The Effects of Different Modalities on Reading Comprehension

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Why to Do This Study

• The structure of the current English for specific purposes (ESP) textbooks:
  – Pre-reading: Questions are in words or pictures
  – Reading
  – After reading

• Our sample
  – Not interesting
  – Take a lot of efforts to understand the reading
Introduction

• Not all classrooms, textbooks, or pedagogical interactions are filled with meaning potential. The lack of meaning potential poses a threat to meaning making (Lier, 2004).
Literature Review: Background Knowledge and RC

• To deal with demanding reading tasks, readers have to either resort to **background knowledge** or enhance their **language proficiency** (Alderson & Urquhart, 1985).

• L2 linguistic knowledge affects **low-level learners’** RC more than high-level learners’ (Bossers, 1992, as cited in Alderson & Urquhart, 1985).
Literature Review (Cont’d)

• Synchronous computer-mediated communication (SCMC)
  – A combination of spoken and written features

• **Text mediation** of online discussion serves as a *thinking device*, helping discussants think, reflect, and revise their ideas (Lotman, 1988; Wertsh, & Biven, 1992).
Literature Review (Cont’d)

• Visual and auditory modalities together ease the limited capacity of the working memory (Brünken, Plass, & Leutner, 2003)

• Animation and narration together, rather than animation and on-screen text, help learners perform better on a problem-solving test, especially for those who know little about the topic (Mayer, 2001).
Literature Review: Motivation and Learning

• Self-determination Theory (SDT) (Deci and Ryan, 1985)
  – Extrinsic and intrinsic motivation

• Course-specific motivational components
  – Interest, relevance, expectancy, and satisfaction

• Teacher-specific motivational components
  – Affiliative drive
  – Authority type
  – Direct socialization of motivation
Literature Review (Cont’d)

- Amotivation (Gorham & Christophel, 1992)
  - Dissatisfaction with grading and assignments
  - Dislike of the subject area
  - Dislike of the teacher
  - Poor organization of teaching materials
Research Questions

• How do online discussion and video watching affect the participants’ RC test?

• What are the participants’ perceptions of using the online discussion and video for RC?

• What are the participants’ opinions and suggestions about using the online discussion and video for RC?
Methods: Participants

• 20 international students in UH (10 ODG; 10 VWG)

• Language proficiency:
  – TOEFL or IELTS from 2009 to 2011
  – TOEFL iBT reading ≤ 25
  – TOEFL PPT reading ≤ 59
  – TOEFL CBT reading ≤ 24

• IELTS reading ≤ 7
Methods: Research Design

ODG (Skype): 40 min
Discuss pre-reading questions

VWG (Video): 40 min (repeated watching)
An Introduction to Carbon Sequestration

Scientific article: 25 min
Title: Future of “Clean Coal” Power Tied to (Uncertain) Success of Carbon Sequestration and Storage -- Scientific American

Critique: 50 min
Summary + Evaluation

Questionnaire
ODG form / VWG form
Part A: Background information
Part B: 19 parallel items + 7 modality-specific items (5-point Likert scale)
Part C: 5 open-ended questions
Pros and cons of OD and VW
Use of the OD and VW affordances
Perceptions of what else can help improve RC
Methods: Data Collection and Analysis

• RC test
  – Calculate the number of content main ideas and supporting details
  – An independent t-test

• Questionnaire
  – Descriptive statistics
  – Item analysis and Cronbach’s alpha
  – An independent t-test (prior knowledge and parallel items)
  – Summary of open-ended answers
Results: Prior Knowledge

11. Before the video watching in the pre-reading activity, how much did you know about the following terms (1=nothing, 2= little; 3= some but not much; 4= much; 5=very much)? Place a check (√) in the cell.

<table>
<thead>
<tr>
<th>Term</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean coal</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon storage</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbon sequestration</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>
Results: Prior Knowledge

• Prior knowledge of the key terms
  – No significant difference in the ODG and VWG
  – More confidence in claiming the results of RC tests are due to the different modalities

(p < .05)
Results: RC Tests

- RC tests
  - No significant difference in the ODG and VWG
  - OD and VW are equally effective on RC

\[ p < .05 \]
Results: RC Test

- The distribution of RC scores in the ODG and VWG

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODG</td>
<td>15.20</td>
<td>4.96</td>
</tr>
<tr>
<td>VWG</td>
<td>15.90</td>
<td>7.24</td>
</tr>
</tbody>
</table>
## Results—Item Analysis

19 parallel items: Cronbach’s alpha is .654.

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty</td>
<td>The information discussed online was difficult for me to understand.</td>
<td>Deleted.</td>
</tr>
<tr>
<td>ODG I16</td>
<td>The information delivered in the video was difficult for me to understand.</td>
<td></td>
</tr>
<tr>
<td>Helpfulness</td>
<td></td>
<td>Deleted.</td>
</tr>
<tr>
<td>ODG I18</td>
<td>Using online discussion did not help me understand the article.</td>
<td>A reverse item for double-check.</td>
</tr>
<tr>
<td>VWG I18</td>
<td>Watching the video did not help me understand the article.</td>
<td></td>
</tr>
<tr>
<td>Teacher authority</td>
<td>I will discuss online for learning only when the teacher requests me to do it.</td>
<td>Kept.</td>
</tr>
<tr>
<td>ODG I25</td>
<td>I will discuss online for learning only when the teacher requests me to do it.</td>
<td>Spontaneity of using SMCM or videos for learning.</td>
</tr>
<tr>
<td>VWG I25</td>
<td>I will watch a video for learning only when the teacher requests me to do it.</td>
<td></td>
</tr>
<tr>
<td>No specific rationale</td>
<td>I will discuss online for learning only when other methods do not help me out.</td>
<td>Deleted.</td>
</tr>
<tr>
<td>ODG I26</td>
<td>I will watch a video for learning only when other methods do not help me out.</td>
<td>No specific theoretical support.</td>
</tr>
<tr>
<td>VWG I26</td>
<td>I will watch a video for learning only when other methods do not help me out.</td>
<td></td>
</tr>
</tbody>
</table>
Results—Item Analysis

• Reliability increases
  – 19 parallel items $\rightarrow$ 16 parallel items
    • .65 $\rightarrow$ .76
  – ODG: 16 parallel items + 7 unique items
    • .79 $\rightarrow$ .84
  – VWG: 16 parallel items + 7 unique items
    • .64 $\rightarrow$ .71
Results—16 Parallel Items

• 8 orientations
  – Spent time
  – Interestingness
  – Helpfulness
  – Stimulation
  – Accomplishment
  – Difficulty
  – Use of SCMC and videos for future learning
  – Teacher authority
Results—Distribution of the Mean Scores of the 16 Parallel Items

ODG

VWG

Mean: 3.67
SD: 0.50

Mean: 3.99
SD: 0.77

1=strongly disagree; 5=strongly agree
Results—Adjusted Parallel Items

• An independent *t*-test
  – 19 parallel items: .080
  – 16 parallel items: .021 → significant different

• Eta squared: .39
  – The different mode of technology can account for 39% of the variance
  – Large effect size
Results: 5 Parallel Items

- 5 parallel items

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interestingness</strong></td>
<td>The questions for online discussion were interesting.</td>
<td>3.4</td>
</tr>
<tr>
<td>ODG 16</td>
<td>The video was interesting.</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>Helpfulness</strong></td>
<td>Using online discussion helped me understand the article.</td>
<td>3.6</td>
</tr>
<tr>
<td>ODG 17</td>
<td>Watching the video helped me understand the article.</td>
<td>4.6</td>
</tr>
<tr>
<td>VWG 110</td>
<td>Watching the video helped me gain knowledge.</td>
<td>4.7</td>
</tr>
<tr>
<td><strong>Teacher authority</strong></td>
<td>I hope my instructors can give me some information about the topic of the article before I read it.</td>
<td>4.1</td>
</tr>
<tr>
<td>ODG 124</td>
<td>I hope my instructors can give me some information about the topic of the article before I read it.</td>
<td>4.8</td>
</tr>
<tr>
<td>VWG 124</td>
<td>I will discuss online for learning only when the teacher requests me to do it.</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>VWG</strong></td>
<td>I will watch a video for learning only when the teacher requests me to do it.</td>
<td>2.4</td>
</tr>
</tbody>
</table>
Results—Distribution of the Mean Scores of the 7 modality-specific Items

Mean: 3.50
SD: 0.63

Mean: 3.47
SD: 1.19

1=strongly disagree; 5=strongly agree
Results: 7 Modality-specific Items

<table>
<thead>
<tr>
<th>Item</th>
<th>Statement</th>
<th>Mean score</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODG1</td>
<td>I liked the online discussion because what was discussed was written down.</td>
<td>3.60+</td>
</tr>
<tr>
<td>ODG2</td>
<td>I felt the way of communication in online discussion was similar to face-to-face discussion.</td>
<td>3.30+</td>
</tr>
<tr>
<td>ODG10</td>
<td>The questions for online discussion helped me discuss.</td>
<td>4.00+</td>
</tr>
<tr>
<td>ODG13</td>
<td>I liked the way of searching online for learning.</td>
<td>4.30+</td>
</tr>
<tr>
<td>ODG15</td>
<td>The questions for online discussion were difficult for me to discuss.</td>
<td>2.30+</td>
</tr>
<tr>
<td>ODG19</td>
<td>When searching online, I was overwhelmed by too much information.</td>
<td>3.40+</td>
</tr>
<tr>
<td>ODG23</td>
<td>I hope my instructors can join the online discussion with me and my partners.</td>
<td>3.60+</td>
</tr>
<tr>
<td>VWG1</td>
<td>I liked watching the video because it had both visual and auditory input.</td>
<td>4.60+</td>
</tr>
<tr>
<td>VWG2</td>
<td>I tended to focus on the visual input rather than the auditory input.</td>
<td>3.60+</td>
</tr>
<tr>
<td>VWG3</td>
<td>I tended to focus on the auditory input rather than the visual input.</td>
<td>3.20+</td>
</tr>
<tr>
<td>VWG4</td>
<td>The dynamic images in the video (i.e. animations and video) facilitated me to understand the topic.</td>
<td>4.60+</td>
</tr>
<tr>
<td>VWG5</td>
<td>The still images in the video (i.e. illustrations, pictures, charts, maps, and photos) facilitated me to understand the topic.</td>
<td>4.40+</td>
</tr>
<tr>
<td>VWG19</td>
<td>When watching the video, the speaker’s narration distracted me from understanding the information delivered.</td>
<td>1.40+</td>
</tr>
<tr>
<td>VWG20</td>
<td>Watching the video did not help me understand the article.</td>
<td>1.50+</td>
</tr>
</tbody>
</table>
Results: Inter-item Correlation

• Look into the correlation coefficients over .80
  – More than half of the variance accounted for by both items
Results: Inter-item Correlation (ODG)
Results: Inter-item Correlation (VWG)

- Interestingness (Video)
- Helpfulness (Knowledge acquisition)
- Modality uniqueness (Spent time)
- Modality uniqueness (Narration distraction)

Strongest correlation (.942)

Negative correlation (-.894)
Results—Comments on the online discussion

• What do you like about the online discussion/video watching? Why?

• ODG
  – Multitasking
    • Discuss+search online
  – Collaborative learning: discuss with others help understand the topic

• VWG
  – Diverse modalities
    • Help understand the topic in depth
    • Help listening and speaking skills
  – Make learning interesting
Results (Cont’d)

• What do you dislike about the online discussion/video watching? Why?

• ODG
  – Physically absent interaction
    • Time consuming interaction→audio/video discussion
  – Scaffolding and organization needed

• VWG
  – Video
    • The narration is too fast
  – Students’ ability
    • Listening ability is not good enough.
Results (Cont’d)

• How did you find out the answers of the questions when discussing online/watching videos?
  
• ODG
  – Search online to read other articles to generate one’s own thoughts

• VWG
  – Online resources
    • Use online dictionaries
    • Read other articles
  – Repeated watching
  – Note taking
Results (Cont’d)

• What else could be done to help you discuss more smoothly online/ understand the video smoothly?

  ODG
  – The organization of the online discussion:
    • More specific discussion questions
    • More personal response
    • Subtasks: understand the topic \(\rightarrow\) share views \(\rightarrow\) conclude the discussion
  – Available resources:
    Encyclopedia and dictionaries

• VWG
  – Mutimodalities:
    • Captions
  – Online search: Definitions of the vocabulary
Results (Cont’d)

• What else could be done to help you understand the article?

• ODG
  – Scaffolding and organization
    • Guide students to use appropriate resources to answer each question
    • An introduction to the article
  – Dictionaries
    • Bilingual dictionaries (translation)
    • Definitions of technical vocabulary

• VWG
  – Definitions of the technical vocabulary
  – Pictures and diagrams
  – Comprehension questions
Conclusion and Implications

• The interestingness and helpfulness may affect the participants’ spontaneity to watch a video for academic learning.
  – The practicability of using videos for self-learning in academic settings.

• The lack of discussion in video watching may cause the participants to ask for more teacher intervention before watching.
Conclusions and Implications

- Online discussion needs more explicit guidance than watching a video.

- Question types:
  - Comprehension
  - Analysis
  - Application
  - Synthesis
  - Evaluation

(Bloom, 1956)
Conclusions and Implications

- It is useful to provide a specialized corpus for looking up technical words and teaching vocabulary.
  - Disciplines and genres
  - Vocabulary instruction (Nation, 2001)
    - The word form appears rarely if at all outside the particular field
    - The word form is used both inside and outside the particular field but not with the same meaning
    - The word form is used both inside and outside the particular field, but the majority of its uses with a particular meaning are in the field
    - The word form is more common in this field than elsewhere
Future Research

• How the pre-reading questions help students discuss online by analyzing the trajectory of their online behaviors and their online conversation?

• Except for critiques, what else can be used to measure students’ RC?
References


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Suggestions and comments?
Thank you ^^