

Worked examples: reveal a decision, then fade support

A complete example supplies the problem, solution steps and result. A completion task supplies selected steps. An independent problem supplies no solution steps.

Authored equation sequence

1 Complete	Complete: $3x + 5 = 20$. Subtract 5 from both sides to get $3x = 15$. Divide both sides by 3 to get $x = 5$. Check: $3 \times 5 + 5 = 20$.
2 Completion	Completion: $4x + 3 = 19$. First supplied step: subtract 3 from both sides, giving $4x = 16$. Ask: which operation comes next, and why does it preserve equality? Teacher check: divide both sides by 4, so $x = 4$. Check: $4 \times 4 + 3 = 19$.
3 Independent	Independent: $5x + 2 = 27$. Ask learners to choose the operations, explain the first and check the result. Teacher check: subtract 2, then divide by 5, so $x = 5$. Check: $5 \times 5 + 2 = 27$.

Decide what the gap checks

Choose the missing step to expose the decision you want to see. A copied answer does not show an independently chosen method. Restore a needed step when an attempt reveals a gap. A similar equation checks a related procedure, not far transfer.

Evidence and limits

Renkl and colleagues (2002): fading improved near-transfer performance compared with example-problem pairs across a school electricity study and two university probability studies. Far-transfer results were mixed. The school study used existing classes and an author-teacher.

Kalyuga and colleagues (2001): inexperienced mechanical trade apprentices benefited from worked examples. With greater domain experience, problem solving became more useful. No fixed readiness threshold follows from this abstract.

These equations are authored planning illustrations, not the research tasks or a tested programme. Choose guidance from relevant knowledge, rather than a permanent ability label.

References

- Renkl, A., Atkinson, R. K., Maier, U. H. and Staley, R. (2002). From Example Study to Problem Solving: Smooth Transitions Help Learning. *The Journal of Experimental Education*, 70(4), 293-315. DOI 10.1080/00220970209599510.
- Kalyuga, S., Chandler, P., Tuovinen, J. and Sweller, J. (2001). When Problem Solving Is Superior to Studying Worked Examples. *Journal of Educational Psychology*, 93(3), 579-588. DOI 10.1037/0022-0663.93.3.579.