Effects of segmenting, signaling, and weeding on learning from educational video

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Introduction

- Videos may require higher levels of cognitive processing.

- A key challenge is to direct learners' attention to relevant information.

- This study examined the effects of three multimedia design principles (SSW) on undergraduate students' learning outcomes and perceived learning difficulty in the context of learning **entomology** from an educational video
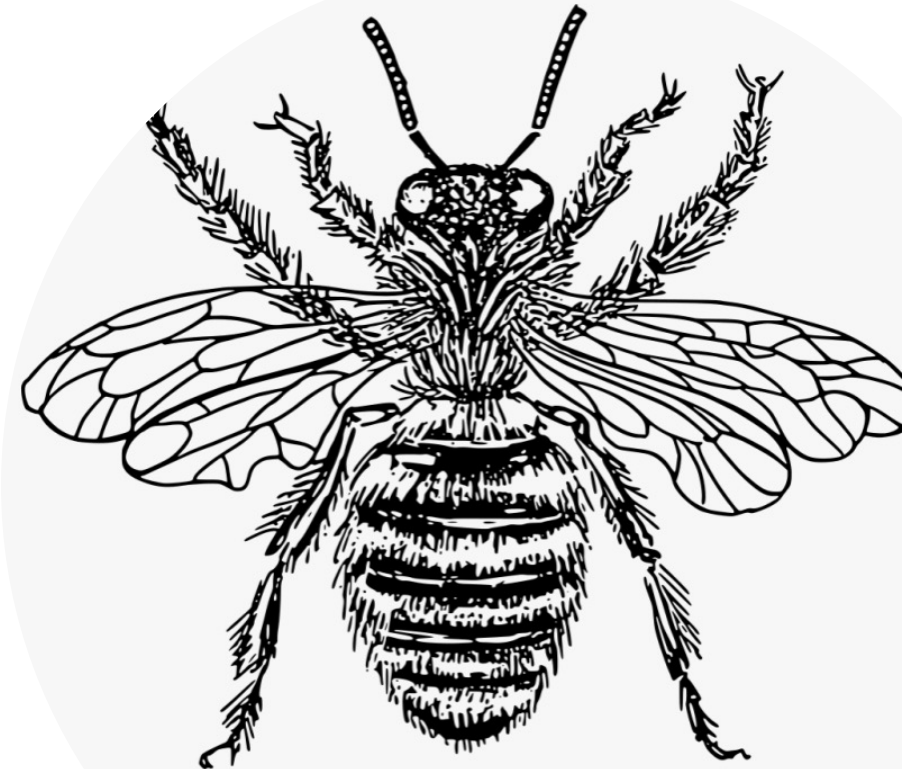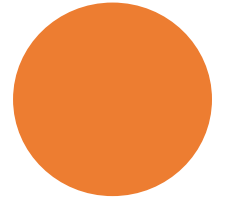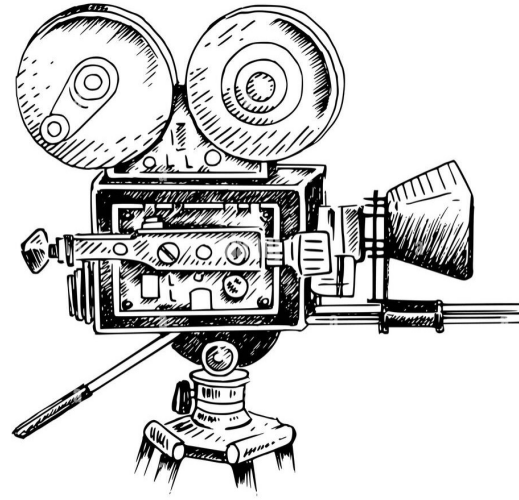
Introduction – The five assumptions

- <u>Cognitive architecture assumption</u> – There is infinite long term and limited active processing memory

- <u>Dual Channel Assumption</u> – Working memory has two structurally and functionally distinct – Visual and Auditory – processing channels

- <u>Limited Capacity Assumption</u> – Each channel can process limited information at a time

- <u>Active Processing Assumption</u> – We select relevant information, make cognitive structures, and integrate those with past cognitive structures

- <u>Cognitive Load Assumption</u> – Three loads for learning – intrinsic, extraneous, and germane

Introduction

- <u>Signaling</u> – main ideas are summarized and highlighted to aid learners in selecting relevant information.

- <u>Weeding</u> – non-essential content is eliminated in order to allow students to engage in processing only the essential content.

- <u>Segmentation</u> – learning material is broken up into several segments of information to help students process one cluster of related information elements before moving to the next one.

Hypotheses

- <u>Hypothesis 1</u>: Novice learners in the SSW (Signaling, Segmentation, Weeding) video group will report lower levels of learning difficulty than their counterparts in the control group.

- <u>Hypothesis 2</u>: The SSW intervention will improve the overall knowledge acquisition (retention, transfer, and structural knowledge) of novice learners in the context of educational video.

Method

(a) **Common characteristics**

Head
Thorax
Abdomen
Six legs
Invertebrates
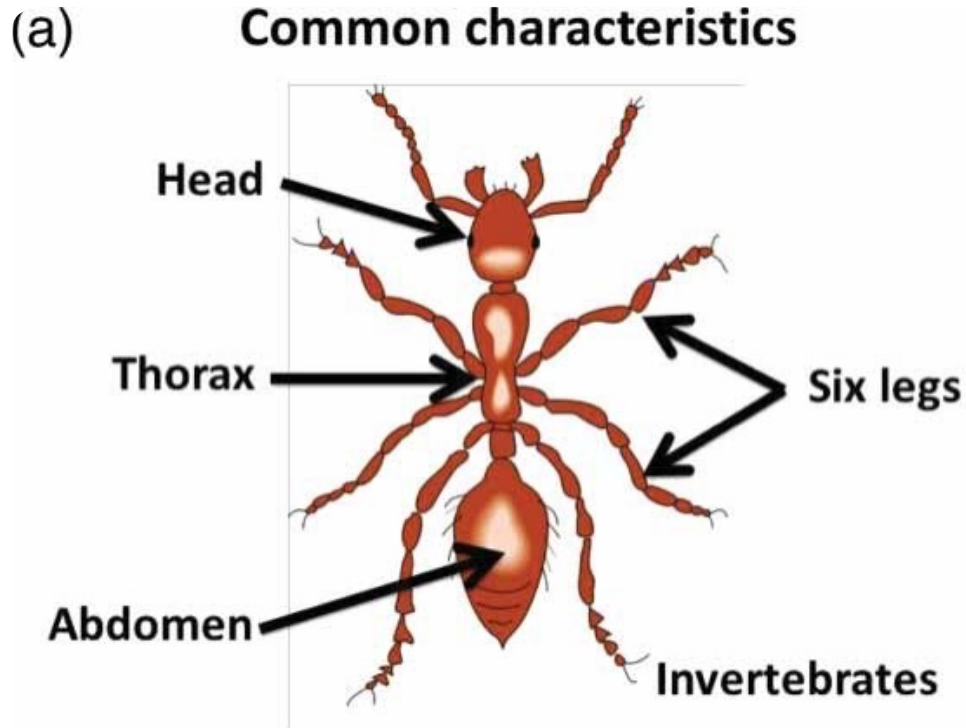
- Independent Variable:
  - Effect of SSW
- Dependent Variables:
  - Perceived learning difficulty
  - Knowledge retention
  - Transfer of knowledge
  - Structural knowledge acquisition.
- Covariates:
  - metacognitive awareness
  - prior knowledge

Table 1. Participants' demographics.

	N	Minimum	Maximum	Mean	Standard deviation
GPA	226	2.2	4.0	3.301	0.4154
Gender	226	1	2	1.42	0.494
Age	226	17	51	20.19	3.082
Year in college	226	1	4	2.30	1.069

Method

Population:
- 226 undergraduate students
- 110 students in the SSW group
- 116 students in the non-SSW group

Table 2. Descriptive statistics of the dependent measures used in this study.

Group	Learning difficulty M	SD	Knowledge retention M	SD	Knowledge transfer M	SD	Structural knowledge M	SD	Overall learning M	SD
SSW	2.31	1.15	15.83	2.526	4.52	0.763	11.98	2.442	31.20	6.173
Non-SSW	2.76	1.54	14.74	3.051	3.97	1.038	10.49	3.144	28.82	6.272
Effect size (*d*)	0.3		0.4		0.6		0.5		0.4	

Note: Scores ranged from 0 to 9 for the difficulty rating, from 0 to 20 for the retention test, from 0 to 5 for the transfer test, from 0 to 20 for the structural knowledge test, and from 0 to 45 for the overall learning outcomes.

Results

Data Analysis using one-way between-groups multivariate analysis of covariance (MANCOVA)
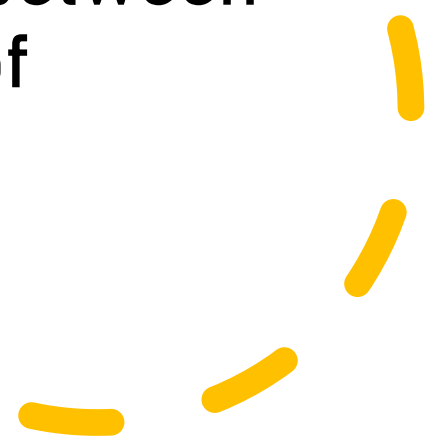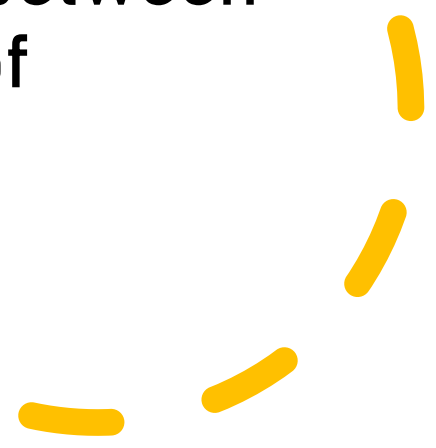
Results

Table 3. Univariate analyses of the effects of SSW on the dependent measures.

Dependent variable	Sum of squares	df	Mean square	F	P	η^2
Learning difficulty	9.385	1	9.385	5.297	0.022	0.023
Knowledge retention	48.358	1	48.358	7.477	0.007	0.032
Knowledge transfer	15.281	1	15.281	19.506	0.000	0.080
Structural knowledge	110.429	1	110.429	14.614	0.000	0.062
Overall learning	239.741	1	239.741	7.235	0.008	0.031

Data Analysis using one-way between-groups multivariate analysis of covariance (MANCOVA)

Results – Hypothesis 1

- The SSW group reported lower learning difficulty compared with the non-SSW group and that the difference was statistically significant. SSW intervention accounted for a 2.3% decrease in the perception of learning difficulty for students in the SSW group.

Results – Hypothesis 2

- The SSW group performed higher on gaining overall knowledge, retention, knowledge transfer, and structural knowledge test compared with the non-SSW group, and the difference was statistically significant.

- The SSW intervention accounted for a
  - 3.1% improvement in the overall knowledge acquisition,
  - 3.2% improvement effect in knowledge retention,
  - 8% improvement in knowledge transfer, and
  - 6.2% improvement in structural knowledge acquisition

  for the participants in the SSW group.

Discussion and Critique

- Too short experience sample
- Only one video
- Entomology context
- Unknown questionnaires
- Twenty marks MCQ Design for assessment
- Coin-toss assignment
- Prior Knowledge misrelation
- Citations