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CONCEPT MAPPING STRATEGY IN STUDENTS' FOREIGN LANGUAGE LEARNING ACADEMIC PERFORMANCE

Shkarban I.
Ph.D., Associate Professor
Department of Foreign Languages, Faculty of Law and International Relations
Kyiv Borys Grinchenko University

The key focus of the 21st century higher education is to provide students with cognitive foreign language learning strategies that can be applied in a variety of real-world settings. In the terms of Ausubel-Novak's theory of meaningful learning, students' knowledge is cognitively acquired through the construction of their own patterns of meanings and through engagement in social interactions and critiques [1]. The expert structure that represents professional knowledge is explicit in the integrated nature of theoretical knowledge and the procedural knowledge constituted by the visible practice that specifies a professional [2].

Thus low cognitive level (rote learning) is typical for the students who tend to concentrate on isolated propositions rather than advance in integrated hierarchical conceptual frameworks. Whereas progressive differentiation is defined by I.M. Kinchin, A. Möllits, P. Reiska as an attempt to integrative reorganization of existing knowledge under inclusive and explanatory principles to reconcile the supposed contradictory ideas with a higher degree synthesis [3].

Concept mapping encourages nonlinear thinking [4]. By structuring concept maps learner proves involved in active knowledge and, as suggested by Hyerle, this educational activity strategy helps students to "think inside and outside the box" [5]. Graphic representation of concept mapping accurately displays the comprehensive arrangement of concepts and the enhancement of metacognitive skills [6]. Concept maps are unique due to their graphical structures: a hierarchical concept map ("Novakian concept map") is recognizable for its top-down structure, general concepts are on top and more specific concepts are at the bottom.

Analysis of recent research and publications. Several authors (I.M. Kinchin, A. Möllits, P. Reiska, J. Vanides, Y. Yin, M. Tomita, M.A. Ruiz-Primo) associate the mapping hierarchy with the learning context. Miller and Cañas suggest a semantic scoring formula which consists of six focus criteria for all concept maps: 1) focus question and root concept, 2) the correct propositional structure, that is link and overall map reorganization; 3) misconceptions or inaccurate propositions; 4) dynamic proposition, i.e. action, movement, change of state or dependency relationships; 5) the number of quality cross-links that install correct, suitable, and instructive links; 6) cycles in which the direction of the arrows allows the entire closed path in a single direction. All levels are transformed into the content-quality scale that is determined by the categories of unevaluated, very low, low, intermediate, high and very high [7].

Other studies by M. Nousiainen and I. Koponen have put forward the concept map structure as an important information tool to evaluate the level of understanding and quality of learners' knowledge. K. Subramaniam, P.E. Harrell, D. Salmon, M. Kelly highlight the effectiveness of the qualitative scheme that differentiates three morphological types of concept map categories – spoke, chain and network [8].

The practically proposed concept map morphology is based on the following comprehensive structural features:

1. *Spoke graphical structure* is characterized by a simple single level concept structure where all subordinate concepts are in relation to the root and have no connection with the neighboring subordination level. Due to the links that are built-in in the spoke structure deleting concepts from the map doesn't impact the overall structure and doesn't affect neighboring subordinate concepts which don't form cross links as well.

2. *Chain graphical structure* is organized by compound connections where the meaning is readable only as a whole because a root concept is structurally linked to the subordinate one and constructs a sequence with the following multiple listed level elements in relation to the root. Deleting concepts impacts only the subordinate concept which is lower down in the sequence.

3. *Network graphical structure* represents highly integrated and hierarchical network of concepts indicating a high level of proficiency in the topic understanding. The integrity of the map is maintained by the cross links on the multiple level relations of concepts to the root, that is removing or adding does not affect the overall structure.

Goal. The pro and contras of traditional quantitative or qualitative approaches to concept mapping analysis are explained by the absence of clear differentiation of the types of knowledge that have been embedded within maps. The application of the semantics dimension of Legitimation Code Theory offers a new approach that is explicit in consideration of qualitatively different knowledge types' organization through cognitive mapping.

Results. The study of the semantic density and semantic gravity degree exhibited within map propositions offers a more balanced and subtle approach to a concept map quality evaluation.

Apart from assessing the overall correctness of general knowledge organizational propositions within a map, the use of Legitimation Code Theory in concept mapping allows the evaluating the mapper's ability to connect theoretical and practical knowledge. This raises the map above the assessment of factual data review and proves the higher organized network of thinking skills that are required for students to achieve proficiency in foreign language learning. This mastery has been shown by I.M. Kinchin to be dependent on the learner's ability to balance between complementary knowledge structures consisting of chains of practice (exhibiting low semantic density and high semantic gravity), and fundamental networks of understanding (indicating high semantic density and low semantic gravity) [9].

To analyze the semantic density and semantic gravity degree exhibited within students' concept mapping the first year students specializing in Maths were faced with a self-study foreign language learning glossary practice on equation definition (English as a foreign language). The task consisted in concept mapping of equation and providing grounding on subconceptual devision.

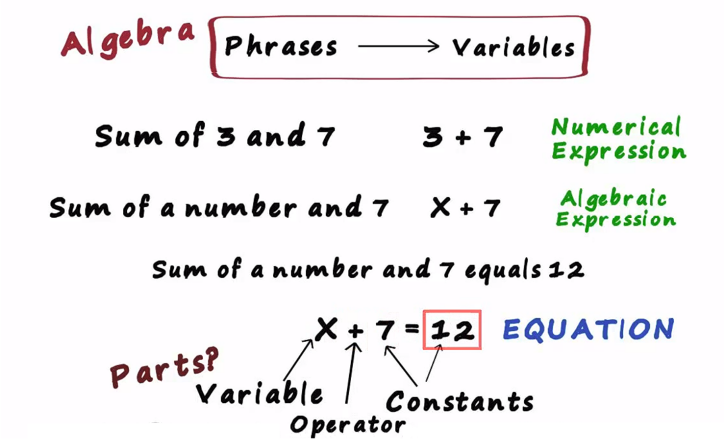

Figure 1. Phrase-Expression links

Figure 1 clearly demonstrates the preface to work that is to establish the link between the linguistic concept "phrase" and concepts of numerical and algebraic expression which serves the base for further subconceptual differentiation. This is a case of a classical cmap which provides a hierarchical network of interconnecting concepts with linking words describing the nature of cohesive links between nodes.

It should nevertheless be a vdiagram that guides the analyses and illustrates the interplay between the conceptual elements (theories, hypothesis, rules, principles and concepts) and the methodological or doing-elements, i.e. transformations, knowledge and value in the context of an educative event (object / subject / event) to answer focus questions.

Conclusions and perspectives. This contrastive approach to concept map analysis raises a number of new opportunities and challenges for the research. By considering concept maps to be structured by different types of knowledge, it offers a new set of research questions that might be addressed through concept mapping analysis.

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