

LETHAL MUTATIONS IN EDUCATION, AND HOW TO AVOID THEM

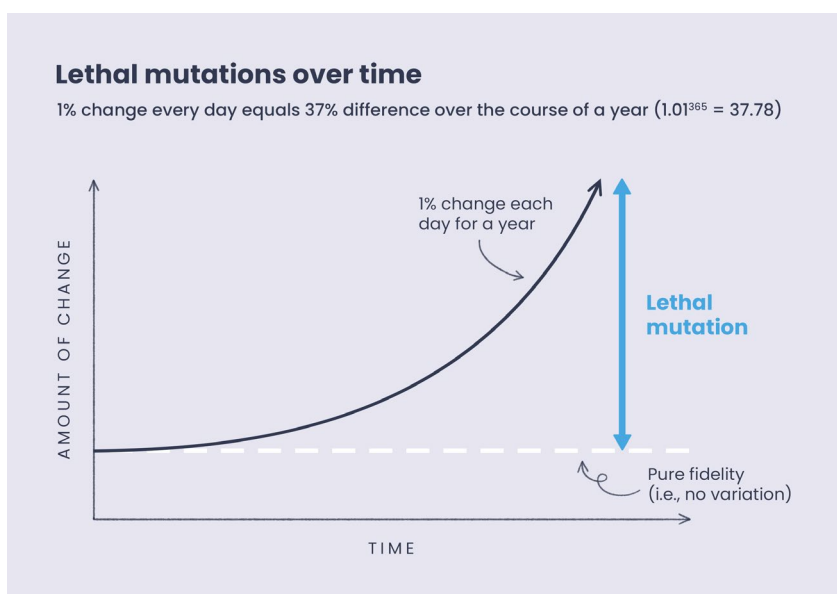
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A lethal mutation, [according to the Education Endowment Foundation](#), happens “when evidence-informed practice is modified beyond recognition from the original practice.” It’s often done with good intentions and driven by a desire to be (or at least appear to be) following “what the research says”.

But what starts as a good idea hoping to be “true” to the research can distort into something else. The result is not only unlikely to help, but in many cases, it can also hinder progress and performance.

Lethal mutations are also insidious. They creep up on you slowly, incrementally, over time – much in the same way that you can’t tell a child has grown in height from one day to the next, but can see an obvious difference after a year. Consider a sound idea changing by only 1% every day. After a year, it will have changed by a huge 37%.



WHAT DO LETHAL MUTATIONS LOOK LIKE IN SCHOOLS?

Lethal mutations are more common in education than it may first appear. Let's consider a few common examples from Cognitive Science principles...

1. Retrieval Practice lethal mutations

Retrieving information from memory by generating an answer to a question has been found to be one of the most effective and efficient ways to accelerate students' learning. It can take many forms such as class quizzes, multiple-choice questionnaires, flashcards or past papers.

Understandably, thanks to its many benefits and relative ease of use, Retrieval Practice has become incredibly popular in education.

However, a lethal mutation can happen when, keen to harness its power, a school mandates the use of Retrieval Practice at the start of each and every lesson with a quiz of five factual questions for students to retrieve. Although this may be beneficial in some subjects, equating all Retrieval Practice to one narrow view and insisting one using this same format all the time constitutes a lethal mutation.

2. Cognitive Load Theory lethal mutations

Cognitive Load Theory highlights the limited capacity of our working memory. It suggests that we can only hold a certain amount of information in it at any one time, and that processing too much new information at once may lead to cognitive overload and can stop learning altogether.

One misconception with Cognitive Load Theory that leads to one of the most common lethal mutations is that it is all about reducing your students' cognitive load. While it's true that too much cognitive load may result in ineffective learning, it's also true that too little can cause students to become bored and complacent, which will also slow down the learning process.

The amount of cognitive load has to be just right for your students to stay engaged and challenged without getting overwhelmed. We call this the Goldilocks Effect – not too much, not too little.

3. Interleaving lethal mutations

Interleaving is the process of mixing up concepts within a subject when studying. Research suggests that this is more effective than blocking, which consists in covering a concept in its entirety before moving on to the next.

This theory has the potential for many lethal mutations. For example, interleaving too many concepts at once – it's not necessarily a case of "the more, the better". This can overwhelm students and lead them to confusing the learning material.

Another common lethal mutation is interleaving unrelated topics, instead of different concepts within the same topic or subject. Although this may lead to a Spacing benefit, this is not Interleaving and won't result in the expected benefits to learning.

HOW TO AVOID LETHAL MUTATIONS IN EDUCATION

When are mutations not lethal?

The good news is that not all mutations are lethal. In fact, some can be really good, and even desirable. Here are four charitable interpretations of why this may happen:

1. ***All journeys start with a first step*** – It shows that an educator may be at the beginning of their journey to becoming more evidence-informed and is starting to embrace applying research findings to their practice.
2. ***Sometimes, a flawed decision is better than no decision*** – Mutations may not be as good as the "optimal" strategy. However, they may be better than the alternative, which is doing nothing. As education leaders, at some stage, we have to plant our flag in the sand and rally behind something, however imperfect.

3. ***We are all novices, really*** – As a community, we are always learning new things from research. Yesterday's ground-breaking scientific innovation may be today's common sense and tomorrow's old hat. There is no doubt that we will all be looking back on our practice in 10 years' time and conclude that it is not exactly what we would still advise. That's just part of the scientific process of learning about learning.

4. ***(Mis)applications can be good*** – Given that a lot of the research happens in an environment that's very different to the one you teach in, you probably don't actually want to replicate some research findings that don't apply to your context. As William James (often referred to as the "father of modern psychology") stated: "*Psychology is a science, and teaching is an art; and sciences never generate arts directly out of themselves.*"

ENCOURAGING INNOVATION IN EDUCATION WHILE AVOIDING LETHAL MUTATIONS

So, how can we tread the line between encouraging a culture of trial and error (which can lead to inventive, creative and helpful mutations) and avoiding lethal mutations? Potentially, by referring back to three central ideas when it comes to applying research findings in real life...

1. Principles, not strategies

Focusing on the key principles or active ingredients instead of a specific strategy allows us to apply and adapt the research findings more effectively. For example, with Retrieval Practice, this could include (but is not limited to):

- ***Challenging but successful*** – If retrieval is too easy, then students aren't thinking hard enough. However, if it too difficult, it can be either demotivating or sub-optimal for memory.
- ***Low stakes*** – Excessive stress can hinder retention and recall. Keeping retrieval low-stakes, which helps differentiate it from a normal assessment, should help enhance learning.
- ***Spaced retrieval*** – As people forget at a far quicker rate than we would like, one-off retrieval is less effective than revisiting the material regularly.

2. Content and context is king

Starting with a specific strategy in mind and a determination to shoehorn it into action, regardless of its appropriateness for the content you're teaching or the context where it will be applied, will likely encourage a rise of lethal mutations. To avoid this, you may ask yourself questions such as:

- What is unique about my subject?
- What are the key features of my cohort?
- What age and stage of their learning journey are they at?

3. Read from a range of sources

This cannot be emphasised enough. No single research paper can ever have a definitive answer. The more research you read, the easier it is to figure out how best to apply the findings, as well as how much weight to place on any given intervention.

FINAL THOUGHTS

Not all mutations are lethal. Almost all are done with the best of intentions. A combination of broken telephone, overconfidence and simplifying of research can lead to something far removed from its original intention. But through trial and error, being open-minded to change and reading lots of research we can hopefully avoid these mutations becoming lethal.