

A manga book for adhesive bonding education: development and planned evaluation

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Introduction

Engineering textbooks are often dense, overly technical, and disconnected from real-world applications. This makes them hard for students to follow and highlights the need for alternative narrative formats that make learning more memorable and engaging.



Manga art

Manga, a form of comic art often called a “graphic novel”, communicates across cultures through visual expression and holds potential as a teaching tool [1].

The use of manga in educational settings

Manga has been explored in teaching, from biochemistry classes [2] to, more recently, medical education in Japan [3], where its narrative and emotional side was suggested to make content more memorable.



The gap: Students report that manga helps them memorize concepts [3], but this has not been properly measured.

RQ1: Do students learn more with the manga?

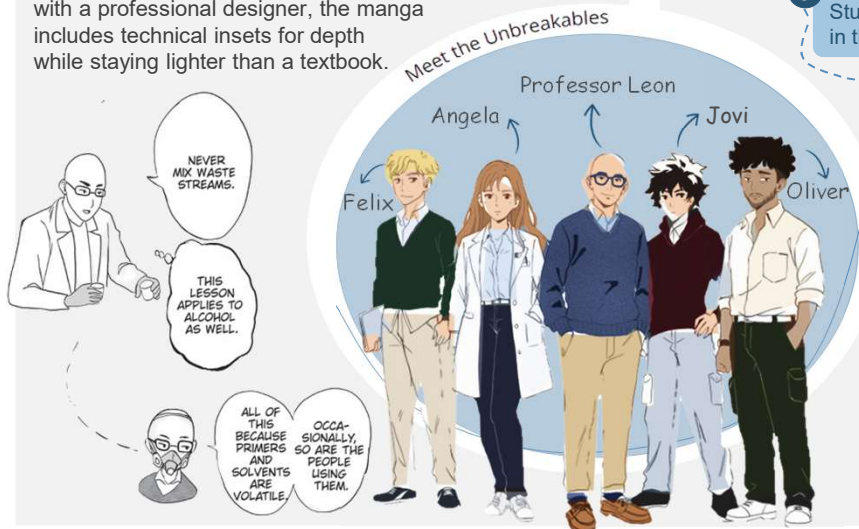
RQ2: How can a manga be built around student misconceptions?

Measuring learning through a concept inventory

A concept inventory (CI) is a multiple-choice test whose wrong answers come from real student misconceptions, revealing how students reason [4]. CIs exist for physics and materials engineering [5], but not yet for adhesive bonding.

Manga book development

“The Unbreakables” is a research team investigating a broken airplane wing. The story follows a Master’s student who joins them. Each plot twist is built around a real student misconception, so the characters make the same mistakes students do, and learn their way out. Developed with a professional designer, the manga includes technical insets for depth while staying lighter than a textbook.

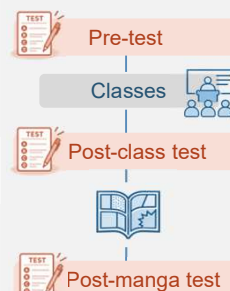


Recipe of a concept inventory

- 1 Key topics defined with expert input
- 2 Open-ended questions drafted
- 3 Students answer in their own words
- 4 Concept inventory for adhesive bonding

Experiment design

With the CI ready, the manga book effect can be tested:



References

- [1] Kinoshita, A. (2022). The Pedagogical Implication of Creative Art Practice by Manga Comic Book Readers in Japan. Cambridge Educational Research E-Journal, 9, 172–182.
- [2] Nagata, R. (1999). Learning biochemistry through manga - helping students learn and remember, and making lectures more exciting. Biochemical Education, 27, 200–203.
- [3] Cale, A. S. (2025). Manga: An Underutilized Resource in Medical Education. Medical Science Educator, 35(1), 517–522.
- [4] Steif, P. S., & Dantzer, J. A. (2005). A Statics Concept Inventory: Development and Psychometric Analysis. Journal of Engineering Education, 94(4), 363–371.
- [5] Krause, S. J. (2003). Identifying student misconceptions in introductory materials engineering classes. ASEE Annual Conference and Exposition, Conference Proceedings, 8–648.