

# COMPARING THE EFFECTIVENESS OF TEACHING METHODS WITH DIFFERENT TYPES OF EXPERIMENTS IN THE CHEMISTRY LABORATORY

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## BACKGROUND

In an effort to improve upon the laboratory experience of students at the University of Tasmania, Australia, this study investigates the advantages and disadvantages of using different teaching methods. The unit studied was the foundation chemistry unit (KRA001) undertaken by students lacking the pre-requisites to enter into the first year general chemistry programme at the University of Tasmania. Current laboratory experiments prior to this study most closely relate to the expository ref? style as a teaching method, and the teaching methods to be investigated in this study include pure expository, Guided Inquiry, and Problem Solving. A total of four experiments were considered covering several experiment types including basic skills, separation by distillation, identification of an unknown organic acid, and fundamentals of acids, bases and buffers.

## AIMS

This project intends to not only improve the laboratories currently used by the School of Chemistry at the University of Tasmania, but also provide insight into which teaching methods are most appropriate depending on experiment type.

## DESIGN AND METHODS

A range of experiments were selected to cover a variety of experiment types commonly observed within a foundation chemistry course. Each experiment was modified into three separate versions representing each teaching method. Each type of experiment was implemented in each semester of 2012 and 2013; e.g. in semester 3 of 2012, all modified laboratories employed the Expository teaching style. Three separate instances of data collection occurred in semesters 3 of 2012, and 1 and 2 of 2013. Additionally, three different types of data collection were used and these included the use of paper quizzes, surveys and reported grades for each student provided by their demonstrators. All data collected was de-identified and voluntary as per the ethics approval (H0012564) procedure upon completion of each experiment. Statistical analysis was completed using a one-way between groups ANOVA with post-hocs tests using SPSS.

## RESULTS

Analysis of collected data is currently underway. In the comparison of the three teaching methods for each experiment, it is anticipated that significant differences should be observed giving an indication of the appropriateness of each teaching method to each experiment. It is further hypothesised that no one teaching method will be found superior across all experiments; rather certain teaching methods will be more appropriate for each type of experiment. Preliminary results indicated significant differences existed largely in the demonstrator awarded grades of students who completed the laboratory. All four experiments indicated one teaching method to be superior in terms of student achievement as observed by the demonstrators. In addition to this, students indicated a preference for different teaching methods in three of the four experiments for workload expectations.

## CONCLUSIONS

From observations of the implementation of the different experiments and the crude data, it has been observed that there are differences in the manner that students approach each teaching method and develop their understanding. This study will be extended for further iterations within the foundation unit in addition to considering experiments from first, second, and third year levels of chemistry subjects.

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