

# Concept Map-Assisted Learning: An Effective Strategy for Building Knowledge Structures

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*“Never believe for a second that your weak, within all of us we have a reserve of inner hidden strength.”*

*–Victoria Addino*

CONCEPTS are generally understood as fundamental building blocks underlying principles, thoughts, and beliefs (Goguen, 2005), playing a central role in all facets of cognition. For students, conceptual understanding is the foundation of the development of disciplinary knowledge. Thorough comprehension of core concepts is critical to the mastery of relevant knowledge and skills and their practical applications (Wang & Miao, 2023). From teachers’ point of view, successful conceptual instruction can significantly increase teaching efficacy and aid students in developing legitimate knowledge structures. Through in-depth analysis of concepts, teachers guide students to discover the relations between knowledge, fostering their learning interest and thinking ability (Yan, 2022). In order for students to grasp core concepts more efficaciously, educators have experimented with a wide variety of teaching methods, including cooperative learning, project-based learning, concept mapping, and more (Wang, 2016). Among them, concept mapping is recognized as an effective device for students mastering major concepts and developing connections between new and prior knowledge.

Concept mapping was developed by the professor of education Joseph D. Novak and his co-workers at Cornell University in the 1970s, where they sought to research the changes in children’s knowledge of science (Novak & Cañas, 2008). Novak’s work was informed by cognitive theories of David Ausubel, who stressed that meaningful learning involved the assimilation of new concepts and propositions into existing cognitive structures (Wu, 2023). Concept mapping has subsequently been adopted as a method to increase meaningful learning in the sciences and other subjects as well as to represent the expert knowledge of researchers, governments, and businesses.

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Concept maps are graphical representation tools, used to describe abstract information such as systems, states, structures, or concepts. They can display the relationships between different concepts visually by nodes and links, facilitating the comprehension and organization of sophisticated information structures (Nousiainen & Koponen, 2011). There has been a widespread application of concept maps in various areas. In business management, they are often used to demonstrate organizational lay-out, clarify departmental responsibilities, and showcase operational processes (Zhu, 2022). In scientific research, researchers use concept maps to organize and illustrate complex scientific information, theories, and experimental findings. They are conducive to researchers' understanding of inherent logic of the relatedness between experimental data, supporting the advancement of in-depth research work (Fang et al., 2023).

Concept maps are most heavily employed in the field of education. From basic to higher education, teachers and students often use them to develop knowledge structures and enhance learning. Particularly in STEM education, concept mapping is adopted to help students comprehend complex conceptual relationships. It is also incorporated into certain specific teaching models such as the holistic module learning model, wherein it is used to support students' structured learning (Meng et al., 2023). In vocational education and adult education, concept maps are applied to demonstrate workflow, skill requirements, career development paths, etc. (Chen, 2019)

*The Effect of Teaching the Secondary School 7th Grade Cell and Division Unit with Concept Maps on the Academic Success of Students* in this issue explores the impact of the use of concept maps in science education on student academic achievements, based on a lesson study among 7th-grade students from a public secondary school in the Central Anatolian Region in Turkey. The analysis results of both quantitative and qualitative data support that the adoption of concept maps in teaching had significantly positive effects on students' learning outcomes, which were achieved by increasing their interest in the lesson, allowing them to learn collaboratively, encouraging self-directed learning, preventing the formation of misconceptions, and making presumably difficult concepts easier to understand, as well as providing fun of learning (Kaymaz & Doğru, 2024). The study provides valuable insights into how to support science instruction using concept maps.

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