Concept Maps…Are They the Key to Student Retention and Learning in Biology I?

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Introduction

The traditional method of teaching biology breaks large, complex topics into small, manageable sections that are easy for students to understand and learn. In order for students to remember the new information they must tie it to information stored in long term memory. The concept map is a classroom assessment technique shown to help students integrate & remember information.

Focus Question

How does the use of concept maps affect students' attitudes, learning and retention in Biology I?

Literature Review

Short term memory can be enhanced by the sequential chunking or grouping of information (Miller, 1956).

For students to learn more knowledge, larger chunks containing more material must be built (Miller, 1956).

The transfer of knowledge from short term to long term memory is based on the recognition of information being similar to previous knowledge (Rule& Furletti, 2004).

"It is the teacher's responsibility to identify what the child already knows and recode it in terms of the new framework." (Myhill & Brackley, p. 266).

The concept map is a classroom assessment technique (CAT) that helps students make their knowledge structure visible and assessable (Angelo & Cross, 1993).

Methodology

Concept maps were used as an assessment technique in Biology I for sixteen weeks. During that time, students created one concept map per chapter and one concept map between chapters that combined information previously learned. Initially students were given biology terms to organize in a concept map using pencil and paper. To increase student motivation they were transitioned to using Inspiration ™.

Test questions were evaluated to determine if students' misconceptions were clarified and specific test questions on previously learned material were evaluated to determine if students retained information.

Each student completed an attitude survey before, during and after the sixteen week period. Students also completed a pre-treatment questionnaire to determine what tools they use to learn and remember biology and what classroom assessment techniques other teachers use. Following the project students completed a post-treatment questionnaire to determine if the concept map was effective at helping students learn and retain biological concepts.

References Cited

Angelo, T.A., Cross, K.P. (1993). Classroom assessment techniques: a handbook for college teachers. San Francisco, CA: Josey-Bass.

Miller, G. A. (1994). The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information. *Psychological Review. 101*(2), 343-52.

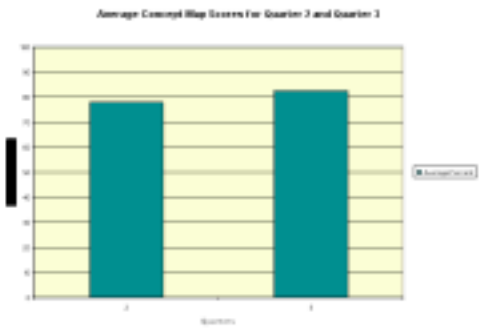
Myhill, D., & Brackley, M. (2004). Making Connections: Teachers Use of Children's Prior Knowledge in Whole Class Discourse. *British Journal of Educational Studies*. 52(3), 263-275.

Rule, A. C., & Furletti, C. (2004). Using Form and Function Analogy Object Boxes to Teach Human Body Systems. *School Science and Mathematics. 104*(4), 155.

Data Analysis and Interpretation

Ten concept maps were constructed by 47 students and the average score earned fluctuated throughout the project. Average students' scores did improve between second quarter and third quarter, Figure 1.

Figure 1



The majority of students' misconceptions (79%) were identified and clarified by constructing and evaluating concept maps.

Students' attitudes toward biology improved during the project, Figure 2. In contrast, student attitudes toward concept maps became more negative, Figure 3.

Figure 2

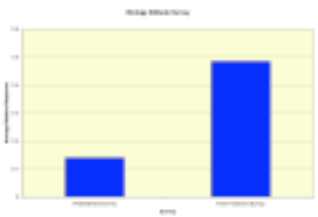


Figure 3

The limited data collected on student retention produced conflicting results. Summative assessment test questions indicated students did not retain the material utilized when constructing concept maps. However, class discussions on the same material indicated retention of the main ideas covered on concept maps.

According to the Post-Treatment survey students preferred creating concept maps in-class using Inspiration ™. In-class students were able to ask the teacher for help and using Inspiration ™ was faster, easier and neater.

Reflection

This project altered the expectations I have for myself and my students. I now see myself as a facilitator. My job is to provide my students with the skills, tools, support and equipment needed to learn and remember biology.