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. (2003)
- Questions can benefit student comprehension
  - Traditional learning
    - Lectures
    - Tutoring
    - Instructional Design
  - Digital learning
    - PowerPoint
    - Virtual tutoring
    - Email-based learning
    - E-Textbooks
- Increases learner’s perception of potential
  - Craig, Zhang, Prewitt (2018)
- Guides attention in presentations
  - Lee & Mulder (2020)

**Conditions**

- Questions are designed to elicit specific responses.
  - Equivalent content statements
  - Shallow-level questions
  - Deep-level questions
  - No response
  - 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.

**Findings**

- 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.

**Conclusions**

**Hypothesis**

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

**Methods and materials**

- 90 online participants
  - Pre-test: Qualtrics
  - Post-test: Amazon MTurk
  - 24-item assessment
  - Establish how much was learned
  - How useful did the participant find the text?

**Researched subjects**

- Biology
  - Mathematics
  - Physics
  - Instructional Design

**Age range of students**

- Middle school
  - High school
  - Post-secondary Professional

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