

Chapter 8

Blending Computational Thinking and Learner-Paced Segment: Content Expert Evaluation of Digital Video Courseware Development

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ABSTRACT

This study explores the development and implementation of digital video courseware (DVC) combining computational thinking (CT) and segmentation techniques to enhance educational outcomes. Segmentation, particularly self-explanation, improves engagement and achievement, while system-paced segmentation reduces cognitive load for novices, boosting retention. The courseware fosters CT skills like

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algorithmic thinking and supports learner-paced flexibility for better information processing. Content experts evaluated its design, pedagogical relevance, and CT alignment. Results highlight improved understanding, retention, and performance, offering insights for advancing learner-centered education through CT integration and adaptive pacing.

1. INTRODUCTION

The collaboration between government, industries, and educational institutions has become increasingly essential in addressing the skills gap among university graduates to support Malaysia's vision of achieving high-income status by 2020. The 11th Malaysia Plan forecasts an increase in job vacancies requiring Technical and Vocational Education and Training (TVET)-related skills from 2016 to 2020. However, many institutions have struggled to produce graduates with TVET-related skills that align with industry demands (Adnan et al., 2021; Affero & Hassan, 2013; Economic Planning Unit, 2015; Ministry of Higher Education, 2017; UNESCO, 2021). Juškevičiene and Dagiene (2018), along with Rodgers and LaBoskey (2018), have emphasized that digital competence and computational thinking (CT) are key 21st-century skills, particularly crucial for university students in technical fields.

The concept of CT was first introduced by Papert in 1980 as part of computer science. However, Wing (2006) later popularized CT as a fundamental skill for all students, sparking a growing body of research on its integration into education. According to Lockwood and Mooney (2017), many countries are still in the process of adopting CT within their curricula at all educational levels. Educators are encouraged to apply diverse tools and materials to teach CT across subjects. When considering teaching and learning approaches, designing educational technology that effectively presents learning materials has become a key strategy. Research by Stiller et al. (2011) and Wang (2017) indicates that appropriate pacing in learning materials can significantly enhance motivation, student engagement, and achievement. Additionally, the Cognitive Theory of Multimedia Learning (CTML) principles, as discussed by Zavgorodniaia et al. (2021), highlight the importance of modality effects, segmentation, and system-paced learning in the design of educational materials. Their study also identified the need for further research to optimize learner control in managing learning materials.

Numerous studies have demonstrated the benefits of learner-paced instruction, including reduced cognitive load Hasler, Kersten, & Sweller (2007) and Moreno and Mayer (2007), improved knowledge achievement (Hasler, Kersten, & Sweller; 2007; Lusk et al., 2009; Mayer & Chandler, 2001), and more efficient skill acquisition. However, Stiller et al. (2009) pointed out that previous studies providing empirical

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