Finding the value in mathematics

Valuing mathematics is important for mathematical learning, but we can value mathematics for different reasons. According to a key theory in education – the Expectancy-Value Theory of Achievement Motivation[1] – three types of value are:

- intrinsic value: valuing mathematics because you find it **enjoyable**,
- attainment value: valuing mathematics because it is **important for your identity**, and
- utility value: valuing mathematics because you believe it will be **useful for your current life and/or future** plans and goals.

Research has shown that students with higher levels of **utility value** are more likely to persist studying mathematics and STEM subjects into upper secondary school and beyond[2].

How do we increase students' utility value?

Part of good pedagogical practice is showing students how things they are learning in the classroom link to the real-world. However, for mathematics, research has shown that when teachers use direct instruction to communicate the importance of mathematics – that is, when they tell students how the mathematics skills and knowledge they are acquiring are important for their daily life – this can have **no impact or a negative impact** on students' mathematics engagement[3].

A different approach is to use a utility-value intervention: this focuses on developing students' utility value by helping them see and make their own personal connections with mathematics. Research has found that utility-value interventions that give students agency to develop their own meaningful links to mathematics, and help them to see it as personally relevant, can lead to increased mathematics motivation and persistence[4].

Rather than telling students why mathematics is useful for their lives, help them make their own connections.

A utility-value intervention involves asking students to do a task that helps them make connections with mathematics that are:

- **personal** (the student must make their own connections)
- **specific** (the student must make the connection between a specific mathematics topic and one of their specific interests or goals)
- **topic-related** (the student must make the connection to a topic they are currently studying)

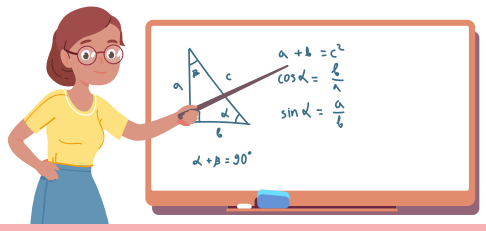
It is a philosophy, not a once-only event

The utility value approach needs to be **embedded in planning** so it becomes a habit and a philosophy for generating meaning and engagement. Students need time to reinforce their own connections with mathematics in **every topic**.

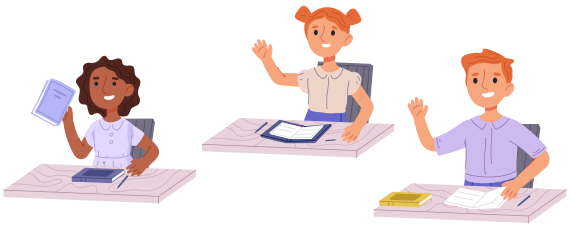
- *How might it be possible to do this activity with every mathematics topic?*
- *When is the best time to do it – before, during or after a unit, and at multiple time points?*

How can I use this in my classroom?

Research reminder:



If a teacher tells a student why a mathematics topic is important, on average, it can have no positive effect.



If a student finds their own personal connection with a mathematics topic, this can have a positive effect.

To implement this idea in your classroom: think about a task you could run that allows students to develop their own connections that make mathematics personally relevant. Below are some key questions that you can ask to help students find their own connections with a mathematics topic.

Personal domain

- What are your interests, hobbies and personal goals?
- What media do you access/watch for information or entertainment?

Mathematics domain

- What is the mathematics topic we are studying in class?

Find a connection

When designing a utility-value task, think about how it would work best in your context. For instance, would it be better for students to think of connections individually or would a class discussion help? Could students share connections with each other?

If students are starting a new topic and are unaware of the new mathematics they will be learning, you may need to choose an optimal time to do the utility-value task. Students will need some understanding of the topic before they can connect it to their lives.

[1] Eccles, J. S., & Wigfield, A. (2023). Expectancy-value theory to situated expectancy-value theory: Reflections on the legacy of 40+ years of working together. *Motivation Science, 9*(1), 1-12. https://doi.org/10.1037/mot0000275

[2] Edwards, D., Buckley, S., Chiavaroli, N., Rothman, S., & McMillan, J. (2023). The STEM pipeline: pathways and influences on participation and achievement of equity groups. *Journal of Higher Education Policy and Management, 45*(2), 206-222. https://doi.org/10.1080/136008 0X.2023.2180169

[3] Canning, E. A., & Harackiewicz, J. M. (2015). Teach it, don't preach it: The differential effects of directly-communicated and self-generated utility-value information. *Motivation Science, 1*(1), 47-71.

[4] Hulleman, C. S., & Harackiewicz, J. M. (2021). The Utility-Value Intervention. In G. M. Walton, & A. J. Crum (Eds.), *Handbook of Wise Interventions: How Social-Psychological Insights Can Help Solve Problems* (pp. 100-125). New York: The Guildford Press.

[5] Activity adapted from Hulleman & Harackiewicz (2021)

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