Has cognitive load theory been dealt a devastating blow?

Greg Ashman

Alfie Kohn has taken recent aim at cognitive load theory, but a closer inspection of his arguments shows they may not hold much water.

Alfie Kohn is an unapologetic supporter of progressive education, that long educational tradition that has promised so much and delivered so little. While others sympathetic to the cause play word games and smuggle their ideas into practice under a bewildering variety of ever-changing names, Kohn has remained admirably willing to hoist the standard, unapologetically. Now, in a new blog post with many footnotes, he has taken aim at cognitive load theory and the research of John Sweller.

It is interesting to speculate on why Kohn has chosen to do this. American education academics and pundits have mostly ignored cognitive load theory. This may be because it is not an American creation, even if a remarkably similar theory – the cognitive theory of multimedia learning – is. Perhaps Kohn's attempt at a rebuttal of cognitive load theory indicates that it is starting to percolate through to American education's collective consciousness and that's why it is time for progressive educators to knock it down.

It is tempting to try to chase down all of Kohn's references. I won't do this because I don't really want to, and it would result in a long blog post with an obsessive tone. Instead, I will look at some examples and wider points.

Kohn makes a pre-emptive strike against accusations of 'cherry-picking' – the widely wielded academic criticism that a writer has selected only the sources that support their contention and ignored the ones that do not:

> *I've cited several metaanalyses and other research reviews in the extensive endnotes to this essay precisely so that sceptics can't claim that I've cherry-picked unrepresentative studies to make the case in favour of what is sometimes called progressive education.*

I tend to find accusations of cherry-picking a little tedious. If a writer has missed important sources, point it out – something I now ironically intend to do to Kohn's piece.

For example, Kohn completely ignores the widespread evidence from PISA that inquiry learning is associated with worse learning outcomes. Why is this important? Well, there are three broad types of study that can potentially answer the question of which teaching method works best – small educational psychology experiments, large education experiments and correlational studies. Typically, researchers only consider large education experiments, but these are often the most confounded. They tend to vary more than one factor at a time and often compare a cool new intervention with business as usual.

To control for the expectations of subjects in a study, we should either compare interventions with interventions or business as usual with business as usual. Large correlational studies like PISA do the latter and so are an important part of the picture. This is a key component of the argument of one of the papers Kohn cites but he never mentions this. He does mention a rebuttal of

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that paper but he does not mention the response to the rebuttal. This is all highly selective.

What does Kohn focus on? Well, to bolster his point that explicit instruction is less effective than "some variant of student-centred learning", from early years to college, he cites *two* sources. The first is a Slate article by Alison Gopnik that relates one of her famous experiments with toys: A 'teacher' taught children how to use a toy whereas another researcher showed children the toy but expressed surprise at what it did. Children in the second group were more likely to discover features of the toy that had not been demonstrated.

What does this prove? Not much. We are talking about toys that are designed to be fun and not maths or reading. And it seems reasonable for the children to assume the 'teacher' had shown all the features and not looked for more. It certainly does not prove that direct instruction somehow destroys creativity.

The second source pits 'active learning' against 'traditional lecturing' and summarises the findings of 225 studies. The active learning conditions involved students who listened to lectures but also completed tasks such as worksheets, discussed ideas with a partner or responded to multiple-choice prompts via clickers. This group did better than those who just listened to the lectures.

I am not surprised by this finding. Barring the worksheets, the listed activities in the active learning condition sound like rudimentary versions of the activities described in Explicit Direct Instruction by Hollingsworth and Ybarra. The kind of explicit teaching advocated for by proponents is highly interactive. If you walked around my school during lessons, you would see students answering a question on a mini whiteboard, giving a thumbs up or thumbs down or turning and talking to their partner every couple of minutes or so.

However, Kohn thinks this argument is unfair.

> *On the one hand, [proponents of explicit teaching are] apt to set up inquiry learning for failure by using a caricatured version of it, a kind of pure discovery rarely found in real-world classrooms, with teachers providing no guidance at all so that students are left to their own devices. On the other hand, the version of DI [explicit teaching] they test sometimes sneaks in a fair amount of active student involvement – to the point that the two conditions may just amount to different forms of constructivist instruction.* [references removed]

There is something approaching a point here. Surely, suggests the pragmatist, we should be looking for a compromise between the two extremes. Guidance is important, but so is student involvement. The trouble is that these two do not operate on a continuum. One is a key distinction between inquiry and explicit teaching, whereas the other is not.

If guidance is important, why not agree to have lots of it, at least when learning new things? What about *full* guidance? And if student involvement is important, why not have lots of that, too? Why not have as much as possible of both? This then becomes the kind of explicit teaching proponents advocate.

Wait, what have I done there? Is it a trick? No. The defining feature of explicit teaching is that concepts are fully explained and procedures are fully demonstrated before we ask novices to apply those concepts or procedures. You either do that or you do not. You cannot do both. Inquiry learning requires students to figure something out for themselves, so it is necessarily antagonistic to full guidance – an antagonism that is present throughout Kohn's piece.

However, the definition of explicit teaching says nothing about the amount of student interaction. Unlike inquiry learning and guidance, we can max this out without stopping it being explicit teaching. This is a distinction that Kohn misses.

A key finding of cognitive load theory is that the effectiveness of full guidance does not apply to relative experts. This is something known as the 'expertise reversal effect'. Relative experts already have relevant schemas in long-term memory to draw upon, so they need more practice solving different problem types.

Kohn quotes a 2007 article by Schnotz and Kurschner that is critical of the cognitive load theory of the time to demonstrate that "Reducing cognitive load isn't always desirable … That's

because 'learning can be impeded … when too much help is provided.'" Kohn does not make clear that this quote relates to *relative experts* and certain uses of animations. Here's the full context of the related footnote:

> *This is demonstrated, for example, by the expertise reversal effect, when performance aids (such as worked-out examples) turn out to be disadvantageous for individuals with higher expertise, or when animations prevent learners from running their own mental simulations (cf. Kalguya et al., 1998, 2003; Schnotz and Rasch 2005). Aids are then beneficial for task performance, but not for learning. In other words: Making a task easier does not necessarily result in better learning.*

Cognitive load theory *predicts* the expertise reversal effect. The animation effect seems more complex and it's not obvious to me whether it aligns with the predictions of the theory.

For the final citation rabbit hole, let's find the source for the quote that for reading instruction, "The more a teacher was coded as telling children information, the less [they] grew in reading achievement."

It comes from a process-product study by Michael Rodriguez. 'Telling' is an odd word and sounds like a pejorative description of explicit teaching. We can find out what Rodriguez means by it by looking at an example:

> *During making words activities, the children manipulated their own set of letters as Ginger [the teacher] coached:*
>
> Let's do tub. Listen to the middle sound. It's not tab, it's not tob. It's / ttt-uuu-bbb/. You need a letter for /uuu/.
>
> *While reading leveled books, students tracked with their fingers as they read independently from their own copies. If they got stuck on a word, Ginger coached by providing hints instead of telling them the word.*

So, 'telling' is telling a student what a word is rather than asking them to sound it out. Ginger's teaching seems pretty explicit to me.

Kohn has two criticisms that do land. He doesn't like the separate type of load known as 'germane load'. This makes cognitive load theory unfalsifiable. John Sweller agrees, which is why he has stopped classifying it as a separate kind of load. And this leads to a second criticism – that when their predictions are proved wrong, cognitive load theory researchers review and change the theory. Which doesn't sound like a bad thing to do when you write it down like that.

This only seems like a criticism if we assume that, to be credible, cognitive load theory needs to be some kind of timeless, revealed truth and not a messy, real-world theory still in the process of being developed. Only time will tell whether its adaptions in the face of disconfirming evidence make it more robust or, like the Ptolemaic system's epicycles, are a sign of a need for fundamental revision. At this stage, pundits can take their pick.

I've probably already spent too much time on this. Most of those familiar with cognitive load theory will not be convinced by Kohn's post. Its audience is more likely to be those who are based in the US and have had cognitive load theory cited as evidence against their preferred teaching methods. These folks can then post Kohn's piece into their replies, avoid having to think too much about it and get on with their day.

However, I will just add a short coda before we move on. It was interesting to see a couple of blog posts by Sue Gerrard from 2014 cited by Kohn. It took me back to the heyday of education blogging and some of the to-and-fro of the time. Gerrard's citations sit in a note about 'CLT's simplified view of cognition' that also cites David Jonassen's chapter from *Constructivist Instruction: Success or Failure*? This book is unusual in that it is framed as a debate and allows the opposing side to ask questions at the end of each chapter to the chapter author. It is therefore a great opportunity to post this comment from John Sweller at the end of Jonassen's chapter:

> *I asked whether there was any evidence from randomised controlled experiments indicating that the cognitive distinctions you make have instructional implications. The answer presented is unambiguously 'no', an answer I agree with. You go on to suggest that lack of evidence from randomised, controlled experiments is unimportant because such experiments are themselves unimportant or perhaps impossible, based on atomic physics. We'll have to agree to disagree on that, but there are serious consequences of this position.*
>
> *Is there any technique that could be used to provide evidence that constructivist teaching is a relatively poor method of teaching?*

It's a good question and one I would be interested in Kohn answering.

This article originally appeared on the author's blog, Filling the Pail.

Greg Ashman [@greg_ashman on X] is Deputy Principal at Ballarat Clarendon College, Victoria. He is a prolific blogger and has written three books: The truth about teaching: An evidence-informed guide for new teachers, The power of explicit teaching and direct instruction, *and* A little guide for teachers: Cognitive load theory. *Greg is an honorary fellow at the Australian Centre for the Advancement of Literacy, Australian Catholic University, and a part-time professor at Academica University of Applied Sciences in Amsterdam. Prior to moving to Australia, Greg worked at several comprehensive schools in London.*