

UNIVERSITI TEKNOLOGI MARA

**INSTRUCTIONAL ANIMATION DESIGN:
THE INFLUENCE OF RENDER STYLES
AT THE COGNITIVE STAGE OF
PSYCHOMOTOR LEARNING**

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ABSTRACT

There have been several studies investigating the effectiveness of two-dimensional visual representation and three-dimensional visual representation. Areas that are similar to this study are in information visualisation, simulation, user interface and virtual navigation. However, the findings from these studies are relatively inconsistent. The research specifically focused on psychomotor learning as this area of study is still relatively under-researched. Moreover, recent studies show that animation is effective in learning procedural tasks. Nevertheless, based on the recommendations of these studies, more research is needed to narrow the gap on the underlying visual characteristics of the digital human representations and its techniques. Hence, this research aims to investigate the effectiveness and the efficiency of various virtual human representations such as two-dimensional visual and three-dimensional visual in motor skills acquisition. The first phase is to investigate the underlying characteristics and applications of animated digital human representations in instructional animations. Explorative studies via a hybrid of directed and interpretive content analysis grounded on Cognitive Theory of Multimedia Learning on the specific design features and visual representations were analysed. This study found common characteristics and unique approaches to creating instructional animation. The second phase is to propose a theoretically based instructional animation design framework for psychomotor learning. The study lays out a conceptual design framework based on selected learning theories, instructional video design, and digital human representations. The third phase is to test the render styles variable of the proposed instructional animation design framework through a series of hypothesis testing which includes cognitive efficacy, temporal efficacy and preference. The hypothesis testing for validation will be done through post-intervention method to measure the difference in efficiency and effectiveness performance. In the context of visual design, this experimental phase explores possible influences of realism (levels of visual details) in the cognitive aspect of motor skill acquisition. Sixty-four students with low-prior knowledge on the subject of tennis were randomly assigned into three groups to view either 2D schematic, 3D stylised, or live-action instructional tennis video. Their performance on the knowledge test (based on the revised Bloom's Taxonomy), learning time, efficiency score, confidence levels, preference, and open-ended responses were analysed. Key findings showed that despite most participants preferred to watch the live-action video; there was no statistically significant difference regarding cognitive learning performance among learners from different treatment groups. Hence, animated digital characters can still be incorporated into motor skill acquisition especially in instructional animations, videos, simulations, video games, and virtual reality. It is crucial to know the efficacy of different graphical renderings to design a simultaneously cost-efficient and engaging learning experience. Overall, this study contributed in identifying design characteristics of instructional animations, proposing instructional animation design framework for motor learning, and observing the efficiency and effectiveness of realism (levels of visual details) that can be applied in various fields such as arts, sports, and multimedia content design. Furthermore, this study has provided empirical evidence, framework and methodological reference for future research.

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