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ABSTRACT

Small-scale chemistry experiments were developed and validated in response to a perceived need to carry out laboratory chemistry activities individually among freshmen in tertiary institutions and to disseminate widely a laboratory capability for chemistry activities among secondary schools. For this purpose, the researcher developed and validated a General Chemistry Laboratory Module of Small-Scale Experiments on the following topics: Element, Compound and Mixture; Physical and Chemical Changes; Ionic and Covalent Bonding; Types of Chemical Reactions; and Acids and Bases. Accordingly, the study investigated the effects of the small-scale chemistry experiments on achievement, concept understanding, level of participation, and attitude of students.

The study is quasi-experimental and followed a non-equivalent pretest-posttest control design. Forty-four freshman B.S Medical Technology students enrolled in Chemistry 101 served as participants. The experimental and control groups consisted of five groups each composed of 22 students. They were drawn through random selection from the ten peer-defined groups formed in the laboratory class at the start of the semester. The experimental group used the develop small-scale chemistry experiments while the control group used the traditional macroscale laboratory experiments.

Validated multiple-choice test with a KR-20 of 0.66 over the five percent topics, measured the achievement of the students while concept mapping assessed their conceptual understanding the concept maps were scored by the researcher and validated by another expert. Interrater reliability averaged 0.81 and 0.85 for pretest and posttest results respectively. Results show, in general, again in achievement and concept understanding between pretest and posttest for each group, with the experimental group exhibiting a higher overall mean of percent gain both achievement and conceptual understanding. The two groups, however, do not significantly differ in achievement and conceptual understanding in each test period. The multiple-choice test and concept map scored of the experimental group show remarkable associations in the five experiments in both pretest and posttest.

Independent observers monitored the level of participation in each group in every experiment using the rubric developed by the researcher. Although both groups were required to submit individual laboratory reports, the experimental group has a higher mean of level of participation than the control group. The level of participation of the two groups differs significantly across the behavioral indicators and across student differences.

The attitudes of students towards chemistry laboratory activity and small-scale chemistry experiments were also surveyed by the researcher. Quantitatively, there is no significant difference in the means of the experimental and control groups regarding the different aspects of laboratory work; but the experimental group has 70% favorable shifts in attitudes compared to the control group. On the attitudes of students towards small-scale chemistry experiments, the experimental group agrees the latter are real experiments, help them in understanding concept better, and are fun to do. The control group on the other hand, finds small-scale chemistry experiments more demanding than the traditional laboratory experiments but also wants to do them,

All things considered, small-scale chemistry experiments have shown themselves to be as pedagogically effective as the traditional laboratory experiments with the added values of being environment friendly and inexpensive.