

# Healthy AI First, Episode 5: The Right Medium

## Sources and evidence for this episode

Miriam has read a twelve-page AI concept twice and still has no answer when Daniel asks what happens with a duplicate payment notification. The episode explains why a small diagram sometimes clarifies more than many pages of text, when pictures hurt, when double explanations and voice help, why rereading feels good while retrieval and self-explanation work better, and how the AI assistant becomes a rubber duck that asks back. Tool tips: output styles in Claude Code and diagrams as text with Mermaid.

All links were checked on 17 October 2026.

## What we mention in this episode

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### Ten Thousand Words

- **Claim:** The same information can be easier or harder to use: a diagram groups by location, saves search and allows conclusions by simply looking.  
**Source:** Larkin, J. H. & Simon, H. A. (1987): Why a Diagram is (Sometimes) Worth Ten Thousand Words. *Cognitive Science* 11(1), 65-100.  
**Link:** <https://doi.org/10.1111/j.1551-6708.1987.tb00863.x> (free copy: <https://mechanism.ucsd.edu/bil/teaching/F12/cs200/Readings/larkin.whyadiagramissometimesworth.1987.pdf>)  
**Strength and limits:** Theoretical paper with computational models, not an experiment with teams. A classic.

### A Picture for Your Ears

- **Claim:** Stripe's documentation says the same notification occasionally arrives more than once; the answer is idempotent processing.  
**Source:** Stripe documentation: Webhooks, section "Handle duplicate events".  
**Link:** <https://docs.stripe.com/webhooks#handle-duplicate-events>  
**Strength and limits:** Vendor documentation; the elevator-button image is ours.
- **Claim:** An agent can write a diagram as text in Mermaid; GitHub renders it as a picture directly in pull requests.  
**Source:** GitHub Docs: Creating diagrams.  
**Link:** <https://docs.github.com/en/get-started/writing-on-github/working-with-advanced-formatting/creating-diagrams>  
**Strength and limits:** Official documentation.

### When Pictures Hurt

- **Claim:** Experiments with students show that the benefit of software diagrams (UML) depends on how familiar people are with them; these studies did not examine experienced teams working with agents.  
**Source:** Gravino, C., Scanniello, G. & Tortora, G. (2015): Source-code comprehension tasks supported by UML design models: Results from a controlled experiment and a differentiated

replication. Journal of Visual Languages and Computing 28, 23-38; additionally Scanniello, G. et al. (2018): Do software models based on the UML aid in source-code comprehensibility? Aggregating evidence from 12 controlled experiments. Empirical Software Engineering 23(5), 2695-2733.

**Link:** <https://doi.org/10.1016/j.jvlc.2014.12.004> · <https://doi.org/10.1007/s10664-017-9591-4>

**Strength and limits:** Controlled experiments mainly with students; the supplementary aggregation also includes practitioners. These studies did not investigate production teams working with agents; indirect evidence. The working rule in the episode is explicitly a hypothesis.

## Double and Spoken

- **Claim:** Learning research long advised giving only spoken narration with a picture, not the same text on screen as well (redundancy principle).

**Source:** Mayer, R. E. & Fiorella, L. (2014): Principles for Reducing Extraneous Processing in Multimedia Learning: Coherence, Signaling, Redundancy, Spatial Contiguity, and Temporal Contiguity Principles. In: Mayer, R. E. (ed.), The Cambridge Handbook of Multimedia Learning, 2nd edition.

**Link:** <https://doi.org/10.1017/CBO9781139547369.015>

**Strength and limits:** Handbook chapter summarizing learning experiments.

- **Claim:** Two more recent reviews of about sixty studies each show that the same information twice can help, especially with little prior knowledge.

**Source:** Adesope, O. O. & Nesbit, J. C. (2012): Verbal redundancy in multimedia learning environments: A meta-analysis. Journal of Educational Psychology 104(1), 250-263; Trypke, M., Stebner, F. & Wirth, J. (2023): Two types of redundancy in multimedia learning: a literature review. Frontiers in Psychology 14.

**Link:** <https://doi.org/10.1037/a0026147> · <https://doi.org/10.3389/fpsyg.2023.1148035>

**Strength and limits:** 57 and 63 studies, mostly with students; the study bases may overlap.

- **Claim:** What helps beginners can slow down experts (expertise reversal effect).

**Source:** Kalyuga, S., Ayres, P., Chandler, P. & Sweller, J. (2003): The Expertise Reversal Effect. Educational Psychologist 38(1), 23-31.

**Link:** [https://doi.org/10.1207/S15326985EP3801\\_4](https://doi.org/10.1207/S15326985EP3801_4)

**Strength and limits:** Review of learning experiments.

- **Claim:** In two experiments with primary school children, the advantage depended on length: written text with the diagram worked better for long explanations, spoken explanations for shorter ones.

**Source:** Leahy, W. & Sweller, J. (2011): Cognitive load theory, modality of presentation and the transient information effect. Applied Cognitive Psychology 25(6), 943-951.

**Link:** <https://doi.org/10.1002/acp.1787>

**Strength and limits:** Two small experiments (n = 24 and n = 64) with children; transferable to developer work only as a guess.

## Rereading Feels Good

- **Claim:** After five minutes, rereading was ahead (81% vs. 75%); after a week, retrieval was ahead (56% vs. 42% of idea units).

**Source:** Roediger, H. L. & Karpicke, J. D. (2006): Test-Enhanced Learning: Taking Memory Tests Improves Long-Term Retention. Psychological Science 17(3), 249-255.

**Link:** <https://pubmed.ncbi.nlm.nih.gov/16507066/>

**Strength and limits:** Lab experiment with 120 students and prose texts; well replicated.

- **Claim:** A review of fifty experiments in schools and lecture halls shows that active retrieval helps in the vast majority of cases.

**Source:** Agarwal, P. K., Nunes, L. D. & Blunt, J. R. (2021): Retrieval Practice Consistently Benefits Student Learning: a Systematic Review of Applied Research in Schools and Classrooms. Educational Psychology Review 33(4), 1409-1453.

**Link:** <https://doi.org/10.1007/s10648-021-09595-9>

**Strength and limits:** Systematic review (5,374 learners); strong basis for learning, indirect for code review.

- **Claim:** Already in the 1970s it was shown that words you complete yourself are remembered better than words you read (generation effect).

**Source:** Slamecka, N. J. & Graf, P. (1978): The generation effect: Delineation of a phenomenon. Journal of Experimental Psychology: Human Learning and Memory 4(6), 592-604.

**Link:** <https://doi.org/10.1037/0278-7393.4.6.592>

**Strength and limits:** Classic memory experiments with simple material.

## The Rubber Duck

- **Claim:** Successful learners explain the steps of worked examples to themselves; eighth graders who explained a text about the circulatory system to themselves sentence by sentence understood more.

**Source:** Chi, M. T. H., Bassok, M., Lewis, M. W., Reimann, P. & Glaser, R. (1989): Self-explanations: How students study and use examples in learning to solve problems. Cognitive Science 13(2), 145-182; Chi, M. T. H., de Leeuw, N., Chiu, M.-H. & LaVancher, C. (1994): Eliciting self-explanations improves understanding. Cognitive Science 18(3), 439-477.

**Link:** [https://doi.org/10.1207/s15516709cog1302\\_1](https://doi.org/10.1207/s15516709cog1302_1) · [https://doi.org/10.1207/s15516709cog1803\\_3](https://doi.org/10.1207/s15516709cog1803_3)

**Strength and limits:** Small groups (1994: 14 vs. 10 people); influential but small studies.

- **Claim:** A classic programming book recommends explaining a problem to someone else, if need be to a rubber duck.

**Source:** Hunt, A. & Thomas, D. (1999): The Pragmatic Programmer. Addison-Wesley (20th anniversary edition 2019).

**Link:** <https://pragprog.com/titles/tpp20/the-pragmatic-programmer-20th-anniversary-edition/>

**Strength and limits:** Practitioner book, not a study; the anecdote is deliberately kept vague.

## A Duck That Asks Back

- **Claim:** The comprehension dialogue (questions one at a time, answer yourself first, then check against the code) is a proposal; whether it improves review by experienced people is open.

**Source:** Basis of the series, chapter 6 and chapter 1, finding 7.

**Strength and limits:** Explicitly marked as a hypothesis.

## Miriam's Second Try

- **Claim:** Claude Code has output styles: "Explanatory" adds short explanations, "Learning" leaves a spot open for you at design decisions (TODO(human)) and waits.

**Source:** Anthropic: Claude Code documentation, Output styles.

**Link:** <https://code.claude.com/docs/en/output-styles>

**Strength and limits:** Vendor documentation; whether it works in daily work as in the lab has not been studied.

- **Claim:** Back to episode 1: those who used AI for questions and explanations understood more.

**Source:** Shen, J. H. & Tamkin, A. (2026): How AI Impacts Skill Formation. Preprint.

**Link:** <https://arxiv.org/abs/2601.20245>

**Strength and limits:** Preprint, 52 people, tested right afterwards.

## Tool tip

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- Switch output style with `/output-style explanatory` or `/output-style learning` (from v2.1.269), alternatively `/config`, menu item "Output style", or `"outputStyle": "Learning"` in `.claude/settings.local.json`: <https://code.claude.com/docs/en/output-styles>
- Diagrams as text with Mermaid (e.g. `sequenceDiagram`) in issues, pull requests, wikis and Markdown files: <https://docs.github.com/en/get-started/writing-on-github/working-with-advanced-formatting/creating-diagrams>
- Prompt for the comprehension dialogue: "Ask me three questions about this change, one at a time. Wait for my answer after each question. And only tell me at the end where I was wrong."

## Further reading

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- Brown, S.: The C4 model for visualising software architecture. Four levels from system overview to code; practical, no proof of effectiveness. <https://c4model.com/>
- Ainsworth, S. (2006): DeFT: A conceptual framework for considering learning with multiple representations. *Learning and Instruction* 16(3), 183-198. <https://doi.org/10.1016/j.learninstruc.2006.03.001>
- Basis of the series: Healthy AI First Software Development, version 2 (1 October 2026), chapter 6.

## Note

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Healthy AI First is AI-researched and AI-generated, narrated in Björn's voice, recreated with AI, and reviewed by him.

Miriam, Daniel and Jonas are fictional characters used as illustrations; the twelve-page concept and the team agreement are told as examples, not study results.