POINT/COUNTERPOINT

Do Students Need to Memorize Facts in the Digital Age?

Editor's Note: Starting with this issue, our Point/Counterpoint question and the Readers Respond question will be one and the same, so you can follow the full conversation here and on pages 8–9. To contribute to future discussions, go to *L&L's* group page on the ISTE Community Ning at www.iste-community.org/groups/landl.

Yes

You find yourself in an unfamiliar town with a car that appears to be taking its last breath. You have a choice between two garages. One has the fastest diagnostic tool and mechanics who have trained extensively in computerized analysis, and the other is staffed by mechanics who have worked on cars for years and use computerized diagnostics as a tool to *assist* them. Which would you choose? Most of us would prefer the latter, as their abilities are backed by personal factual knowledge that makes them more valuable and likely to diagnose the problem correctly, whether or not they receive assistance from the computerized diagnostic software.

Robert E. Mahoney

The same concept applies to education. The failure to properly develop underlying declarative knowledge (facts) can have long-term implications. It is foolhardy to expect students to develop procedural knowledge (processes) without the underlying declarative knowledge.

No

Memorize or analyze? In my experience—corporate and academic—analyzing always takes precedence over memorizing. It is the foundation of critical-thinking skills. For example, managers who can think through problems and anticipate alternative scenarios are invaluable.

When we think through problems or make connections, we create new, or reinforce existing, neural pathways in the long-term memory portion of our brains. Children are born with far more neurons in their brains than they will use in adulthood. This is because if a neuron goes unused and never becomes part of a brain pathway, it either dies or becomes unusable (www.brains.org/path.htm). So a major task for educators is to help students reinforce and create as many pathways as possible, because by doing this, they create long-term storage of pathways and develop a better system of recollecting and using memory.

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Willard R. Daggett and Paul David Nussbaum discovered that, given the right

Research at UCLA shows that the digital generation has different neural networks designed for rapid cybersearching. But educators need to ensure that this modified brain still has the capacity to understand the relevance and significance of the retrieved data.

Calculators, for example, represent the epitome of "knowledge at your fingertips." Yet allowing students to use calculators instead of learning basic mathematical facts has created a generation that lacks the ability to estimate the reasonableness of their answers.

As a teacher of both technology and algebra, I have observed that students who fail to memorize multiplication facts are at a disadvantage. Some students grasp only the "possible" answer with the calculator, whereas others are able to grasp the entire concept because they can call upon their store of mathematical knowledge. Students who are factoring, for example, need to realize that the numbers 11 and 28 have something in common: One represents the sum of the numbers 7 and 4, and the other represents the product of those same numbers. Students who lack this factual knowledge because they have learned to rely on technology fail to make that association.

To develop critical-thinking skills, students must have a base of adequate knowledge so they can properly interpret and filter content.

As educators, we should help students develop a "road map" of factual knowledge upon which they can build their critical-thinking skills. To develop these skills, students must have a base of adequate knowledge so they can properly interpret and filter content. Critical thinking and higher-order thinking skills are like the destinations on the map, with stops along the way to acquire the requisite factual knowledge.

Mere access to a plethora of knowledge in this digital age does not ensure that students will have any understanding of the relevance of the material. Students need to develop the associations between various facts. They need to develop a complex neural network that allows them to filter, assess, and associate material. Knowing how to access knowledge using technology is a worthy skill, but having the ability to access a reservoir of factual knowledge provides an invaluable resource for students as they map their future.

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environment, activity, and mental stimulation, the brain can continue making pathways throughout life (www.leadered.com/pdf/Brain Research White Paper.pdf). So we should also model active thinking and learning to help our students develop a lifelong habit of learning that keeps their brains agile.

If we rely on memorization strategies, we are reinforcing only short-term storage of pathways. This leads to disconnects between messages, images, and memory recollection.

I vividly recall memorizing every multiplication combination between 1 and 12. Yet when I needed a number, I often mentally calculated from another number. What if, instead of simply memorizing facts, students played mental games of building tables by adding numbers cumulatively? By doing this, they would create an analytical framework to understand the numbers. Because brains use neurons to create or reinforce long-term storage of pathways, the memorization would still occur as a byproduct of the analytical process.

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Whether to memorize or not is not related to today's digital availability of data. Everything that resides online is a result of human effort to collect, organize, and interpret information. Even when reference materials were available only in print, students could retrieve information, albeit more slowly, and did not have to keep it all in their brains. What has changed is that we can now perform research with much more accuracy and speed to understand a problem, such as how humans learn. Then we can take that research to the next level through analysis, deduction, and further research.

If our students learn to find, organize, and analyze information, they will continually challenge their brains and reinforce their neuron pathways. Their long-term memory storage will work more efficiently, and memorization will occur because they will be thinking about information rather than storing data. And when they become tomorrow's managers and workers, they will be equipped to make informed decisions based on analysis of a situation and its ramifications rather than off-the-cuff decisions based on whatever data is thrown in front of them.

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