Kindling student success with relevant math pathways

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Purpose and Relevance

“Students value school when they understand how it is related to things they care about and how it can help them reach their long-term goals. Students value their schoolwork when they believe it is relevant to their lives and experiences and/or will help them connect to a purpose that is bigger than themselves—whether it is a contribution to their family, their community, society at large, or something else.”

Romero, C. (2015). What we know about growth mindset from scientific research. SERN Research Summary
Students' perception of the purpose or relevance of their schoolwork shapes their responses to challenges in school

**EXAMPLE OF A CHALLENGE**
Student faced with a tedious or difficult academic task

- **If the student doesn't see the larger purpose or personal relevance of their schoolwork...**
  - “Doing well on this task doesn't matter to my life or those I know and care about.”
  - Distractions arise out of the blue; less likely to persist
  - Diminished academic engagement and performance

- **MINDSET**
- **PSYCHOLOGICAL INTERPRETATION**
  - “It's difficult, but it's relevant to people I know and can help me make a difference in the world.”
- **BEHAVIORAL RESPONSE**
  - Engages in deeper learning and maintains effort on task in spite of potential distractions
- **ACADEMIC OUTCOME**
  - Increased academic engagement and performance

- **Negative outcomes diminish motivation**

- **If the student sees the larger purpose or personal relevance of their schoolwork...**

- **Positive outcomes reinforce motivation**

Rob has 40 coins, all dimes and quarters, worth $7.60. How many dimes and how many quarters does he have?

Maria wants to purchase new carpet for her bedroom. Her room is 12 feet wide and 10 feet long. How many square feet of carpet should Maria buy?

A train starts from Los Angeles and heads for Chicago at 40mph. Two hours later a different train leaves the same station for Chicago traveling 60mph. How long before the second train overtakes the first train?
How to incorporate authentic contexts

Use data from real sources:

- American Cancer Society, American Diabetes Association, American Lung Association, etc.
- Consumer Reports
- Bureau of Labor Statistics
- Bureau of Justice Statistics
- Census Bureau
- Consumer Financial Protection Bureau
- U.S. Fire Administration
- United States Geological Survey
- Congressional Budget Office

- Environmental Protection Agency
- Internal Revenue Service
- U.S. News and World Report
- World Bank
- World Health Organization
- Local chamber of commerce or board of commerce and industry
- Institutional data (e.g. costs, enrollment, demographics, campus dimensions, programs)
Rob has 40 coins, all dimes and quarters, worth $7.60. How many dimes and how many quarters does he have?
Doctors use the length of certain bones in the body to predict the height that a child will reach in adulthood. This example will use two equations that relate the length of a child’s ulna (U), measured in centimeters, and the age (A) of the child, measured in years, to the predicted height in centimeters. The ulna is one of the two long bones in the forearm.

Gauld et al. (2004) derived the following equation for female children in Australia.

\[
\text{Height} - 31.845 = 4.459U + 1.315A
\]

Cheng et al. (1998) derived the following equation for female children in China.

\[
\text{Height} - 30.35 = 4.32U + 1.29
\]

Find the length of the ulna (in centimeters) and the age (in years) in which both models will predict a height of 167.64 cm in later life. Does the solution you found in Part B make sense? Why or why not?
Maria wants to purchase new carpet for her bedroom. Her room is 12 feet wide and 10 feet long. How many square feet of carpet should Maria buy?
Bob and Carol Mazursky have recently purchased their first home. The scale model shows the rectangular lot, the house, the driveway, and the backyard.

The Mazurskys decide to begin their improvements with fertilizing and reseeding the backyard. They found an ad for Gerry’s Green Team lawn service. Gerry came to their house and said that the job would take about four hours and would cost about $600.

Is Gerry’s estimate consistent with his advertisement? Why or why not?

**Gerry’s Green Team**

**Itemized Costs:**

- Grass seed: 4 pounds per 1,000 sq. ft. @ $1.25 per pound
- Fertilizer: 50 pounds per 12,000 sq. ft. @ $0.50 per pound
- Labor: $45 per hour
Relevant?

A train starts from Los Angeles and heads for Chicago at 40mph. Two hours later a different train leaves the same station for Chicago, traveling 60mph. How long before the second train overtakes the first train?
The point on Earth’s surface directly above where an earthquake occurs is called the epicenter. The distance from the epicenter of an earthquake can be measured using the P-wave (or primary wave) and the S-wave (or secondary wave). Suppose the P-wave travels at a speed of 6.0 km/sec and the S-wave travels at a speed of 3.3 km/sec. The S-wave arrives 10 seconds after the P-wave. How far is the monitoring station from the epicenter?
How to incorporate authentic contexts

• Coming up with authentic contexts, especially when we are working with diverse student populations, can be difficult!

• You don’t have to build them all yourself.

• Library of open-source, contextualized math problems that you can use (or use to generate your own ideas) coming soon to https://dcmathpathways.org/resources
To Learn More...

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