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**DEVELOPMENT OF GENERAL CHEMISTRY CONCEPTS
AT SCHOOL LEVEL**

A THESIS PRESENTED BY

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A good understanding of the general chemistry section in the chemistry syllabus for the General Certificate of Examination - Advanced Level, GCE (A/L) is essential for students as it provides the knowledge in basic concepts in chemistry that are helpful to understand the other sections in the chemistry syllabus. However, most advanced level chemistry teachers consider teaching general chemistry section of the GCE (A/L) chemistry syllabus poses many problems. The analysis of the content in the evaluation reports of the chemistry papers in the GCE (A/L) examination shows that students too experience difficulties in answering the questions that are focused to evaluate their knowledge in general chemistry concepts. This study aimed at identifying problems of the learners and assisting them in learning the concepts in general chemistry. In the Sri Lankan context the knowledge of some basic concepts in general chemistry is introduced at the junior secondary level of the school system. Therefore this study focused on identifying the problems in the teaching learning process in this section from junior secondary stage of education to senior secondary stage (General Certificate of Examination - Ordinary Level) of education too. The purpose of this was to find out ways of developing concepts in general chemistry effectively in students.

To understand how general chemistry concepts are taught at junior and senior secondary levels, three questionnaires were administered among O/L and A/L science teachers. 25% of them were interviewed. The answer scripts in term test papers of the GCE (O/L) students were also analyzed. Two diagnostic tests were conducted to A/L students to identify problematic topics in a selected unit (The unit on 'Chemical bond') in the general chemistry section of the A/L syllabus. Six classrooms were observed to identify problems in teaching and learning chemical bonds at GCE (A/L.) By doing a content analysis of the general chemistry sections in the O/L and A/L syllabuses, it was found out that the content in the teacher guides and textbooks had created some problems in learning. According to O/L teachers it is too much for the tenth graders to learn concepts involved in writing symbols, valence and writing formulae in the same year. It was also found that the content related to general chemistry in the O/L syllabus has to be reorganized to ensure smooth flow of facts from lower grades to upper grades.

The students had difficulties in writing formulae, balancing chemical equations and drawing dot-cross diagrams and, understanding molecular geometry, intermolecular forces, polar and non-polar molecules. In writing chemical formulae most of O/L

students made mistakes. Fifty percent of the teachers stated that it is difficult to teach balancing equations for O/L students as well as A/L students. In teaching chemical bonds, several defects of the teachers such as presenting incomplete or irrelevant facts, making incorrect and incomplete explanations, problems in introducing lessons and managing time were identified. To overcome the identified difficulties and to facilitate teaching learning process, a handbook was prepared on the unit on 'Chemical bond' in the GCE (A/L) chemistry syllabus and it was tried out in four classes. The analysis of students' answer sheets showed that students in the classes of the trying out sessions had comprehended the content better than the students who learned the unit in the traditional manner. It is suggested to reorganise the content in general chemistry from junior to senior secondary level and to introduce new methodologies of teaching to assist students in their learning. In addition preparation of handbook for each unit in general chemistry section of the GCE (A/L) chemistry syllabus is recommended.

In Sri Lanka students have the opportunities to develop science process skills in primary classes through the subject 'Environment Related activities (ERA.)' The content in this subject was analysed in order to find out whether some activities that are related to general chemistry sections can be introduced in these grades. Two grade two classrooms were observed to understand the ways of introducing ERA subject in the primary classes. Subject experts were interviewed. It was found out that there are several themes in the ERA syllabuses in primary stage in which some activities related to general chemistry can be introduced. It was also found out that even though there are opportunities; teachers do not introduce activities that are directed to improve scientific process skills in students. A booklet of activities was prepared in which some activities related to general chemistry concepts are introduced that are related to the content in the ERA syllabuses. This book also provides opportunities to develop process skills in students. Some of the activities in this booklet were tried out in primary teacher training programmes and the primary teachers were very satisfied with the outcome of these activities.