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ORIGINAL ARTICLE

A STUDY OF PRACTICAL TASK USED IN TEACHING AT SENIOR SECONDARY LEVEL

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Abstract:

In order to investigate the students' learning outcomes in Chemistry Laboratory, a performance-based assessment was developed and implemented to a group of 50 chemistry students having chemistry as an elective subject at grade 12 in the academic year 2012-12 at Gyanodaya Vidya Mandir,Narsingarh . A multi-step organic synthesis experiment was chosen, and the basic organic manipulative skills, such as reflux, distillation, extraction, filtration, and re-crystallization were incorporated in the laboratory activities. According to the mean scores of on-site assessment, the students' manipulative skills of extraction and filtration should be reinforced. Students paid less attention on laboratory safety, and liked to rinse the apparatus with large amount of acetone, did not set up the equipments in proper position and did not work in the fume hood from our observations. Those indicated that we should give more emphasize on the laboratory safety guidelines in the class. From the analysis of paper-and-pencil science-concept test, students were unable to give reasonable explanations for certain Lab observations nd also , lacking the ability of rationalizations. The on-site assessment of undergraduates' performance in Lab activities assisted chemistry educators analyzing the strengths and weakness of our laboratory instructions, as well as reforming and improving the chemistry laboratory training programs of students and teaching assistants in the future.

KEYWORDS:

Chemistry, Laboratory Skills, Performance, Assessment,

.INTRODUCTION

The importance of practical work in science is widely accepted and it is acknowledged that good quality practical work promotes the engagement and interest of students as well as developing a range of skills, science knowledge and conceptual understanding. Although there are examples of good practice in schools, concerns have been expressed by sections of the science community, industry and business that in general the amount of practical work has declined and, more importantly, that its quality is uneven. These concerns were specifically raised by the STEM High Level Strategy Group (HLSG) which agreed that, “there is a need to forge the work that is already in train into a focused strategy to promote high quality practical work in school science” and that SCORE should lead on a piece of work to: raise the profile of practical work in science and engage stakeholders in the debate; map out the current situation; provide the basis for a consensus as to what is meant by practical work in science and the development of a strategy; propose plans for the implementation of the strategy . Chemistry Laboratories have long been recognized for their importance, and unique mode in science education. The design and analysis of laboratory activities has been of interest to teachers, and educational policymakers. In order to improve the research ability of

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students, an Integrated Chemistry Laboratory Program was implemented on students.

DEFINITION OF PRACTICAL WORK

There is confusion in the broader science education community about the definition of 'practical work'. This confusion makes discussions about the value of 'practical work' difficult. A variety of terms exist to describe practical work, many of which are frequently used with little clarification . For example, Science in the National Curriculum uses several terms with little attempt to explain their meaning: 'Practical and enquiry skills', 'practical and investigative activities', 'independent enquiry' and 'experimental work'

The most recent published review of the literature on learning and teaching in the school science laboratory gives what it calls a classical definition as:

…learning experiences in which students interact with materials or with secondary sources of data to observe and understand the natural world (for example: aerial photographs to examine lunar and earth geographic features; spectra to examine the nature of stars and atmospheres; sonar images to examine living systems).. This inclusive definition might act as a starting point for clarifying terms in the UK science education community.

PURPOSE OF PRACTICAL WORK IN SCIENCE

There are many purposes for doing practical work in school science. Some of the purposes most frequently stated by teachers are:

(I)to encourage accurate observation and description;
(II)to make phenomena more real;
(III) to arises and maintain interest;
(IV) to promote a logical and reasoning method of thought.
(V) to practise seeing problems and seeking ways to solve them;
(VI) to develop a critical attitude;
(VII) to develop an ability to cooperate;
(VIII) to find new facts and arriving at new principles.

.Evaluation instruments

A multi-step organic synthesis experiment was chosen, and most of the basic organic manipulative skills were incorporated in the laboratory activities. Two evaluation instruments were designed, or modified by the investigators: one is the on-site assessment observation checklists for manipulative skills and the other is a paper-and-pencil open-question test for science concepts. The validities of the instruments have been verified by pretest and two chemistry experts.

Evaluation procedures

The learning outcomes of students were assessed at the end of the session after taking the chemistry laboratory courses for two years. Students planned the laboratory work before class. Then the manipulative skills were evaluated during lab hours by teachers according to the observation checklists. The science-concept test sheets were written after lab work. TAs as the evaluators attended the training course on how to observe and evaluate students' lab skills prior to the laboratory work.

DATA ANALYSIS AND RESULTS

The laboratory “Synthesis of Aniline and Its Derivatives” were revised for the on-site assessment. Basic organic chemistry laboratory skills, such as reflux, distillation, extraction, filtration, and re-crystallization were incorporated in the lab work. The mean scores of manipulative skills (converted to 1-100 scales) of the students were shown in figure 1. The students obtained lower scores in extraction, and gravity filtration manipulative skills. There were significant differences between students of boys and girls in operating reflux, extraction, and gravity filtration. The mean scores of science concepts (converted to 1-10 scale) of the students were shown in figure 2. The students got lower scores in question III, that the students were expected to give reasonable explanation for the observations of the reaction. The boys

obtained significantly higher scores than those of girls in questions IV, V and total scores.

Figure-1 The mean scores of manipulative skills of students (I) Reflux (II) Simple steam distillation (III) Extraction (IV) Suction filtration (V) Re-crystallization .

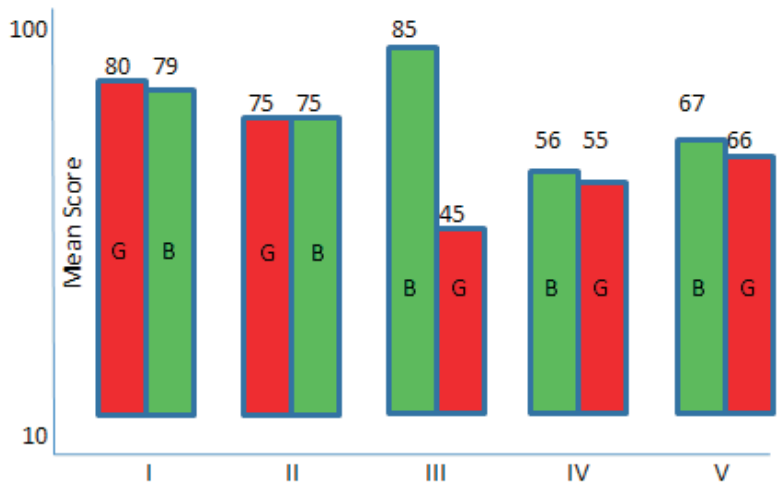

Figure -2 Mean Score of the concept of students (I) Purpose of the lab work (II) Skilled intend to train (III) Account for observation (redox reaction) (IV) Account for observation (neutralization reaction) (V) concept of salt outing (VI) Principal of steam distillation .

CONCLUSIONS AND IMPLICATIONS

As we know that the chemistry laboratory emphasizes more on learning how to carry out standard procedures than other science subjects. According to the lower mean scores of on-site assessment, the students' manipulative skills of extraction and filtration should be reinforced. On the other hand, we observed that the students paid less attention on laboratory safety, for they rinsed the apparatus with large amount of acetone, did not set up the apparatus in proper position, and did not work in the fume hood. Those indicated that we should more emphasize on the laboratory safety guidelines in the class. After on-site assessment, we interviewed students.

From the analysis of paper-and-pencil science-concept test, students were unable to give reasonable explanations for certain Lab observations, lacking the ability of rationalization. The female students showed better achievements in chemistry laboratory manipulative skills and in science concepts.

The performance-based assessment instruments developed in this study not only evaluate the students' learning outcomes. These on-site assessments of student's performance in Lab activities assisted chemistry educators analyzing the weakness of our laboratory instructions as well as reforming and improving the chemistry laboratory training programs of students.

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