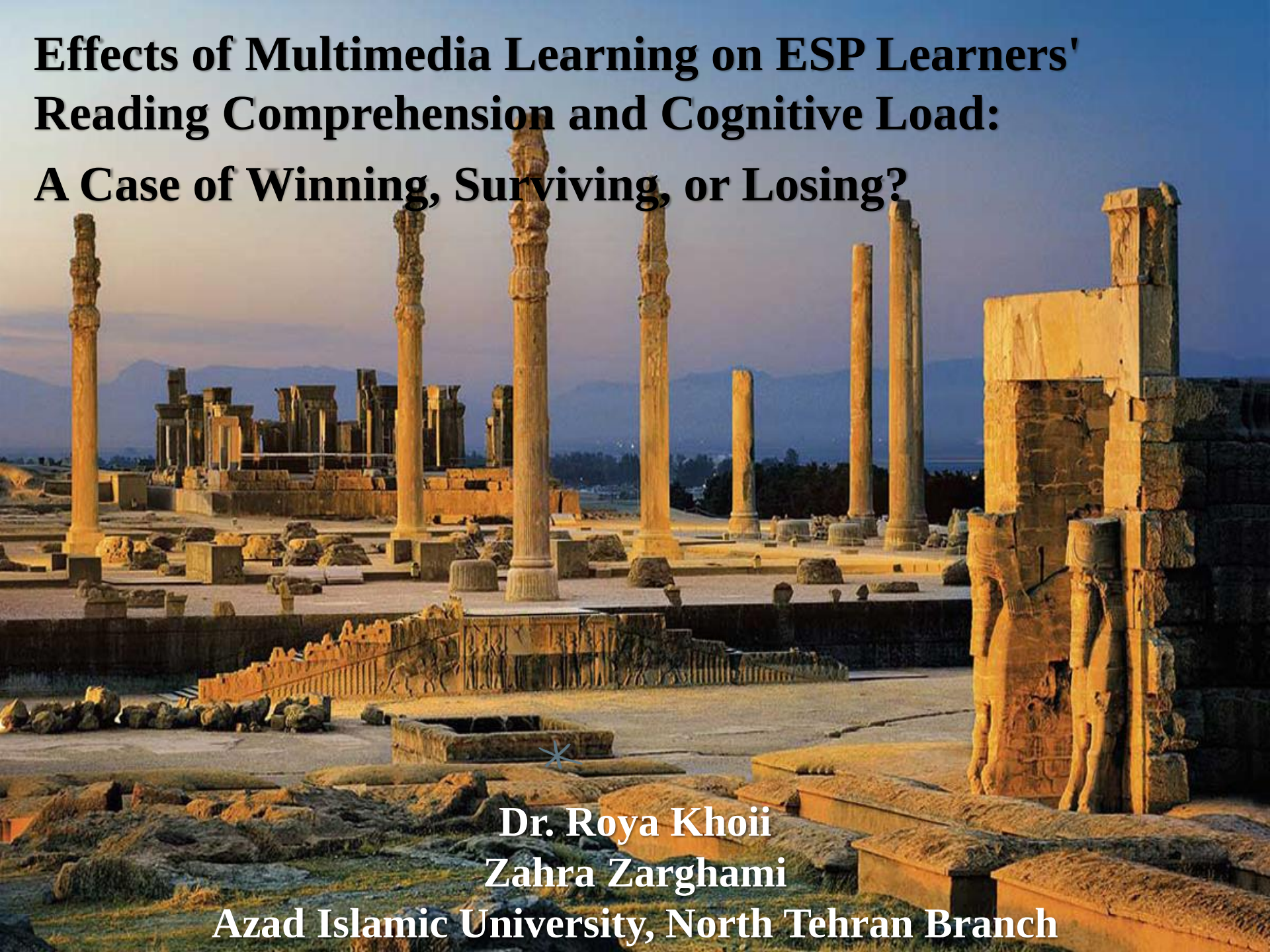
Effects of Multimedia Learning on ESP Learners' Reading Comprehension and Cognitive Load: A Case of Winning, Surviving, or Losing?



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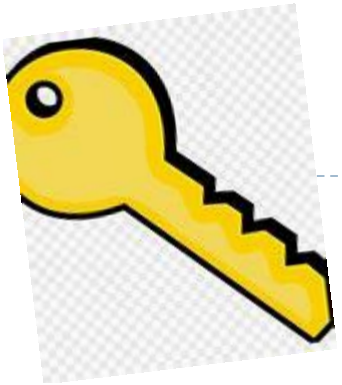
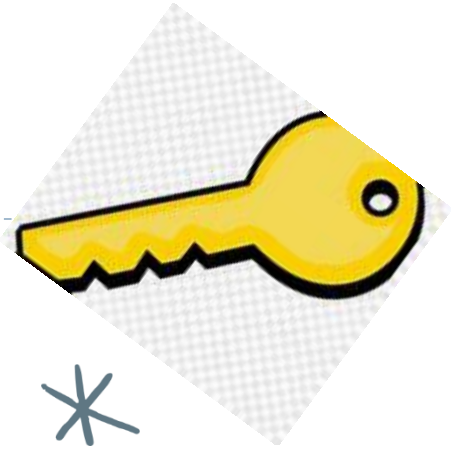
Key Concepts





English for Specific Purposes

Archival Science

Multimedia

Cognitive Load Theory

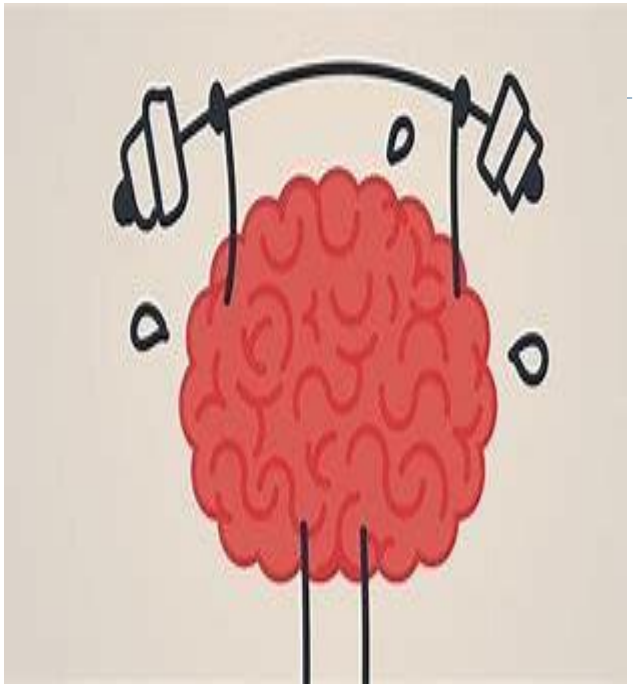
Reading Skill

Statement of the Problem

In the spite of the extensive global relationships among archivists all around the world to promote this profession and the need to know English to accomplish this task, teaching and learning English in this field is neglected in Iran.

Most of the studies regrading multimedia-based learning have been conducted in EFL/ESL contexts.

There are several contradictory views as to how multimedia should be used in ESP classes.



Statement of the Problem

Language learning can be a hard and tedious task for Iranian archivists in ESP courses.

Learning the language of Archival Science seems to impose a great burden on the cognitive capacity of Iranian ESP learners.

Significance of the Study

To demonstrate the effects of employing multimedia in an ESP course for different stake holders in Archival Science.

To provide answers to how an L2 should be learned, what should be learned, and when it can be learned by ESP learners.

To represent the possible influence of multimedia on the cognitive load of ESP learners.

To offer opportunities for anywhere-anytime language learning to improve professional communication capabilities.

Research Questions

1. Is there any significant difference between using multimedia-assisted task-based vs. task-based-only language teaching approaches on improving the reading comprehension of Iranian archivists in an Archival Science ESP course?

2. Is there any significant difference between using multimedia-assisted task-based vs. task-based-only language teaching approaches on the mental efforts of Iranian archivists in an Archival Science ESP course?

Instruments

1. Language Proficiency Test (Preliminary English Test)
2. Reading Comprehension Pretest
3. Reading Comprehension Posttest
4. Cognitive Load Self-rating Scale (Pass, 1992)
5. Stimulated Recall Sessions

PARTICIPANTS

- Forty-eight male and female Iranian archivists.
- 30-45 years.
- M.A. or Ph.D. graduates or students with diverse educational and professional backgrounds.
- Low-intermediate level in terms of both GE and technical language of Archival Science.
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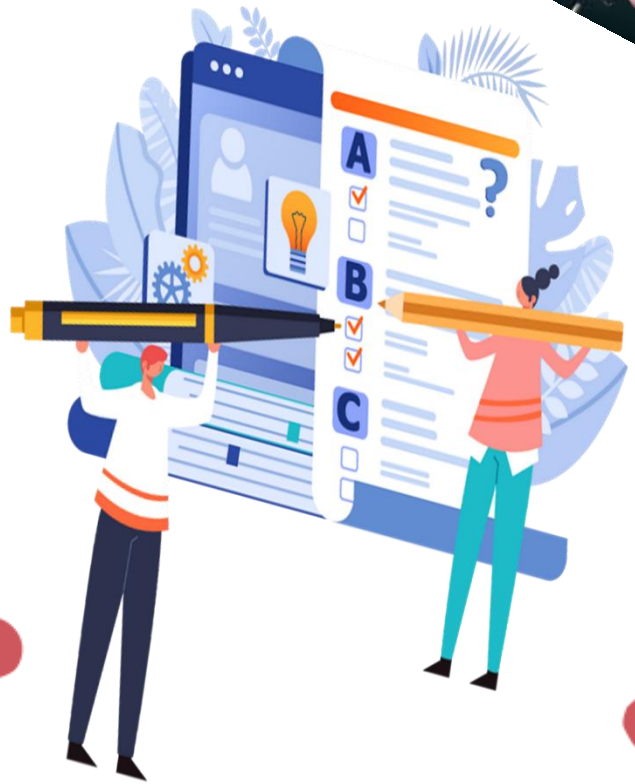
Tools of Data Provision

- Course Handout
- Learning Management System
- Multimedia Lessons
- Text and Image Files
- Video and Audio Files
- The Tutorial for Schoology



Pre-treatment Phase

Checking Homogeneity:
Language Proficiency Test (PET)

Introductory Session

- To introduce the course objectives;
- To describe instructional methods to be used in the class;
- To explain the requirements for passing the course;
- To review the process of using the LMS, Schoology.

Pretesting:

- The reading comprehension test

Treatment Phase

Treatment Conditions

Experimental group:
Multimedia-assisted task-based approach

Control group:
Face-to-face task-based approach

- Similar materials;
- The same teacher;
- The same number of instructional hours, two sessions per week (a total of 10 sessions), 90-120 minutes each;
- Similar tasks and exercises in accordance with the learners' actual level of language knowledge.

Completing the Self-rating Scale by the participants of both groups

Post-treatment Phase

Posttesting
The reading comprehension test

Holding stimulated-recall sessions

Data Analysis

Qualitative Data

Stimulated Recall Sessions: An inductive approach of thematic analysis to analyze the data related to cognitive load.

Quantitative Data

Language Proficiency Test: Cronbach α reliability, Inter-rater reliability, Skewness Analysis, Independent Samples *t*-tests.

Reading Comprehension Pretests and Posttests: Reliability (K-R 20 formula), Skewness Analysis, Levene's Test, Independent Samples *t*-tests, Paired Samples *t*-tests.

Cognitive Load Self-rating Scale: Mean Score, Independent Samples *t*-test, Levene's test.

Findings

Quantitative Results

The results of an independent samples *t*-tests indicated that the experimental group outperformed the control group in terms of reading comprehension.

An independent samples *t*-test demonstrated that the experimental group had experienced a greater cognitive load while learning ESP through the multimedia-assisted task-based approach.

Cognitive Load

- Cognitive load is the amount of working memory being used, like the RAM in your computer, only for the human brain. When memory usage on your computer is high, the system starts to slow down; it doesn't function as efficiently. The same thing happens with learning. When the cognitive load is high, learning is less efficient.

Cognitive Load: Types

- **1. Intrinsic load**. This is often described as the inherent difficulty of the subject matter.
- **2. Germane load**. This is the portion of the memory devoted to integrating new information, the creation and modification of schema.
- **3. Extraneous load**. This is the portion of memory that is taken up by processes not related to learning at all.
- Cognitive overload occurs when the combination of intrinsic, extraneous, and germane loads becomes overwhelming for the learner.

Qualitative Results

Theme	Sub-theme	Theme	Sub-theme	Theme	Sub-theme	Theme	Sub-theme
Technology-related problems	Internet problems	Learner-related problems	Bad learning habits	Content-related problems	Task and assignment difficulty	Instruction-related problems	Boring classes
	Technical problems		Tiredness		Inefficient communication with others		Content irrelevance
	Unfamiliarity with technology		Lack of concentration		Inefficient interaction with others		
	Using the virtual learning platform		Lack of motivation		Problems in processing information		
			Low self-confidence		Environmental distractors		
			Mental problems				
			Negative feelings				
			Poor general English				
			Time management problems				

Discussion
Cognitive Theory of Multimedia Learning

The multimedia-assisted task-based approach significantly contributed to the reading skill of Iranian archivists.

Dual Channel Assumption	Limited Capacity Assumption	Active Processing Assumption

Baddeley and Hitch (1974) & Baddeley (1992)	Information Processing Theory	Constructivist Theory of learning

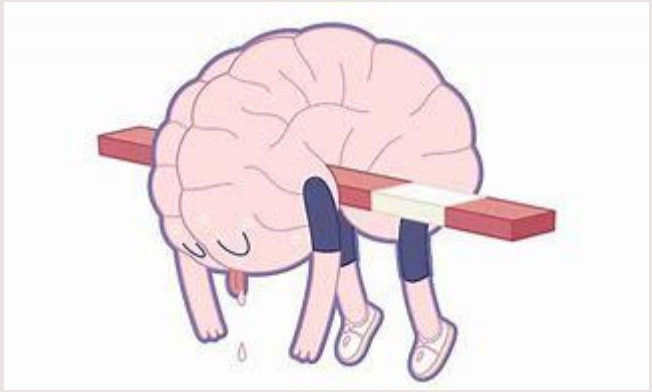
Discussion
Cognitive Theory of Multimedia Learning

- CTML is based on three main assumptions, each relying on a theory of learning by itself.
- 'Dual Channel Assumption': Verbal and visual channels of working memory are separated. The phonological loop and visuospatial sketchpad are two important components of working memory.
- 'Limited Capacity Assumption' relying on 'Information Processing Theory': Verbal and visual channels have a limited capacity and can hold information for a limited time.
- Cognitive overload is a result of WM's exposure to too much information.

Discussion
Cognitive Theory of Multimedia Learning

- 'Active Processing Assumption' in parallel to the 'Constructivist Theory of Learning' considers learning as an active process of collecting, organizing, and integrating new information.
- Considering these three assumptions, it can be said that multimedia learning aims to utilize both information processing channels (visual and verbal), manage cognitive load, and avoid cognitive overload.

The findings indicated four areas of problems affecting the cognitive load experienced during the learning process.



- Technology-related problems
- Learner-related problems
- Content-related problems
- Instruction-related problems

Discussion

- Intrinsic load: inherent difficulty of subject matter: sequencing and chunking
- Germaine load: relating new data to background knowledge: reflections, worked examples, concept maps, brainstorming
- Extraneous load: distracting data (hidden programs): avoid split attention:
  - **Keep students in the LMS when possible**
  - **Set links to open in a new tab**
  - **Keep the course navigation clean and simple**

Pedagogical Implications

Stakeholders: in designing blended learning ESP courses and preparing educational content that decreases cognitive load.

Administrators: in selecting educational materials, instructional content, teaching methods, and ESP course planning.

Policy-makers and senior managers: in planning in-service ESP training courses.

ESP teachers: in selecting educational resources and employing appropriate teaching methods that are rooted in theoretical and practical research in the ESP field.

Pedagogical Implications

Employees: in turning them into knowledgeable professionals who can play significant roles in promoting their job quality.

Employees: in learning English in order to engage in work-related relationships with colleagues overseas.

Cognitive Load Self-rating Scale (Pass, 1992)

Before you start, please complete the following details:

First Name:	**Last Name:**
Class Name:	**Session Number:**

Please rate the mental effort you invested to learn the materials presented to you in this session and to do the tasks.

In learning the materials presented in this session or doing the tasks, I invested:

1. very, very low mental effort
2. very low mental effort
3. low mental effort
4. rather low mental effort
5. neither low nor high mental effort
6. rather high mental effort
7. high mental effort
8. very high mental effort
9. very, very high mental effort


Thank you