MANAGING COGNITIVE LOAD IN MULTIMEDIA-ASSISTED ENGLISH LANGUAGE LEARNING: PRINCIPLES FOR PRIMARY SCHOOL EDUCATION

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Abstract

The integration of multimedia technologies into primary English as a Foreign Language (EFL) education provides new opportunities for developing young learners' language skills. Videos, animations, audio recordings, and interactive activities create multimodal learning environments. However, excessive visual information, unnecessary sounds, and complex instructional materials may increase cognitive load and negatively affect learning outcomes. This paper examines the theoretical foundations of cognitive load management and proposes five methodological principles for designing multimedia-assisted English lessons for Grades 3–4: information simplification, gradual presentation, visual-verbal coordination, pre-training, and active learner engagement. The study highlights the importance of adapting multimedia materials to children's cognitive characteristics to support comprehension, memory, and communicative language development.

Keywords: cognitive load, multimedia-assisted learning, primary EFL education, working memory, young learners, instructional design.

1. Introduction

The development of digital technologies has significantly transformed foreign language education. In primary English language classrooms, multimedia resources such as videos, animations, audio recordings, digital stories, and educational games provide opportunities for presenting language through visual, auditory, and interactive formats.

These resources can support vocabulary acquisition, listening comprehension, pronunciation practice, and speaking development. However, multimedia use does not automatically guarantee effective learning. Excessive animations, background sounds, lengthy explanations, and simultaneous presentation of multiple information elements may distract learners and overload their cognitive resources.

This issue is particularly important for learners in Grades 3–4, whose information-processing abilities are still developing. Therefore, multimedia materials should be designed according to children's cognitive characteristics and learning needs.

The purpose of this paper is to examine the methodological foundations of cognitive load management and identify principles for effective multimedia-assisted English language teaching in primary education.

2. Theoretical Foundations of Cognitive Load Management

Cognitive Load Theory, developed by Sweller (1988), explains how the limitations of working memory influence learning. According to this theory, learners have limited cognitive resources for processing new information. Therefore, instructional materials should be organized to avoid unnecessary mental demands.

Mayer's Cognitive Theory of Multimedia Learning (2021) provides an additional theoretical foundation. It explains that meaningful learning involves selecting, organizing, and integrating verbal and visual information.

The theory is based on three assumptions:

1. **Dual-channel assumption:** Information is processed through visual and auditory channels.
2. **Limited-capacity assumption:** Each channel has limited processing capacity.
3. **Active-processing assumption:** Learning requires learners to select, organize, and integrate information.

Cognitive Load Theory also distinguishes three types of cognitive load:

- **Intrinsic load:** The complexity of the learning material itself.
- **Extraneous load:** Unnecessary mental effort caused by ineffective instructional design.
- **Germane processing:** Mental activity involved in constructing meaningful knowledge.

In primary EFL education, teachers should reduce unnecessary cognitive demands while maintaining meaningful learning challenges.

3. Methodological Principles for Managing Cognitive Load

Based on Cognitive Load Theory and multimedia learning principles, five methodological principles are proposed for Grades 3–4.

1. Information simplification. Multimedia materials should contain only information relevant to the learning objectives. Unnecessary animations, decorative images, and background sounds should be avoided. For example, when teaching the topic "Animals", teachers can initially present three or four animal pictures with their English names and pronunciation.

2. Gradual information presentation. Learning materials should be divided into short, manageable segments. When teaching "Daily Activities", learners may first study individual expressions such as *wake up*, *have breakfast*, and *go to school*. Afterwards, these expressions can be presented in a short animated sequence.

3. Visual-verbal coordination. Images, written words, and audio recordings should be meaningfully connected. For example, when introducing the sentence *The cat is sleeping*, learners should see the corresponding image while listening to the sentence. This helps establish connections between visual and verbal information.

4. Pre-training. Before presenting complex multimedia materials, teachers should introduce essential vocabulary and concepts. Before watching an animated story about friendship, learners may first study words such as *friend*, *help*, *share*, and *kind*. This preparation facilitates comprehension.

5. Active learner engagement. Learners should actively process multimedia information rather than simply watch videos or listen to recordings. Teachers can use picture matching, prediction activities, comprehension questions, and short speaking tasks. After watching an animated story, learners may identify characters, answer questions, and retell the story using simple English sentences.

Table 1. Methodological principles for cognitive load management

Principle	Classroom application
Information simplification	Removing unnecessary visual and auditory elements
Gradual presentation	Dividing materials into short segments
Visual-verbal coordination	Connecting images, text, and audio
Pre-training	Introducing key vocabulary in advance
Active engagement	Using interactive and communicative tasks

These principles are consistent with multimedia instructional design strategies, particularly coherence, signaling, spatial contiguity, and segmenting (Castro-Alonso et al., 2021).

4. Practical Application in Primary EFL Classrooms

The proposed principles can be implemented through different multimedia-supported English lessons.

For example, when teaching the topic "Animals", the teacher can introduce several animal names through pictures and audio recordings. Learners listen to the pronunciation, observe the images, and repeat the words. Afterwards, they watch a short animation and complete picture-matching activities. Finally, they produce simple sentences such as "The lion is strong" and "The elephant is big".

A similar approach can be applied to the topic "Daily Activities". Short animated sequences demonstrate familiar actions accompanied by English expressions. Learners listen, observe, repeat, and gradually construct sentences about their daily routines.

The instructional process can follow five stages:

1. Introducing essential vocabulary.
2. Presenting short audiovisual materials.
3. Checking comprehension.
4. Completing interactive activities.
5. Practising independent speaking.

The complexity and duration of multimedia materials should be adapted to learners' language proficiency and individual needs. The primary objective should be meaningful language learning rather than simply increasing the number of digital elements in a lesson.

5. Conclusion

Effective multimedia-assisted English language teaching requires careful consideration of young learners' cognitive characteristics and information-processing capacities. Although multimedia resources provide valuable opportunities for presenting language through visual and auditory channels, poorly designed materials may create unnecessary cognitive demands.

This paper proposes five methodological principles for managing cognitive load in primary EFL classrooms: information simplification, gradual presentation, visual-verbal coordination, pre-training, and active learner engagement.

Applying these principles may help teachers design age-appropriate multimedia materials, improve comprehension, support vocabulary retention, and create opportunities for meaningful speaking and listening practice.

In conclusion, cognitive load management represents an important methodological component of effective multimedia-assisted English language teaching in primary education. Further empirical research is needed to examine the effectiveness of these principles among learners in Grades 3–4.

REFERENCES

1. Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science, 12*(2), 257–285. https://doi.org/10.1207/S15516709COG1202_4

2. Mayer, R. E. (2021). *Multimedia Learning* (3rd ed.). Cambridge University Press.

3. Castro-Alonso, J. C., de Koning, B. B., Fiorella, L., & Paas, F. (2021). Five strategies for optimizing instructional materials: Instructor- and learner-managed cognitive load. *Educational Psychology Review, 33*, 1379–1407. https://doi.org/10.1007/s10648-021-09606-9

4. Mayer, R. E., Lee, H., & Peebles, A. (2014). Multimedia learning in a second language: A cognitive load perspective. *Applied Cognitive Psychology, 28*(5), 653–660. https://doi.org/10.1002/acp.3050

5. Cameron, L. (2001). *Teaching Languages to Young Learners*. Cambridge University Press.