INVESTIGATING DETERMINANTS AND IMPACTS OF EFFECTIVE EDUCATIONAL VIDEOS: A CONCEPTUAL FRAMEWORK

Mohd Akmal Faiz Osman, Khadijah Abdul Rahman, Siti Aishah Mokhtar, Noor Arina Md Arifin, Nik Nur Izzati Nik Rosli, Amira Idayu Mohd Shukry, Tengku Farid Tengku Abdul Aziz

Faculty of Information Management, Universiti Teknologi MARA,
UiTM Machang Campus, 18500 Machang, Kelantan, Malaysia

INTRODUCTION

Using videos to educate people has been long used by the army since World War II. The ability to link theoretical knowledge with real-life examples makes videos compelling, which enables a more significant understanding of particular learning topics.

Videos of the *Watts Riots* in Los Angeles were shown to allow students to see the devastating result of racial tension, hence explain why government endeavors of racial harmony is economic

The rapid growth of access to high-speed Internet allows videos to be easily viewed or downloaded anywhere at any time, including in universities, offices or at home through personal devices such as computers, notebooks and smartphones

However, according to educational psychologist expert, Professor Dr Richard E. Mayer, just making technology available to people is never enough. Furthermore, it has been integrated with instruction programmed in a way that it makes sense for the learner to understand the learning (*Mayer & Moreno, 2003*)

LITERATURE REVIEW

Benefits of Educational Video

- The main reason educational videos have been used in the higher learning institution is their ability to facilitate and enhance learning. This has been proven in fields such as software engineering (*Herala et al., 2017*), dentistry (*Wong et al., 2019*), foreign language (*Alkhatiri, 2019*), medical (*Taslibeyaz et al., 2017*), arts (*DeWitt et al., 2013*), engineering (*Ahmed & Marzouqi, 2015*), and economic studies (*Rhodes & Cerveny, 1984*)

  It also has reportedly been used to enhance learning in the organisation (*Zhang, 2006*) and schools (*Sorrells, 2019*). *Herala et al. (2017*) reported an increase in learning outcomes for students who study software engineering courses with videos as compared to the previous setting

- Apart from its benefits on learning outcomes, it was discovered that videos are an efficient way to reach the target audience, which is the students. *Wong et al. (2019)* reported the usage of educational videos in dentistry studies not only increases student's practical marks but also decrease the risk of hurting patient while performing dentistry care

LITERATURE REVIEW (CONT.)

Benefits of Educational Video (Cont..)

- In language studies, Alkhatiri (2019) reported the usage of videos to lower the fear of the students to pronounce words in front of others

- Elsewhere in the medical field, Taslibeyaz et al., (2017) conducted an analysis on 43 articles of video usage in medical education.

  The findings revealed that videos facilitate learning and contributes to learner's clinical skills. They reported that the flexibility of videos enables the learner to easily access the presentation of skill practices, feeling of a real examination, and repeatable practices the skill.

LITERATURE REVIEW (CONT.)

Effectiveness of Educational Videos

- Cognitive Theory of Multimedia Learning (CTML) by *Mayer and Moreno (2003)* described the phenomena of effective multimedia learning and instruction and is often applied in educational video studies (*Liew et al., 2020).*
- Therefore, to determine the effectiveness of educational videos, it is essential to measure the cognitive load in the videos that would ease learners' information processing capabilities by complying to the human's learning architecture according to CTML (Mayer & Moreno, 2013; Sweller, 2010). Figure 1 Depicts the Cognitive Theory of Multimedia Learning.

LITERATURE REVIEW (CONT.)

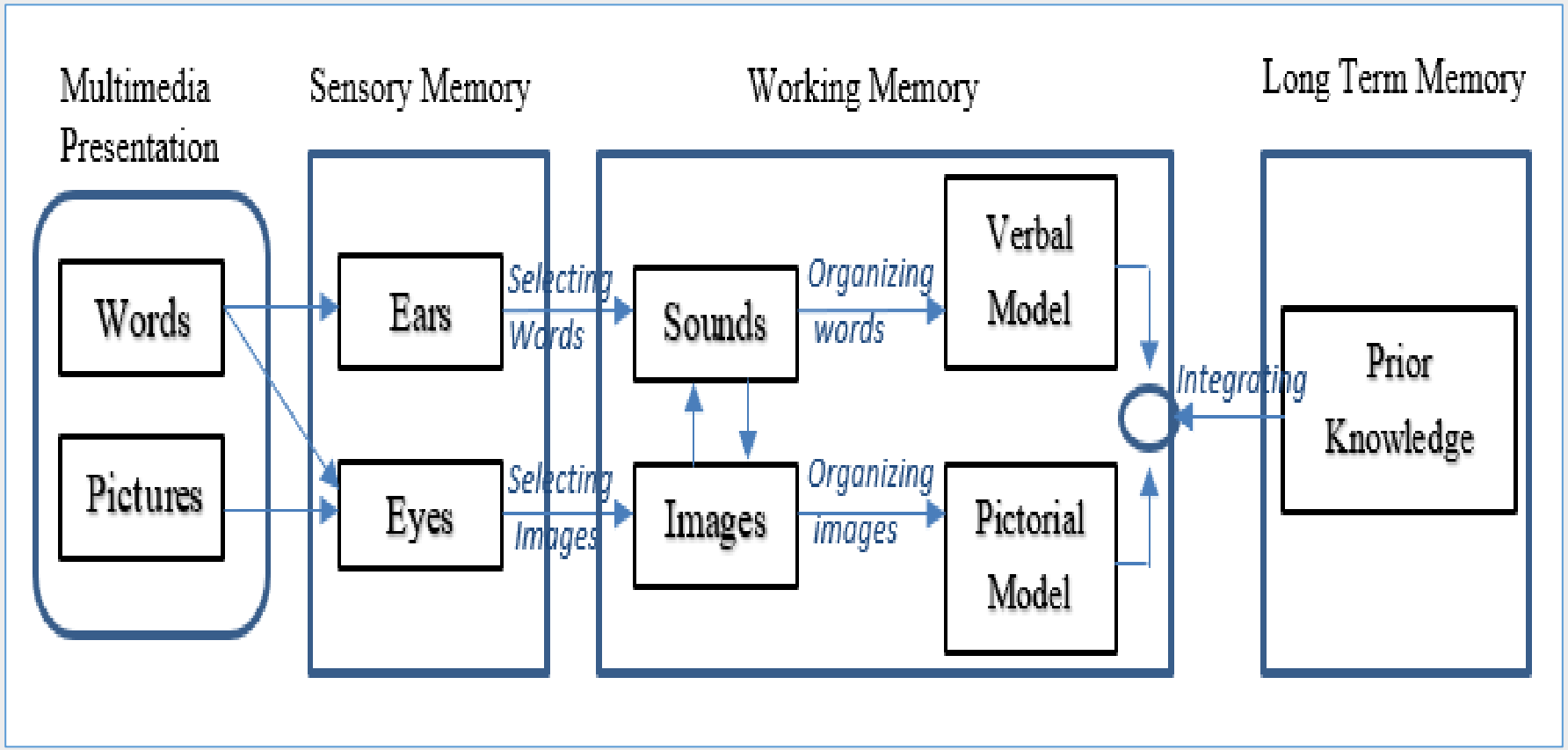

Fig. 1. The Cognitive Theory of Multimedia Learning (Mayer, 2003)

FACTORS WHICH AFFECT THE EFFECTIVENESS OF EDUCATIONAL VIDEOS

Modality Principle

- Principles of Multimedia Learning by *Moreno and Mayer (1999)* should be used by educators to develop educational videos.

  Currently, there are 12 principles which are stated that would reduce the cognitive load in an educational video. Among frequently tested principles were modality principles, spatial contiguity principles, and segmenting principles

- Modality principles posit that learning from visualization's supplemented by spoken text should be more effective than learning from displays supplemented by written text (*Moreno & Mayer, 1999*).

- *Castro-Alonso and Sweller (2020)* proved that learning from visuals completed by spoken words is more effective than learning from visual supplemented by written words

  This modality principle effects on video learning has also been found to reduce extraneous processing (*Richter, Scheiter, & Eitel, 2018*), while enhancing generative processing.

LITERATURE REVIEW (CONT.)

Spatial Contiguity Principle

- The Spatial Contiguity Principle highlighted the concerns with the placement or position of both image and text in an educational video

  An example of spatial contiguity principle in a video is when a caption is explaining an image, its caption should be placed close to the image rather than it being distant.

- *Schroeder and Cenkci (2018)* argued that the spatial contiguity effect could occur due to a variety of different poor instructional designs and discovered that there was a significant effect of integrated models towards learning performance.

  In line with *Schroeder and Cenkci (2018), Makransky, Terkildsen, and Mayer (2019)* performed both subjective and objective measurement on the effects of spatial contiguity principle on cognitive load and learning outcome

LITERATURE REVIEW (CONT.)

Segmenting Principle

- The segmenting principle posits that people learn deeper when multimedia instructions are presented in segments rather than as continuous units

  For instance, the duration of chapter 1 video lesson is originally one hour, but after applying the segmenting principle, the video is divided into five subtopics that consists of 20 minutes of duration each

  Chen & Yen's (2019) study revealed that their experiment groups with segmented clips had higher learning performance than the non-segmented groups

  This finding was in line with *Rey et al., (2019)* meta-analysis, as they found that segmentation of learning material reduced overall cognitive load, by allowing more time for the learner to adapt with the pace of the lesson

LITERATURE REVIEW (CONT.)

Interpolated Assessment

- In recent years, interactivity of videos has been a subject of research interest in which, as technology evolves, is now possible for videos to interact with learners. For instance, while a student watches the video lesson, questions that require answers could suddenly pop out

  Interpolating assessment in an educational video enables the learner to interact with the video. *Szpunar et al. (2013)* found the interpolated assessment in educational videos enhance learning outcome while reducing cognitive demands

  Tweissi (2016) studied effects on embedded questions in educational videos where two versions of the video, one with embedded questions and the other without questions

LITERATURE REVIEW (CONT.)

Cognitive Load

Martin (2014) classified cognitive load measurement methods into two dimensions which are objectivity and causal relationship.

Objectivity dimensions are concerned with measuring the cognitive load through objective or subjective measurement, while causal relationships measure the cognitive load direct or indirectly.

- Among these are subjective ratings of mental effort by Paas (1992), cognitive load measurement by Leppink et al., (2013), and an instrument by Cierniak et al., (2009). According to Mutlu-Bayraktar et al., (2019), subjective ratings of mental effort by Paas were the most used by researchers.

Fig. 2. Classification of Methods for Measuring Cognitive Load

LITERATURE REVIEW (CONT.)

Figure 2 depicts the classification of methods for measuring cognitive load based on objectivity and causal relationship

Objectivity	Causal Relationship	
	Indirect	Direct
Subjective	Self Reported Mental Effort	Self Reported Stress Level
		Self Reported Difficulty of Materials
Objective	Physiological Measures	Brain Activity Measures
	Behavioral Measures	Dual-Tasks Performance
	Learning Outcome Measures	

Fig.2. Classification of Methods for Measuring Cognitive Load

LITERATURE REVIEW (CONT.)

Learning Outcome

- *Andrade et al., (2015)* and *Park (2015)* found that cognitive load significantly impacts learning outcome

  In order to measure the learning outcome, pre-tests and post-tests were frequently used by previous researchers (*Chen & Yen, 2019; Klepsch & Seufert, 2020; Andrade et al., 2015).*

- *Chen and Yen (2019*) claimed there is a significant relationship between Intrinsic Load, Extraneous Load, and Germane Load with test scores (*Andrade et al., 2015).*

  June et al. (2014) conducted an action research investigating the impact of videos on students learning among tertiary students in Malaysia. They found that by watching the videos, the students are not only able to understand lectures better, but they were also able to visualize the content and relate them to the real workplace.

LITERATURE REVIEW (CONT.)

Figure 3 depicts the proposed conceptual framework to measure the effectiveness of educational videos in the University.

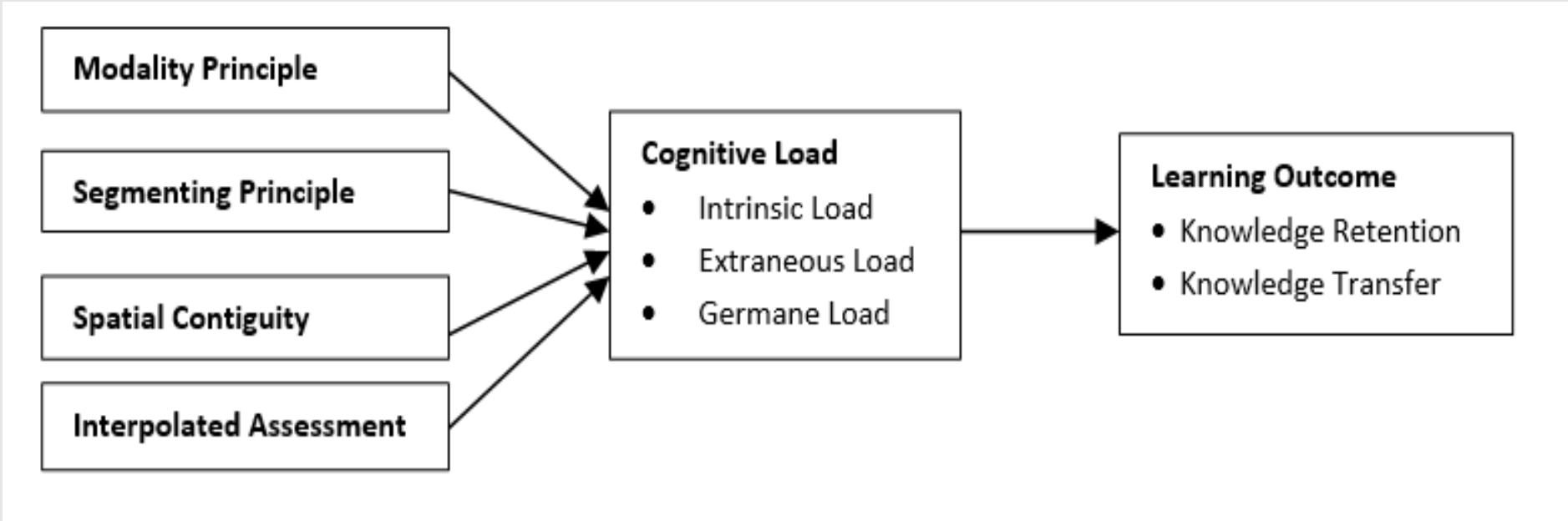

Fig.3. The Proposed Conceptual Framework in Measuring the Effectiveness of Educational Videos

CONCLUSION AND SUGGESTIONS FOR FUTURE STUDIES

- Educators in universities should integrate educational videos in teaching, as it would complement traditional classroom teaching due to its delivery flexibility, attractiveness, and ease of use

  In order to develop educational videos, aspects such as the modality principle, spatial contiguity principle, segmenting principle, and interpolated assessment should be considered as it has been proven to affect the cognitive load. In turn, the cognitive load has shown to significantly affect learning outcomes.

- Although many other factors may affect cognitive load and learning outcome, the discussed factors were seen to have been frequently applied and tested upon educational videos.

CONCLUSION AND SUGGESTIONS FOR FUTURE STUDIES (CONT)

- An effective educational video can be summarized to be a video that enhances learner knowledge by not overloading their working memory with the extraneous and intrinsic load

Educational videos have been developed and tested in multiple learning courses; however, there is scarce evidence in the context of Library and Information Science Courses.

Future studies on effective educational videos in this context could be stipulated in an attempt to contribute to the body of knowledge and better generalize these findings.

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