

- For secondary teachers

COGNITIVE SCIENCE: COGNITIVE LOAD THEORY

Don't Overload Working Memory

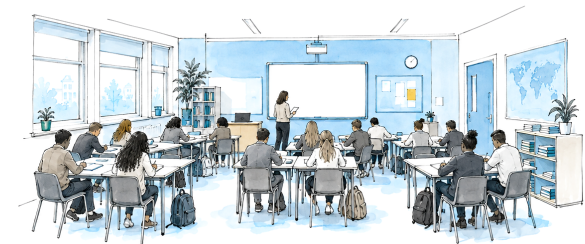
Six experiments run in 1991, split between an Australian trade-training programme and one Year 9 science classroom, not a UK trial.

How many times have you put a diagram next to a paragraph explaining it, and just assumed that combination was helping?

Across six experiments, splitting a diagram from its explanatory text only hurt learning when the two had to be mentally combined to make sense. When a diagram already explained itself, adding separate text made scores worse, not better, and simply merging the text onto the diagram didn't fix it.

● ● ● Evidence: Promising

Independent UK classroom replications with larger samples, direct cognitive-load measures and evidence across additional year groups.

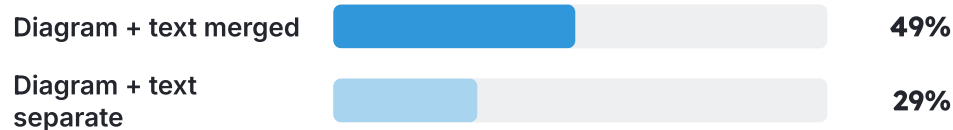


WHAT HAPPENED

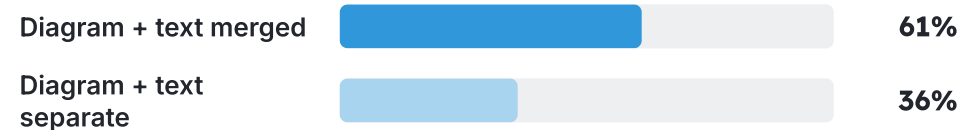
Merging helped only when merging was needed

Chandler and Sweller ran six experiments: trade apprentices learning to test electrical wiring, and Year 9 science learners learning how blood flows around the body. When a diagram needed a separate explanation to make sense of it, physically merging the two into one source raised written test scores by roughly two thirds, and the advantage held for twelve weeks. When the diagram already explained itself without any extra text, the fix wasn't to merge the text in more neatly. It was to delete it: diagram-only groups outscored both the merged and the separate-text groups, in some cases by roughly double.

Right after training



12 weeks later



Written test scores (out of 28) for first-year electrical apprentices learning installation testing in a Sydney company's training programme, tested immediately after a one-week course and again 12 weeks later. "Merged" = diagram and text combined into one source; "separate" = diagram and text kept apart, the format the company already used before the study. Chandler & Sweller (1991), Experiment 1.

Two moves, not one

1

Cover the text first

Cover the paragraph next to a diagram. If a learner can still answer the key question from the diagram alone, the text is redundant.

2

Merge, if it's needed

If the diagram is unintelligible without the words, put the words directly on the diagram, not in a separate list or paragraph below it.

3

Cut, if it's not

If the diagram already explains itself, delete the extra text. Adding it back in, however tidy, tended to lower scores, not raise them.

Across your subjects and classes

These experiments used electrical wiring diagrams and one biology diagram. What follows are sensible ways the same merge-or-cut choice could work with your own materials: worth trying, not separately tested in every subject.

Subject	How the pattern could apply
Science	A labelled diagram (a cell, a circuit, a rock cycle) that needs a key to make sense: put the key's words on the diagram itself. If a diagram already carries its own labels and a learner could answer your question from it alone, don't add a paragraph restating it underneath.
Maths	A graph, shape or table that needs worked steps to interpret: merge the steps onto the figure rather than listing them separately below it. If learners can already read the graph unaided, a repeated explanation competes for attention rather than adding to it.
Geography	A map with a separate legend: keep the key's wording close to the symbols it explains, not in a distant box, whenever the map can't be read without it.
DT / Art	An exploded diagram or a step-by-step technique image: number the steps directly on the diagram rather than in a separate paragraph.
MFL	A vocabulary image with a separate word list: if the picture alone already conveys the word, a short label is enough. A full sentence explanation next to it can slow recognition rather than help it.

Adapting to your class

Classes needing more scaffolding

Default to the merged format, labels on the diagram, since it asks nothing extra of a learner deciding where to look.

SEND or EAL support

Ask which source is doing the real work, the picture or the words. Extra text next to a diagram a learner already understands is one more thing competing for a working memory that may have less spare room to begin with.

High-attaining classes

Resist the urge to add explanation to a diagram that already stands alone. The study found that doing so could lower scores, not just waste paper.

Mixed-attainment classes

Merge as the whole-class default rather than trusting everyone to combine diagram and text mentally themselves; test the diagram-alone version with a confident subgroup if you're unsure.

Start with one: pick a handout you already use with a diagram and a paragraph next to it. Cover the paragraph. If a learner can still answer your key question from the diagram alone, cut the paragraph. If not, move the words onto the diagram instead of leaving them apart.

A 1991 finding, replicated six times inside one paper

Developing

This rates how solid the evidence is, not how useful the idea is. The pattern repeated across six experiments and two unrelated subjects, but it comes from one research team's 1991 studies, with fairly small groups, and no direct measurement of cognitive load itself.

- Groups were small, 14 to 15 apprentices or 10 to 15 school learners per condition, spread across six separate experiments rather than one large trial.
- The authors say so themselves: most of these experiments had "no direct measures of cognitive load." The theory explains the pattern; it doesn't directly show what was happening in a learner's head.
- Half the evidence is adult trade apprentices in workplace training, not a school classroom; the school half is Year 9 science learners in one Australian high school, not a UK sample, and not tested beyond that single year group.

What that means for you: treat "merge if needed, cut if not" as a strong habit worth testing on your own materials, not a rule proven for every subject or age group. Try the check on page 3 before deciding which way to go.

TRY IT THIS WEEK

Your first small step

THIS WEEK

Take one handout with a diagram and a nearby paragraph. Cover the paragraph and check whether the diagram alone answers your key question. Merge the words onto the diagram if it doesn't. Cut the paragraph if it does.

Try it and watch: notice whether learners who usually reread the paragraph twice stop needing to, once the words sit on the diagram itself, or answer just as fast once you've cut it. That's your own evidence, not ours.

Go deeper

Cognitive Load Theory: A Teacher's Guide · structural-learning.com/post/cognitive-load-theory-a-teachers-guide

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