievement Emotions, which included tomoji-based items to measure the constructs of Expectancy, Value, Emotions, and Achievement (Karamarkovich & Rutherford, 2021).
- The adapted Tomoji Emotion scale revised how the items were presented to students, as well as the scoring approach and composite calculations.

Development History and Previous Uses

- The measure has been used in two mid-to-large scale evaluation studies for a mathematics learning product focused on fraction knowledge, Fraction Ball, with elementary students, along with other small-scale efficacy studies of the platform.

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Accessing the Measure

- You may access the measure here:
    - Guo. S., Bailey, D.H., Rhodes, K., Begolli, K.N., Bermudez, V.N., Lawrence, L., Alvarez-Vargas, D., Acevedo-Farag, L.M., Ahn, J., Bustamante, A.S., & Richland, L.E. (2024). Buckets of fun: Impacts of fraction ball activities on students' math-related emotions. Journal of Applied Developmental Psychology, 92, 101645. https://doi.org/10.1016/j.appdev.2024.101645
    - https://www.uciscienceoflearning.org/uploads/1/1/7/8/117864006/buckets_of_fun_fraction_ball.pdf
- The original Expectancy, Value, and Emotion scales with corresponding Tomojis can be accessed here:
    - Karamarkovich, S. M., & Rutherford, T. (2021). Mixed feelings: Profiles of emotions among elementary mathematics students and how they function within a control-value framework. *Contemporary Educational Psychology, 66*, 101996. https://doi.org/10.1016/j.cedpsych.2021.101996
- For additional information on the adapted measure, please contact:
    - Dr. Andres Bustamante at asbustam@uci.edu or
    - Siling Guo at silingg1@uci.edu