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EFFECT OF INQUIRY-BASED LEARNING AND SOCRATIC DIALOGUE METHODS ON ACHIEVEMENT OF GCE (A/L) CHEMISTRY COMPARED TO CONVENTIONAL TEACHING METHOD

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Inquiry-Based Learning (IBL.) and Socratic Dialogue (SD) are the most effective teaching approaches to problem-solving and improving critical thinking. Therefore, the present study aimed 1) to identify the effectiveness of the IBL and SD teaching on student achievement in the General Certificate of Education (GCE.) Advanced Level (A/L) chemistry and the knowledge retention of the subject matter compared to conventional teaching method (CTM), which serves knowledge as a teacher-centred method, 2) to assess the effectiveness of IBL and SD in the development of higher-order thinking skills (HOTS) and lower-order thinking skills (LOTS), and 3) learner perceptions toward the IBL and SD methods. This study employed a quasi-experimental design using 60 selected students in the science stream from each grades 12 and 13 in St Bridget's Convent, Colombo, Sri Lanka. Two types of teaching approaches (treatments), namely IBL and SD and CTM, were systematically designed and implemented. A chemical bonding lesson was conducted for Grade 12 students (Group I), while Grade 13 students (Group II) followed the electroplating lesson using these two treatments separately. Students' achievement was measured using test papers (pre- and post-tests) consisting of six sub-questions: three for HOTS and three for LOTS. Post-tests evaluated knowledge retention after one month for both groups. Independent sample t-tests ($p < 0.05$) were used for analysis. Findings confirmed that students' achievement in chemistry was significantly higher in IBL and SD treatment (76 and 53%) compared with the CTM treatment (58 and 43%) in both Group I and Group II, respectively. Also, HOTS in different groups were promoted by the IBL and SD teaching approach. LOTS of Group I students were positively affected by IBL and SD methods, while LOTS of students in Group II were comparable with those in the CTM group. Knowledge retention in the two groups was significantly higher in IBL and SD methods (72 and 51%) compared to the CTM (51 and 34%), respectively. The majority of students who learned chemical bonding and electroplating using the IBL and SD methods were positive in the rubric assignment. Therefore, this study concludes that IBL and SD strategy is more effective in understanding, memorising, and critical thinking in chemistry.

Keywords: Chemistry education, Chemical bonding, Electroplating, Rubric assignment, Teaching methods