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CONCEPT MAPPING: A STRATEGY FOR MEANINGFUL LEARNING IN MEDICAL MICROBIOLOGY

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Abstract. Concept mapping is a tool for meaningful learning. In concept mapping, one identifies the important concepts from a subject and describes the relationship between those concepts with linking words. In this work we discuss strategies to help medical students to organize, integrate concepts presented in a traditional third-year Medical Microbiology course and to acquire concept-mapping skill. This activity had three goals: 1) to give firsthand experience with mapping; 2) to illustrate the idiosyncratic nature of concept mapping, as each map is different because it reflects the thinking and experiences of the author. 3) to be able to evaluate the maps as students are acquiring skill in concept mapping. Practical lectures were organized by the teacher by making a concept map to use as a teaching guide. The map was given as a guide to help students see the organization and integration of the important concepts. This give a conceptual flow to the lecture and helped the teacher pinpoint what he felt was important for students to understand. Such maps were shared with students. Students were introduced to meaningful learning and concept mapping, shown examples of concept maps and given a guide on how to construct a concept map. Maps were also used to obtain feedback, having student's concept map a lecture that was given. Each student did a research work related to parasitology, and presented to the others in the form of a concept map. In order to evaluate concept-mapping skills an exam evaluation was done involving diagnostic microbiology. Practical lectures given with the help of a concept map where very helpful for both teacher and students. Lectures without using at first concept mapping and asking students to do after lecture the corresponding concept map revealed to be an eye opening experience about what students think are the important concepts in a lecture are and how they are related. Evaluation of concept mapping skills revealed to be very useful as the grades were higher comparing to traditional questions, although students complained that they are often tested on minute detail, not on their understanding of the concepts or the relationships between concepts. Students believe that making a good concept map requires a thorough understanding of the material and that the maps are useful in helping to learn and understand the course material. Most students uses concept maps to reinforce and understand the significance of what they are studying. Maps are also used to see how broad concepts are integrated, and as a guide for deciding what is important to understand. For traditional students, the biggest obstacle in using concept mapping is deciding what level of detail is appropriate (i.e., what are the essential concepts).

1. Introduction

Concept mapping is a tool for meaningful learning. In concept mapping, one identifies the important concepts from a subject and describes the relationship between those concepts with linking words (Novak et al., 1984, 1991a). Students in many settings can use this new skill in concept mapping. At the Medical Faculty of Porto as in the Medical College of Pennsylvania concept mapping has been evaluated (on a voluntary basis) as a tool to help students organize and integrate the concepts presented in a traditional third-year Medical Microbiology course. A similar program was also started at the University of Florida medical school. Students believe that making a good concept map requires a thorough understanding of the material and that the maps are useful in helping to learn and understand the course material (Stewart et al., 1979; Watson et al., 1987). Most students use concept maps to reinforce and understand the significance of what they are studying. Maps are also used to see how broad concepts are integrated, and as a guide for deciding what is important to understand.(Novak et al., 1984, 1991b)

In this work we discuss strategies to help medical students to organize, integrate concepts presented in a traditional third-year Medical Microbiology course and to acquire concept-mapping skill. This activity had three goals: 1) to give firsthand experience with mapping; 2) to illustrate the idiosyncratic nature of concept mapping, as each map is different because it reflects the thinking and experiences of the author. 3) to be able to evaluate the maps as students are acquiring skill in concept mapping.

2. Methods

Practical lectures were organized by the teacher by making a concept map to use as a teaching guide. The map was given as a guide to help students see the organization and integration of the important concepts (Moreira et al., 1979). This give a conceptual flow to the lecture and helped the teacher pinpoint what he felt was important for students to understand. Such maps were shared with students. Students were introduced to meaningful learning and concept mapping, shown examples of concept maps and given a guide on how to construct a concept map. Maps were also used to obtain feedback, having student's concept map a lecture that was given (Deschler, 1990). Each student (n=50) did a research work related to parasitology, and presented to the others in

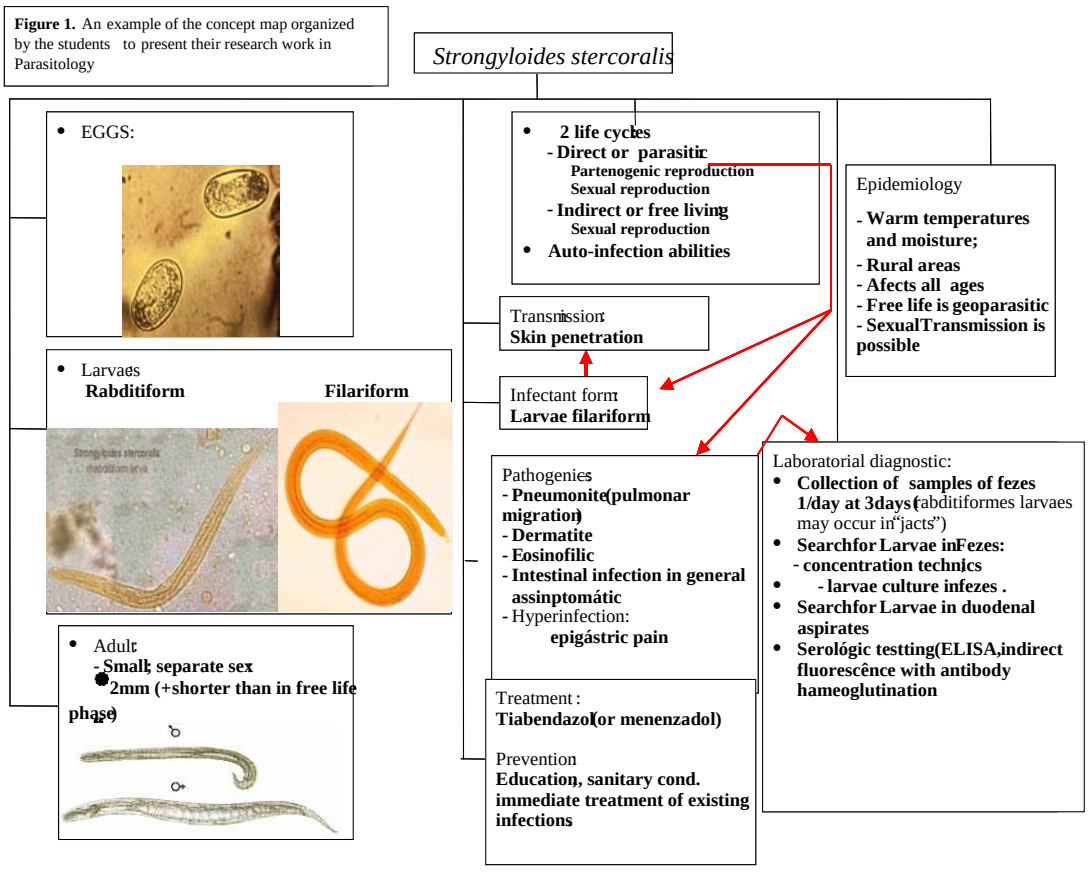
the form of a concept map. In order to evaluate concept-mapping skills an exam evaluation was done involving diagnostic microbiology.

3. Results and Discussion

Practical lectures given with the help of a concept map were very helpful for both teacher and students. Lectures without using at first concept mapping and asking students to do after lecture the corresponding concept map revealed to be an eye opening experience about what students think are the important concepts in a lecture are and how they are related. Evaluation of concept mapping skills revealed to be very useful as the grades were higher comparing to traditional questions, namely 60% of the students had the 16/20 grade in the two questions involving to concept mapping.

Although students complained that they are often tested on minute detail, not on their understanding of the concepts or the relationships between concepts. The research work on parasitology was presented to the class in the form of concept maps as illustrated from the examples in Figure 1 and Figure 2.

Figure 1. An example of the concept map organized by the students to present their research work in Parasitology



4. Conclusions

Students believe that making a good concept map requires a thorough understanding of the material and that the maps are useful in helping to learn and understand the course material, as can be concluded by the analysis of Figure 1. Most students uses concept maps to reinforce and understand the significance of what they are studying. Maps are also used to see how broad concepts are integrated, and as a guide for deciding what is important to understand. For traditional students, the biggest obstacle in using concept mapping is deciding what level of detail is appropriate (i.e., what are the essential concepts). The evaluation of concept mapping skills revealed excellent results comparing to more traditional questions.

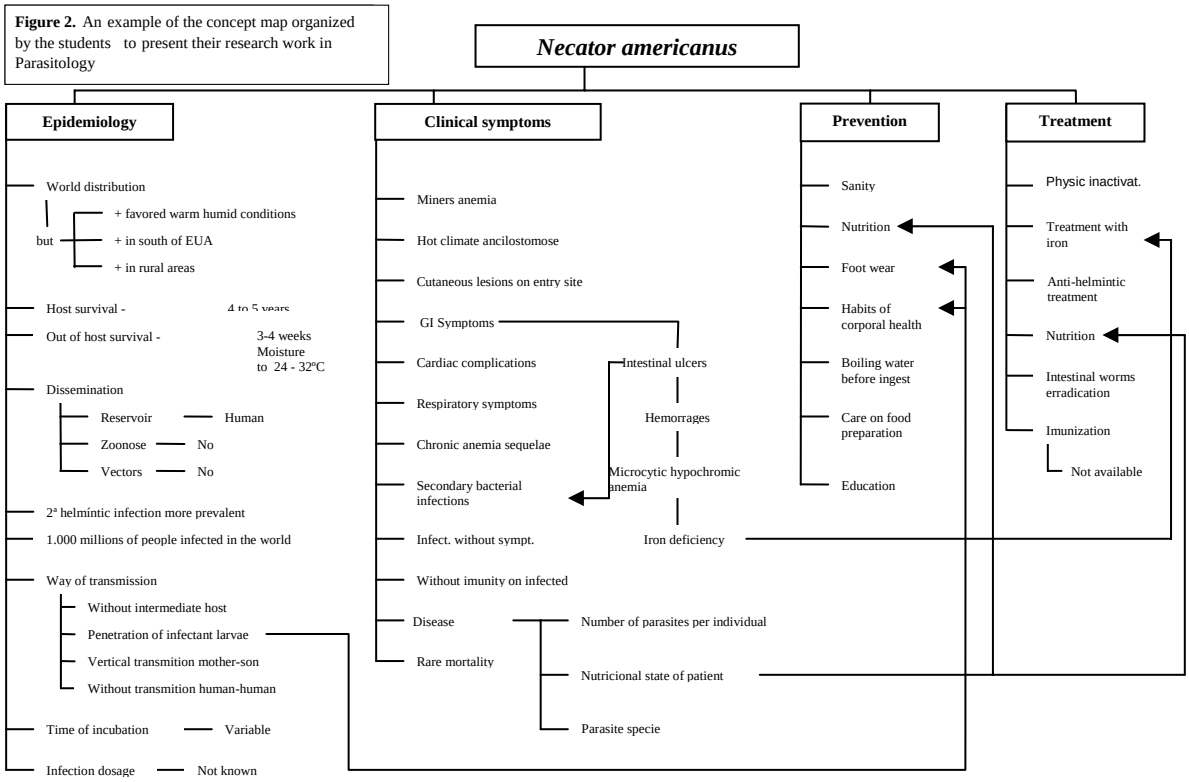


Figure 2. An example of the concept map organized by the students to present their research work in Parasitology

5. Summary

To date, concept mapping has been used in a variety of educational settings. It is a valuable learning tool to incorporate into medical education. Concept mapping can be used as an adjunct to other study methods, helping students organize and integrate information, gain new insights and detect areas where there are misunderstandings. Since concept maps represent the thinking and experiences of the map maker they can act as a visual mnemonic, helping one retrieve information. Finally, concept mapping can promote interaction between students who share maps or who make maps together, and between students and faculty who evaluate student maps and provide feedback.

6. Acknowledgments

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