

Applying Dual Coding and Cognitive Load Theory in Designing Hybrid Learning Materials for Eastern Art History

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Abstract

Eastern Art History presents unique pedagogical challenges due to its symbolic complexity, abstract philosophical ideas, and cultural distance from modern learners. This study explores how *Dual Coding Theory* and Cognitive Load Theory can be applied to the design of hybrid learning materials to enhance student comprehension and engagement. Employing a qualitative-participatory method, data were gathered through classroom observations, semi-structured interviews with undergraduate students, and analysis of teaching documents in an Eastern Art History course. The findings indicate that combining verbal explanation with carefully selected visual media, such as images of artwork, architectural features, and documentary footage, enhances students' conceptual understanding and memory retention. *Dual Coding Theory* explains this by activating both visual and verbal cognitive channels, while Cognitive Load Theory clarifies how such integration can reduce extraneous cognitive load and promote deeper mental processing. This study also highlights the importance of visual aids not merely as supplementary tools, but as integral components of course design that help students connect abstract knowledge with concrete visual representations. This research emphasizes the need for theoretically grounded instructional strategies in hybrid learning environments, particularly in arts education. Aligning pedagogical design with cognitive learning principles contributes to more transformative, accessible, and sustainable art history education. The results offer a model for implementing cognitive-based visual learning in higher education contexts, especially within digital and hybrid formats.

Keywords: *Dual Coding Theory*, Cognitive Load Theory, Eastern Art History, Hybrid Learning, Visual Pedagogy.

1. Introduction

Teaching the subject of Eastern Art History at the higher education level often encounters complex pedagogical challenges. The course material, rich in symbolic meaning, profound philosophical thought, and cultural values that are distant from the everyday experiences of contemporary students, frequently hampers both comprehension and delivery in the classroom. Artworks from civilizations such as China, Japan, India, and regions of Southeast Asia are often difficult for students to fully grasp due to limitations in connecting historical narratives typically presented textually with visual forms that can be tangibly experienced. As a result, the learning process tends to feel disconnected and fails to effectively bridge the historical context with the aesthetic experience essential to understanding Eastern art.

On the other hand, today's generation of university students is accustomed to digital culture and visual learning patterns, which demand more adaptive and multimodal teaching approaches. Hybrid learning, combining face-to-face instruction with technology-based online learning has emerged as a strategic solution to bridge these challenges [1]. This learning model

has proven effective in higher education. Over the past two decades, hybrid learning has developed rapidly, and the widespread shift to remote education during the COVID-19 pandemic further accelerated its adoption, making it one of the most commonly implemented instructional methods in both schools and universities [2]. However, the development of hybrid learning materials cannot be carried out haphazardly; it must be grounded in relevant learning theories, particularly those related to how the brain processes visual and verbal information simultaneously. In a study conducted by Turel [3], it was found that visual elements have a more lasting impact on memory, learners tend to retain and understand information better when visual components are incorporated. The study also highlighted that repeated exposure to similar or parallel listening texts contributes to learning effectiveness. Furthermore, participants expressed a preference for reviewing audio-only materials when they were accompanied by either keywords or supplementary contextual visuals along with keywords.

Within this framework, Dual Coding Theory, introduced by Allan Paivio, serves as a relevant theoretical foundation. This theory posits that learning becomes more effective when information is presented through two distinct yet complementary cognitive representation systems: the verbal system and the visual system [4]. Dual Coding Theory is used to help students process information in learning materials based on their learning preferences. The application of Dual Coding Theory has a significant impact on learning outcomes. Selecting information in instructional materials according to individual student preferences provides learners with the opportunity to study more easily and optimize their learning process. For teachers or lecturers, Dual Coding Theory offers the opportunity to design learning materials that align with students' characteristics. Learning materials developed using the DCT approach have the potential to foster more effective learning [5]. Meanwhile, Cognitive Load Theory, developed by John Sweller, emphasizes the importance of managing cognitive load in the learning process. This theory highlights that information overload beyond the capacity of working memory can hinder the formation of new knowledge schemas [6]. Therefore, instructional design that takes into account the balance between the complexity of the material and the cognitive capacity of learners becomes critically important, especially in the context of learning that involves symbolic cultural content and the complex philosophies of Eastern traditions.

This study aims to explore how the application of Dual Coding Theory and Cognitive Load Theory can be integrated into the design of hybrid-based instructional materials for the course *History of Eastern Art*. Using a participatory qualitative approach, the research draws on data collected through classroom observations, student interviews, and analysis of learning documents. The primary focus of this research is to formulate a hybrid instructional design model that not only delivers information but also transforms students' learning experiences [7]. In this design, visual media is positioned as a central component of learning rather than merely a supporting element. Grounded in strong theoretical foundations, the model is expected to enhance students' conceptual understanding, improve information retention, and bridge cultural gaps in the teaching and learning of Eastern art in today's digital era.

2. Method

This research employs a qualitative approach with a participatory method, aiming to deeply explore students' learning experiences and assess the effectiveness of a hybrid instructional design grounded in visual cognitive theory. This approach was chosen to enable the researcher to contextually understand students' responses to the integration of visual media in the learning process of the *History of Eastern Art* course, particularly within a hybrid learning environment.

The subjects of this study were students from the 2023 cohort of the Visual Arts Education Program at Universitas Negeri Malang who were enrolled in the *History of Eastern Art* course. A total of 112 students participated, divided into four classes. Participants were selected purposively, based on their level of active engagement in classroom activities and their willingness to take part in the observation and interview processes.

The data in this study were collected through three main techniques: classroom observation, semi-structured interviews, and analysis of instructional documents. Observations were conducted during teaching and learning sessions to directly examine the use of visual media, interaction patterns between lecturers and students, as well as students' spontaneous responses to the material presented. In-depth interviews were carried out with selected student representatives from each class to gain insights into their perspectives on the use of visual media, its relation to their understanding of the material, and their learning experiences in a hybrid format. Meanwhile, the instructional documents analyzed included the Semester Learning Plan (RPS), lecture presentation materials, and student assignments related to the integration of visual media in the learning process.

All data were analyzed using an interactive thematic analysis approach. This process involved an in-depth examination of interview transcripts, observation notes, and instructional documents to identify recurring patterns, key themes, and relationships among emerging data elements. To ensure the validity of the findings, source triangulation was employed by comparing observational data, interview results, and relevant documentation. In addition, member checking was conducted by asking respondents to confirm the interpretation of their interview responses, ensuring that the meanings captured by the researcher accurately reflected the participants' experiences. Through this process, the study aims to formulate principles or a model of hybrid instructional design that aligns with the unique characteristics of the *History of Eastern Art* course and is grounded in robust learning theories.

3. Result and Discussion

Based on classroom observations and student interviews conducted in the *History of Eastern Art* course, it was found that the use of visual media combined with verbal explanations significantly enhanced students' understanding of abstract and symbolic content. Students reported that when materials were presented through images, videos, or digital visualizations, they found it easier to grasp the forms, symbolic meanings, and cultural contexts of the artworks being discussed. This indicates that learning processes engaging both cognitive channels, verbal and visual, simultaneously, as outlined in Dual Coding Theory, contribute meaningfully to improved information retention and comprehension [8].

In the development of hybrid-based learning, the findings of this study highlight the importance of selecting visual media that are both relevant and contextually appropriate to enhance instructors' delivery of course material. Visualizations such as images of Hindu temple structures, traditional Japanese ink illustrations, or documentation of ancient Egyptian artifacts serve as bridges between conceptual oral explanations and concrete visual representations. In practice, these types of media can be integrated into digital platforms such as Learning Management Systems (LMS), interactive e-books, or video materials, allowing students to access them independently or during synchronous learning sessions.

From the perspective of Cognitive Load Theory, The integration of relevant visual media also helps reduce students' extrinsic cognitive load. When verbal explanations are accompanied by supporting visualizations, students do not need to imagine the form or context of the art objects being described [9]. This optimizes working memory capacity to build germane load, which is productive cognitive effort in forming new understanding schemes. Conversely, the use of unstructured visual media or media not directly related to the content of the material risks increasing unnecessary cognitive load [10].

Field observations also revealed that students demonstrated higher interest and stronger emotional engagement when visual materials were presented in an engaging and interactive manner. For example, students' enthusiasm increased when watching documentary videos about historical sites or when viewing presentations that included symbolic diagrams accompanied by narrative explanations. In the context of hybrid learning, such experiences can be replicated through the development of multimedia materials that combine textual narration, visual illustrations, light animations, and voice-over narration, thereby creating a more immersive and meaningful learning experience [11].

One of the most promising instructional media designs to bridge visual, verbal, and interactive aspects in hybrid learning is an interactive e-book based on Augmented Reality (AR). This medium allows students to view Eastern art objects such as sculptures, architecture, or traditional paintings in three dimensions using their mobile devices, while simultaneously listening to explanatory narratives or reading contextual textual descriptions. As a result, cognitive processing occurs in parallel through two representational channels, in alignment with the principles of Dual Coding Theory [12]. Furthermore, the use of AR can also reduce extrinsic cognitive load by providing concrete and accessible visual representations, while increasing germane load through active exploration of visual material. In this case, AR e-books not only serve as a learning supplement, but also as a center for multimodal and transformative learning experiences.

4. Conclusions and Suggestions

The findings of this study indicate that the development of hybrid learning materials for the course History of Eastern Art, based on the principles of Dual Coding Theory and Cognitive Load Theory, can have a positive impact on improving the quality of learning. By strategically utilizing visual media, such as illustrations, documentary videos, and three-dimensional models, students can connect abstract verbal information with concrete and easily understandable visual representations. This approach not only deepens understanding

of the symbolic value and cultural context of the material but also contributes to strengthening students' memory and cognitive engagement during the learning process.

The application of Dual Coding Theory enables information processing to occur through two channels simultaneously, contributing to the strengthening of long-term memory structures. On the other hand, Cognitive Load Theory highlights the need to manage mental load so that complex material can be understood more effectively. In this context, the presence of visual media in instructional design is not merely a supporting element but plays a key role in fostering deeper and more meaningful understanding.

One media option that has great potential to support this approach is interactive e-books that utilize Augmented Reality (AR) technology. With AR, students can explore works of art virtually, understand their historical background visually, and listen to narrative explanations at the same time. This type of media format aligns well with the characteristics of hybrid learning, where interactivity, ease of access, and multi-sensory engagement are key factors in enhancing the effectiveness of art education in the digital age.

Based on the findings, it is recommended that higher education institutions begin designing and implementing Augmented Reality (AR) technology-based learning modules into the structure of art and art history curricula. In addition, training for lecturers on learning design based on cognitive theory and the use of interactive technology needs to be carried out in a planned and sustainable manner. This initiative is expected to create learning experiences that are not only engaging and responsive to the learning styles of the digital generation but also possess conceptual and contextual depth in understanding the richness of Eastern culture.

References

- [1] E. Pruanthy, M. Simbolon, I. M. Sari, and W. P. Pratiwi, "Eris Dkk ., Penggunaan Media Visual PENGGUNAAN MEDIA VISUAL DALAM PEMBELAJARAN SEJARAH," pp. 36–42.
- [2] Y. Helsa, R. Marasabessy, D. Juandi, and T. Turmudi, "Penerapan Hybrid Learning di Perguruan Tinggi Indonesia: Literatur Review," *J. Cendekia J. Pendidik. Mat.*, vol. 7, no. 1, pp. 139–162, 2022, doi: 10.31004/cendekia.v7i1.1910.
- [3] V. TÜREL, "Learners' Perceptions Towards Dual-Coding in Adaptive Hypermedia Environments: Listening Texts, Keywords and Visuals," *J. Learn. Teach. Digit. Age*, vol. 8, no. 1, pp. 32–46, 2023, doi: 10.53850/joltida.1083583.
- [4] J. Mir, "Impact of Dual Coding Strategy to Enhance Students' Retention of Scientific Concepts in Middle Schools," *Ann. Hum. Soc. Sci.*, vol. 4, no. IV, 2023, doi: 10.35484/ahss.2023(4-iv)63.
- [5] C. Kurniawan, S. R. Kusumaningrum, K.-F. T. Lam, and E. Surahman, "Improving Language Teaching and Learning Process with Dual Coding Theory Approaches," *J. Pendidik. Teor. Penelitian, dan Pengemb.*, vol. 7, no. 8, p. 281, 2022, doi: 10.17977/jptpp.v7i8.15313.
- [6] J. Sweller, "Cognitive load theory, learning difficulty, and instructional design," *Learn. Instr.*, vol. 4, no. 4, pp. 295–312, 1994, doi: 10.1016/0959-4752(94)90003-5.
- [7] S. Abdus, I. Ardana, I. Degeng, and P. Setyosari, "Pengaruh Beban Kognitif

- Pembelajaran Multimedia Dan Pengetahuan Awal Terhadap Hasil Belajar Keterampilan Apilkasi Pengolah Angka Mahasiswa Perbankan Syariah STAIN Pamekasan. *Repository*, 9(3), 1–,” *Repository*, vol. 9, no. 3, pp. 1–32, 2017, [Online]. Available: <http://repository.iainmadura.ac.id/id/eprint/50>
- [8] S. Pajriah and A. Budiman, “PENGARUH PENERAPAN MODEL PEMBELAJARAN DUAL CODING TERHADAP PENINGKATAN HASIL BELAJAR SISWA PADA MATA PELAJARAN SEJARAH (Studi Penelitian Kuasi Eksperimen pada Siswa Kelas XI di SMA Informatika Ciamis),” *J. Artefak*, vol. 4, no. 1, p. 77, 2017, doi: 10.25157/ja.v4i1.737.
- [9] D. A. Sholihah, “Strategi Pembelajaran Matematika Berdasarkan Cognitive Load Theory untuk Meminimalkan Extraneous Cognitive Load,” *Equal. J. Ilm. Pendidik. Mat.*, vol. 5, no. 1, pp. 13–23, 2022, doi: 10.46918/equals.v5i1.1197.
- [10] F. Damayanti, “Pembelajaran Berbantuan Multimedia Berdasarkan Teori Beban Kognitif untuk Meningkatkan Kemampuan Menyelesaikan Masalah Program Linear Siswa X TKR 1 SMKN 1 Doko,” *J. Pendidik. Sains*, vol. 1, no. 2, pp. 133–140, 2013.
- [11] H. Firmansyah, “Penggunaan Media Pembelajaran Digital untuk Meningkatkan Minat Belajar Sejarah di Sekolah Menengah Atas,” *JIM J. Ilm. Mhs. Pendidik. Sej.*, vol. 9, no. 2, pp. 541–548, 2024, doi: 10.24815/jimps.v9i2.30416.
- [12] B. N. Falah, P. Wijayanti, and M. Masriyah, “Beban Kognitif Intrinsik Siswa Kepribadian Guardian dalam Memecahkan Masalah Matematika Ditinjau dari Gaya Belajar,” *J. Pendidik. Mat.*, vol. 12, no. 2, pp. 123–137, 2022.