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ABSTRACT

This study investigated the effects of the multimodal-representation approach in teaching college biology on students' conceptual understanding, science process skills, and science attitude.

An instructional material based on a standard tertiary level General Biology course employing multimodal- representation (descriptive, mathematical, analogical, and experimental of scientific concepts and processes) was designed and compared against the traditional approach to teaching. The topic content focused on genetics, which comprised a unit in a three-unit General Biology (Natural Science 2). The instruments developed and used were the Genetics Conceptual Understanding Test, Science Process Skills Rubrics, Science Literacy Test, Science Attitude Scale and Focus Group Discussion Guide.

This research employed a quasi-experimental design where data was gathered from two intact classes of college non-science freshman from a local university in the province of Laguna. The researcher handled the experimental and control groups for the duration of one semester with actual intervention of five weeks equivalent to 25 hours.

Both qualitative and quantitative research methods were utilized. Qualitative data were obtained via analysis of students' focus group discussion. On the other hand, quantitative data were obtained via scores in the Science Attitude Scale, Science Literacy Test, Genetics Conceptual Understanding Pretest and Posttest, and Science Process Skills Rubrics. Results were subjected to statistical analysis and reported as means, standard deviation and mean difference. The *t*-test was done to determine the difference in the observed means in test scores at $\alpha = 0.05$ level of significance. Analysis of the relationships of prior science knowledge, gender and income status with conceptual understanding, science process skills and science attitude were done using Pearson Product Moment Correlation test, Independent Samples *t*-test and Analysis of Variance.

Results showed significantly higher scores in the Genetics Conceptual Understanding Test and Science Process Skills of students exposed to the multimodal-representation approach. Although no reliable statistical evidence showed better science attitude among students exposed to the multimodal-representation approach, qualitative data showed improved appreciation and attitude towards science.

Prior science knowledge was found to positively correlate with conceptual understanding. Gender was found to correlate significantly with science process skills in favor of the male students. There was also an observed moderate relationship between income status of

students on conceptual understanding and science process skills in favor of those belonging to the high-income status family.

In terms of student perception and preference on various modalities, descriptive representation remained to be the most preferred mode while mathematical representation was the least preferred. The role of repeating representations was acknowledged as contributory factors in the learning of difficult concepts and processes in genetics.

Difficulties and problems encountered by the students in the use of the multimodal-representation approach included the need for active participation in the class, more classroom-based activities, and the absence of technological supports.