Concept Mapping: Renewing Learning and Thinking
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# CONCEPT MAP: ACTIVITIES FOR READING COMPREHENSION AND SECOND LANGUAGE LEARNING IN BIOLOGICAL AND MEDICAL SCIENCE AREA

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**Abstract**. It is well known the efficiency in using concept map as a learning tool. This research, that was developed as part of the program *Leitura e Compreensão de artigos científicos em inglês na área de Ciências* Biologicas – LECACI-Bio, in Instituto de Ciências Biológicas at Universidade Federal de Minas Gerais, Brazil, was an attempt to show activities that can be used as a variation in the concept map approach in the development of skills on reading comprehension and second language learning in biological and medical science area. The study showed that the use of concept maps in the classes can be useful to vocabulary language developing and reading skills in English.

**Keywords:** concept map, learning tool, skills development

## 1 Introduction

*Concept maps are graphical tools for organizing and representing knowledge* (Novak & Cañas, 2008) The knowledge is stratified in small pieces of information and disposed in a visual manner in such a way that the reader can retrieve rapidly the subject. The graphic is composed by circles or boxes that were connected with lines. In the circles or boxes, the concepts or labels are used to describe events or objects. On the lines, the linking words or linking phrases are used to stablish the relationship between two concepts. Two or more concepts connected by linking words or phrases create propositions with meaningful statements. It was first used in 1972. Novak, based on the learning psychology of David Ausubel, developed a course of science to children using concept and propositional frameworks in order to make the assimilation of new concepts and propositions easier. The objective of this work is to discuss the learner's performance in the tasks where the concept maps were used as an educational tool to develop skills on reading comprehension and English learning for undergraduate and graduated learners of Biological and Medical Science.

## 2 Materials and Methods

This research was performed as part of the program *Leitura e Compreensão de artigos científicos em inglês na área de Ciências Biológicas* – LECACI-Bio, in Instituto de Ciências Biológicas at Universidade Federal de Minas Gerais, Brazil. The classes are designed for undergraduate and graduated learners of Biological and Medical Science in order to provide proficiency in reading academic texts in English. The data was collected from the first semester of 2018 group with eleven learners. It was heterogeneously compounded of beginners and advanced English learners, college seniors and juniors from Biological and Medical Science graduation and post-graduation courses. The learners were exposed to concept maps tasks with different approaches.

In the Table 1 below the task approaches are named and described (material and procedures, tips and benefits). The tasks were developed from the internet resource. The texts used as basis for the tasks were academic in the Biological and Medical Science area. The task development followed the chart order in such a way the students started with 'filling the blanks' of the concept maps to 'studying the structure of sentences based on the concept map structuration'.

## 3 Results

The 'filling the blanks' activities were performed without difficulties by the learners. The most experts in the biological and medical areas discussed the way the concept maps were designed and pointed some solutions to the structure of the map. 'Making a text in L1 from the map in L2' was an easy task too because the concept map chosen was three levels of hierarchy. The learners should write in Portuguese small paragraph about the structured information from the tree structure.

| TASKS | MATERIAL AND PROCEDURES | TIPS | BENEFITS |
|---|---|---|---|
| a) Filling the blanks | Give a sheet of paper with a map with blanked circles or squares to be filled. | The learners can do it individually, in pairs or in group. It could also be used competition to challenge the students. | • Appreciation of learner's knowledge<br>• Awareness and motivation for learning |
| b) Designing a map using given words. | Give words from the same theme and ask the learners to design a concept map, finding the relationship among the words. | Use brainstorming to raise the participation of the learners. | • Appreciation of learner's knowledge<br>• Organization skills based on hierarchy |
| c) Making a text in L1 from the map in L2 | Give the concept map to the learners and ask them to write a text from it in the target language. | Ask the learners to look the words they do not know at the dictionary. | • Vocabulary development;<br>• Connection of ideas;<br>• Reading comprehension |
| d) Making a text in L2 from the map in L1 | | | |
| e) Designing a map from a text. | Give a text to the students and ask the learners to design a map. | | |
| f) Reading a text after studying a conceptual map | Give a concept map to the learners from a subject. Ask them to guess the words they do not know. Give a text based on the conceptual map subject. | The reading can be part of the task and the map can be used as an introduction to the theme. | • Use of reading skills for reading comprehension |
| g) Mapping the text | Give a text to the students and ask them to circulate the conceptual words on the text. Ask the students to link the words and find out the relationship between the circled words. | The use of colors could integrate the information correspondence. | • Reading skills for reading comprehension<br>• Text mining |
| h) Answering questions using a concept map | Give questions to the students to be answered using a concept map as reference | The questions should be elaborated to avoid the mechanization of knowledge. | • Information retrieval |
| i) Studying the structure of sentences based on the concept map structuration | Give complex sentences to the learners and ask them to put in a concept map structure. | The use of metalanguage could be used to help the learners' comprehension about the structure of the sentences. | • Structural learning<br>• Connection of ideas;<br>• Reading comprehension |

**Table 1**: Tasks for Concept Mapping

However, 'Designing a map using given words' was misunderstood by some learners who designed words tree without connecting the ideas with nodes. In such a way the collection of words was useful because they used the dictionary to find out the word meaning. The activities based on 'designing a map from a text' were developed in pairs, with different knowledge level in English and Biology, i.e., one knows a lot in biology and is beginner in English and vice-versa. The exchange of information helped them in the concept map design.

'Reading a text after studying a conceptual map' was a good pre-task to read the academic texts mainly because the students could do a review in specific biological and medical science area. To the post-graduation students, who had already chosen a study area, it was an opportunity to gain vocabulary. In the task "Answering questions using a concept map" most of the students were fast in doing the activity. Their ability to find the answers in the concept map was notable. It could be because they were working with concept map since the beginning of the semester, but also because the information in the concept map was more visible.

The learners showed much difficulty in performing "Making a text in L2 from the map in L1" and "Studying the structure of the sentences based on the concept map structuration" mainly because of the proficiency in English and in syntax. The activities of 'Mapping the text' could be more exploited if the word

syntax of the text was associated to the study of the sentences structure, showing the importance of identifying the class of the words.

The activities were used in classes and had the expected results. The benefits to the learners' emotional and cognitive development were visible because in only one semester they were ready to read academic texts without many difficulties. Another observation is that the memorization of concepts was more meaningful because the students learnt the content as a whole instead of separated parts.

## 4 Discussion

The studies of Moraes (2004), Preszler (2004), Gomes *et al* (2011), Liu and Lee (2013), Carabetta (2013), Khaghaninejad and Arefinejad (2015), Tajeddin & Tabatabaei (2016) presented the learners outcomes after using conceptual maps for learning biological and medical concepts, learning L2 and developing reading skills. In relation to the concepts, the learner can develop contend organization and internalization, integration of knowledge into larger conceptual frameworks, critical thinking, analytical performance improvement, enhance of biology learning attitudes and motivation, confidence and autonomy. The learning of a second language the students can improve reading skills with the gain of vocabulary and language syntax what lead to reading comprehension, and proficiency and cognitive improvement. Besides, Moraes (2004), Preszler (2004), Gomes *et al* (2011), Liu and Lee (2013) and Carabetta (2013) emphasized the positive arguments of using concept maps as an educational tool. The outcomes include students' emotional and cognitive development.

Gomes *et al* (2008) are attentive to the fact that the scope of medical education demands the necessary changes for the formation of a professional who is able to know how to learn; meaningful learning allows the genuine contextualization of knowledge needed by the medical practice. The word map permits effective learning and practice in a complex interdisciplinary context. Novak and Cañas (2008) emphasized that 'at first glance' concept maps may appear to be just another graphic representation of information. However, understanding the foundations for this tool, it is possible to the user see that the simple arrangement of words into a hierarchy order can be a profound and powerful tool. The concepts linked by well-chosen words can provide propositions that shown new knowledge acquiring, better structure and manage organization, strategical writing and learning assessing.

## 5 Conclusion

It is possible to find examples of studies using the concept map as an educational tool. However, the alternatives of these uses in learning tasks are restricted to the construction of the concept map based on a text or theme orientation. The objective of this work was to offer ideas to bring some variation in the use of the concept map. From the tasks variation it was shown that it is possible to create different strategies to the use of this educational tool not only to the biological concept learning, but also as reading strategy, or yet, as vocabulary language developing.

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