

# Implementing Concept Mapping to Evaluate College Students' Ocean Literacy

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The purpose of the study is to understand freshmen in the university regarding marine science concepts by using concept map method (open-ended tasks) and an open-ended question, and to assess their misconceptions about marine science concepts. A survey method was conducted on students from three departments of National Taiwan Ocean University (NTOU), Taiwan. In pre-test, a total of 305 samples was distributed, and a validity count of 294 was returned. In post-test, a total of 140 samples was distributed, and a validity count of 134 was returned. Using questionnaires as research instruments, the data were subject to concept mapping and SPSS statistics. The results of this study were as follows:

1. The answers provided by the students of NTOU with the assistance of propositional concept maps showed the average mark 63.07 out of 150, indicating only a basic understanding of marine science concepts among these students.
2. The first three terms "Submarine Volcano", "Mid-Ocean Ridge", and "Ocean currents" were the most commonly used by students to express marine science concepts. The first term "Submarine Volcano" was 131 times. The other two terms "Mid-Ocean Ridge" and "Ocean currents" appeared 126 and 113 times, respectively.
3. The marine concepts were more knowledge-oriented in the cognitive domain than attitudes and affective domains. We also observed the knowledge-oriented (46.4%), the affective-oriented (16.0%), the attitude-oriented (11.6%), and misconception-oriented (5.2%).
4. The scores of the post-test propositional concept maps were higher than that of pre-test. Therefore, it's helpful to the ability of marine sciences that students attend in the class of Introduction to Environmental Science Related to Marine. The total scores of ME were  $t = -3.166, p < 0.01$ , and the total scores of MM was  $t = -4.092, p < 0.001$ .
5. The marine science concepts we provided were mostly accuracy-oriented. In accuracy-oriented, the scores of CSE was  $t = -4.752, p < 0.001$ , the scores of CSE was  $t = -4.814, p < 0.001$ , and the scores of MM was  $t = -5.950, p < 0.001$ .
6. The three marine words "Submarine Volcano", "Oceanic trench" and "Plate" were most frequently misconstrued by students.
7. The most misconceived statement of the marine misconception assessment was "the relative connections of submarine volcanoes, plate, and mid-ocean ridges", "salinity of the ocean", "depth of the oceanic trench", and "the difference between tides and ocean currents".

The study can assist researchers and higher education in improving the quality and effectiveness of infusing marine education into curricula and promote ocean literacy.

Keywords: Ocean literacy, marine science, concept map, misconceptions