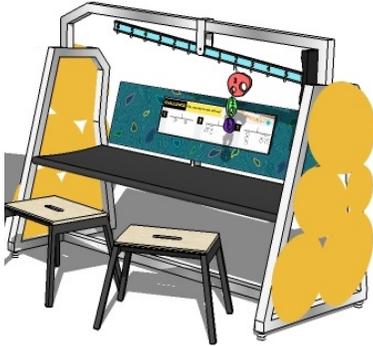


Math Content

While the REVEAL study sought to understand staff facilitation in general, it was carried out in the context of exhibits that focused on math. In order to conduct a rigorous study, the team had to define the kind of mathematical reasoning we hoped to see and develop instruments to reliably measure it.

Mathematical Reasoning in REVEAL



The REVEAL study used three components of the **Design Zone exhibition**, which was created to engage visitors in functional reasoning, a type of algebraic thinking.¹ Functional reasoning deals with quantities that are predictably related, so that a change in one quantity results in a change in the other. Set in real-world contexts of creative problem solving through art, music, and engineering, each Design Zone exhibit focused on a specific relationship among two or more quantities or variables. Through interaction with the exhibit, visitors were encouraged to explore the question: "When <Quantity 1> changes in a particular way, how does <Quantity 2> change?" Once they figured out the relationship, visitors were able to use their understanding to accomplish a task, such as creating a balanced, esthetic mobile or collaboratively completing an Etch-A-Sketch drawing.

For example, at the Balancing Art exhibit used during REVEAL (pictured on the left), visitors hang pieces of different weights on either side of a pivoting rod in order to create a balanced mobile. Since each piece is marked with its weight and the positions on the rod are labeled with their distance from the center, the exhibit engages visitors with the mathematical relationship among weight, distance, and force that underlies all mobiles: the force that an object exerts is the product of its weight and its distance from the point, or fulcrum, from which the rod is suspended.

Measuring Functional Reasoning, Math Awareness, and Math Enjoyment

The REVEAL team created an overall framework for investigating visitors' functional reasoning, consisting of four dimensions: (a) identifying mathematical quantities, (b) describing mathematical relationships, (c) exploring mathematical relationships, and (d) achieving mathematical goals. The **rubrics for each exhibit** were based on this framework and were used to code videos of families at the exhibits. The team also developed survey instruments to measure families' **enjoyment of the mathematics** and awareness of the mathematics in the exhibit.

¹ Greenes, C. E., & Rubenstein, R. (Eds.). (2008). *Algebra and algebraic thinking in school mathematics: Seventieth yearbook*. Reston, VA: National Council of Teachers of Mathematics. Kaput, J. J., Carraher, D. W., & Blanton, M. L. (2008). *Algebra in the early grades*. New York: Lawrence Erlbaum Associates/National Council of Teachers of Mathematics.



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