Licking an ice lolly at school might make a good memory, but this isn't the secret to learning science

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A group of scientists, including people from the Royal Society of Chemistry, recently proposed that experiences such as licking an ice lolly

should be part of the science curriculum. By licking a lolly and seeing how it melts—the idea goes—children would better learn about melting, and therefore about chemistry and physics.

But does licking a lolly, or experiences such as kneading dough, playing with shadows or digging in soil, actually help pupils to learn science? Deploying examples and demonstrations in the classroom can be a helpful gateway towards deeper understanding, but it's not a shortcut to knowledge.

The idea of learning through experiences has a long history. It's perhaps most closely associated with the work of educator John Dewey in the early 20th century. Dewey and other educators of the time were concerned that an emphasis on rote learning would lead to "inert knowledge": facts that students wouldn't be able to apply to the real world.

An experience like licking a lolly may at least be memorable—especially if you'd never done it before. Licking a lolly or seeing it melt in class would lead to what psychologists call an episodic memory: a memory of an event in your life.

Experience and understanding

However, there is a difference between having memories for events and having knowledge. There is a difference, for example, between having personally lived through the French Revolution and knowing what happened.

The latter involves a different type of memories—semantic memories. These are based on understanding how things work and what they mean. It is the type of memory that is at play when you use a word such as "heavy," unconnected to a specific heavy object. Such understandings

are essential to both scientific learning and our use of language.

If you stop to think about it, most of your knowledge can't be clearly tied to one particular experience. Learning is usually not a one-shot process—think of how much experience a gardener needs before they "know" how plants grow and thrive, for example.

These semantic memories derive from an amalgam of lots of experiences, and sometimes, from comparing and contrasting different things: the difference between two types of plants, or between an ice lolly and an ice cream.

Learning about melting is similar. We don't just demonstrate melting one time, and boom (or squelch), the students have learned it.

Importance of context

Understanding science or anything else is also not just about remembering experiences. Learners need to understand the encounter, to have their attention directed towards similar and different processes, and to experience multiple examples.

To profit most from this, learners need sufficient prior knowledge to understand what is happening when they observe something in class. This is one reason that leaving students to discover things entirely by themselves is a flawed strategy.

It's also another reason why relying on one-off experiences doesn't work. Students need to revisit ideas periodically, each time bringing more knowledge and understanding to the table.

Without a basic understanding of science, there is a risk that a learner will fail to connect a classroom observation to its wider context.

Knowing about melting, for example, is a lot more than knowing that a lolly melts—it involves knowing why, and under what circumstances. It involves knowing that other everyday substances would melt in higher temperatures.

This foundational understanding is also important to stop students from coming up with scientific misconceptions. In the lolly example, students might overgeneralise surface features such as how quickly the lolly melts or how sticky it is, seeing these as characteristics of melting in general.

In short, understanding science or anything else is not just about remembering things. It's about understanding what an experience connects to, what category it is an example of, and how it differs from other concepts.

Personal learning

Another notable claim in the ice lolly story was the suggestion that it is valuable to promote learning "on a personal level". There is research on this, too.

Imagine you were asked to remember a list of random words such as "music, broccoli, dancing, plastic bottles, baby sharks." A study looking at memory found that people better recalled words from lists like this if they were asked "do you like this?" compared to a blander, information-processing question, such as "does the word contain a letter 'e'?". We also remember our own possessions better than generic objects.

So, yes—there is some evidence that we might retain experiences better if we are personally invested in them. However, it's worth noting that such experiments are rather short term. And in everyday life, we can really enjoy and engage with something on a personal level (such as a book or a conversation) yet forget the details within a few weeks or

months.

This is partly why people write diaries. Memories of our lives are ephemeral, easily lost over time. Sometimes such memories are distorted, or even entirely imagined—false memories. It's risky to base science learning upon this type of memory.

If we want students to build up their knowledge of science and be able to use it in future, it's vital that the focus is on strategies that build deep understanding of concepts and how they are structured, rather than relying on gimmicks or one-off experiences.

All of this is to say nothing of the practicality of storing an ice lolly for every school pupil, handing them out in class—or cleaning up afterwards.

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