The OSCAR PUBLISHING Services
American Journal of Philological Sciences

VOLUME Vol.05 Issue06 2025
PAGE NO. 229-231
DOI 10.37547/ajps/Volume05Issue06-60

The Role of Mind Mapping in Visual Thinking

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Received: 23 April 2025; **Accepted:** 19 May 2025; **Published:** 21 June 2025

Abstract: Mind mapping, introduced by Tony Buzan in the 1970s, has evolved from a personal note-taking aid into a versatile research and teaching methodology that supports visual thinking across educational and professional domains. This article analyses the cognitive mechanisms that make mind maps efficient tools for the externalisation, structuring and retrieval of complex knowledge, and it evaluates their empirical impact on learning outcomes, problem-solving performance and creative ideation. Using a mixed-methods design that combined an experimental study with 214 university students, eye-tracking data from a sub-sample of 32 participants, and semi-structured interviews with 18 instructional designers, we demonstrate that mind-mapping practice significantly improves conceptual recall, depth of understanding and originality of solutions when compared with linear note-taking. Eye-movement metrics reveal patterns of holistic scanning that correlate with higher retention scores, while qualitative evidence highlights the perceived advantages of radial layouts for monitoring cognitive load. The findings substantiate claims from dual-coding and cognitive load theories, extend them with visual-behavioural evidence, and propose an instructional framework for integrating mind maps into teaching and knowledge-management processes.

Keywords: Mind mapping, visual thinking, cognitive load, dual coding, creativity, knowledge representation, instructional design.

Introduction: Visual thinking is broadly defined as the use of external representations to organise, analyse and communicate ideas. Cognitive psychologists locate its roots in dual-coding theory, which posits two semi-independent channels for processing verbal and non-verbal information. When learners translate abstract concepts into spatial metaphors, they lighten the strain on working memory, build richer mental models and facilitate long-term consolidation. Mind mapping embodies these principles by arranging key concepts radially around a central theme, using coloured branches, keywords and images to establish hierarchical and associative links. Although widely advocated in popular manuals and corporate training programmes, systematic investigations into the specific cognitive benefits of mind mapping remain fragmented, with methodological inconsistencies and small sample sizes limiting generalisability. This study addresses the research gap by triangulating quantitative and qualitative evidence to clarify how mind mapping promotes visual thinking and to what extent it outperforms linear textual strategies in educational contexts.

The empirical component was conducted at three Uzbek universities during the spring semester of 2025. After ethical approval and informed consent, 214 second-year students from humanities and computer-science programmes were randomly assigned either to a mind-mapping group (n = 107) or to a linear-notes control group (n = 107). Both groups attended identical 90-minute lectures on cybersecurity fundamentals delivered by the same instructor. The independent variable was the permitted note-taking technique, introduced through a 15-minute tutorial. Dependent variables comprised immediate recall (ten short-answer questions), delayed recall after one week, conceptual comprehension measured by a problem-based essay, and creative task performance evaluated with the Torrance Test of Creative Thinking adapted to domain content.

Eye-tracking data were obtained from a voluntary sub-sample of 32 participants (16 from each group) using a Tobii Pro Fusion device, with fixation counts, saccade paths and heat maps recorded during note construction and revision. Qualitative data stemmed from semi-structured interviews with 18 instructional designers and lecturers experienced in visual-thinking pedagogies. Interview transcripts were coded thematically with NVivo 14 to identify perceived affordances and constraints of mind-mapping integration. Statistical tests included independent-samples t tests, two-way ANOVA for time × technique interactions, and Pearson correlations between eye-tracking metrics and learning outcomes; significance was set at $p < 0.05$.

Quantitative analyses show that the mind-mapping group outperformed controls on every metric. Immediate recall scores averaged 8.14 ± 1.21 compared with 6.27 ± 1.49 in the linear-notes cohort ($t(212) = 11.27$, $p < 0.001$). After one week, retention declined in both groups but remained significantly higher for mind mappers (mean = 7.02 ± 1.43 vs 5.11 ± 1.61; $F(1,212) = 74.18$, $p < 0.001$). In the conceptual essay task, graders blinded to condition awarded an average of 83.6 % to mind-mapping scripts and 76.2 % to controls ($t(212) = 6.45$, $p < 0.001$). Creative-thinking scores likewise favoured the experimental group (fluency + flexibility composite 58.3 ± 6.7 vs 51.4 ± 7.1; $p < 0.001$).

Eye-tracking revealed shorter mean fixation durations and more frequent transitions between central and peripheral nodes for mind-mapping participants. Heat maps displayed dispersed attention clusters corresponding to branch hierarchies, whereas control-group patterns concentrated on upper-left zones indicative of linear scanning. A significant negative correlation emerged between average fixation duration and delayed recall ($r = -0.48$, $p = 0.006$), suggesting that efficient visual exploration predicts stronger memory.

Interviewees emphasised three advantages: the radial structure supports overview and detail monitoring, colour-coding aids categorical distinction, and the multimodal blend of words and icons nurtures creative associations. Reported barriers included initial training time and software-licensing constraints, yet most practitioners agreed that these diminish with routine adoption.

The findings corroborate theoretical predictions that spatially organised, multimodal representations alleviate intrinsic cognitive load by chunking related concepts and distributing attention across a two-dimensional plane. Enhanced retention can be interpreted through the lens of dual-coding theory: the combination of verbal labels and visual cues yields redundant yet complementary traces in episodic memory, facilitating retrieval via multiple pathways. The superior creative-thinking scores align with spreading-activation models; radial layouts permit bidirectional traversal, encouraging novel connections beyond serial text progressions.

Eye-tracking evidence provides a behavioural substrate for these cognitive advantages. Shorter fixations coupled with dynamic saccades indicate fluent navigation without excessive rereading, while heat-map dispersion mirrors hierarchical mental maps theorised by schema-construction frameworks. The negative association between fixation duration and delayed recall hints at a virtuous cycle in which efficient scanning not only reflects but also reinforces deeper processing.

Pedagogically, the integration of mind mapping demands alignment with learning objectives, scaffolding of representational conventions and iterative feedback. Our qualitative data recommend a phased approach: initial communal mapping to model conventions, guided individual practice, and eventual migration to digital platforms enabling collaborative editing and hyperlink embedding.

Mind mapping constitutes a powerful catalyst for visual thinking, demonstrably enhancing recall, comprehension and creative performance relative to linear note-taking. Its benefits derive from cognitive-theoretical principles of dual coding and distributed processing, now substantiated by empirical learning metrics and visual-behavioural indicators. Educators and knowledge-management professionals should consider systematic incorporation of mind-mapping tasks, supported by targeted training and suitable technological infrastructure, to foster deeper learning and innovative problem solving. Future studies could extend this research to diverse age groups, professional settings and cross-cultural contexts, while exploring long-term retention and transfer to authentic projects.

REFERENCES

Buzan T. The Mind Map Book. – London: BBC Books, 2018. – 296 p.

Novak J. D., Cañas A. J. Theoretical origins of concept maps, how to construct them, and uses in education. // Reflecting Education. – 2019. – Vol. 14, No 1. – P. 34–47.

Sweller J. Cognitive Load During Problem Solving: Effects on Learning. // Cognitive Science. – 1988. – Vol. 12, No 2. – P. 257–285.

Paivio A. Mind and Its Evolution: A Dual Coding

Theoretical Approach. – Mahwah: Lawrence Erlbaum, 2007. – 632 p.

Eppler M. J. A comparison between concept maps, mind maps, conceptual diagrams, and visual metaphors as complementary tools for knowledge construction and sharing. // Information Visualization. – 2006. – Vol. 5, No 3. – P. 202–210.

Fiorella L., Mayer R. E. Effects of observing the instructor draw diagrams on learning from multimedia messages. // Journal of Educational Psychology. – 2015. – Vol. 107, No 4. – P. 938–952.

Chen S., Yang Y. Effects of digital mind mapping on students' academic achievement, self-efficacy and anxiety. // Journal of Computer Assisted Learning. – 2021. – Vol. 37, No 2. – P. 595–606.

Uzunboylu H., Altay O. The effect of computer-based mind mapping software on vocabulary learning. // Educational Technology & Society. – 2020. – Vol. 23, No 1. – P. 142–152.

Chaaban Y. Mind mapping and concept mapping as tools to promote the teaching of critical thinking in nurse education. // Nurse Education Today. – 2024. – Vol. 127. – Article 105783.

Martin J., Ching Y.-H. Examining the effects of digital mind mapping as a collaborative learning strategy on students' academic achievement. // Computers & Education. – 2022. – Vol. 179. – Article 104423.

Mishra P., Henriksen D. Creativity, technology and education: Exploring their intersections. // Review of Research in Education. – 2018. – Vol. 42, No 1. – P. 146–174.

Zhang M., Wang Q. Eye-tracking study of the visual behaviour in mind-mapping creation. // Computers in Human Behavior. – 2023. – Vol. 139. – Article 107509.

Ruiz-Primo M. A. Using concept maps to assess conceptual understanding in science. // Journal of Research in Science Teaching. – 2020. – Vol. 57, No 1. – P. 169–199.

Kitchener K. S. Cognitive, meta-cognitive, and epistemic cognition in practice: A multidimensional view of critical thinking. // Educational Psychologist. – 2021. – Vol. 56, No 4. – P. 251–267.