The Effect of Deep-Level Reasoning Questions in Digital Learning Resources

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Research question

How do deep-level reasoning questions affect comprehension of content in digital learning resources?

Theoretical background

Need: Improve comprehension and engagement within digital learning resources

Structure of content can benefit student comprehension

- **Increases encoding of information into memory** — Mayer (1997)
- **Increases self-regulation processes.** — Lin et al. (2005)
- **Increases learner's perception of potential** — Craig, Zhang, Prewitt (2018)
- **Guides attention in presentations** — Lee & Muldner (2020)

Questions can benefit student comprehension

- **Traditional learning**: Lectures, Tutoring, Instructional Design
- **Digital learning**: PowerPoint, Virtual tutoring, Email-based learning, E-Textbooks
- **Researched subjects**: Biology, Mathematics, Physics, Instructional Design
- **Age range of students**: Middle school, High school, Post-secondary, Professional

Conditions

Questions are designed to elicit specific responses.

Equivalent content statements	Shallow-level questions	Deep-level questions
No response	Yes/no	Logical reasoning
The ___ is…	Is the…	How does…

Deep-level questions have shown to be most effective in increasing student comprehension in a variety of learning environments.

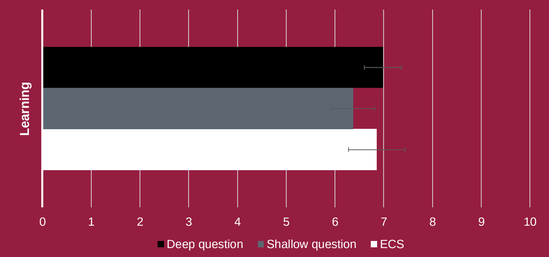
Hypothesis

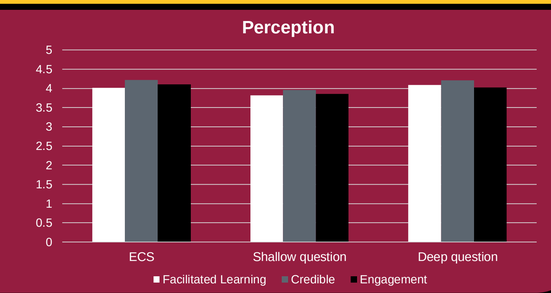
Students will comprehend information the best when they are presented deep-level questions regarding the learning resource they read.

Methods and materials

1. **90 online participants**
   - Qualtrics
   - Amazon MTurk
2. **Pre-test**
   - 24-item
   - Establish prior knowledge
3. **Chapter of text**
   - Shallow-level
   - Deep-level
   - Equivalent content statements
4. **Post-test**
   - 24-item
   - Establish how much was learned
5. **Perception survey**
   - How useful did the participant find the text?

Findings





Conclusions

Although overall learning and perception did score in a favorable direction, they did not demonstrate statistical significance across any one specific condition. These findings may be attributed to:

Fatigue Effect

Across conditions, there was a negative change in scores from the pre- to post-test. This may be attributed to the forced timing feature implemented on each page.

Assessment Sensitivity

With a 24-item assessment, a score of 6 can be attributed to chance. Pre- and post-test scores did not progress past this score. This may be due to the assessments being too difficult or poorly aligned with the content of the chapter.

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