

EFFECTIVENESS OF INTEGRATING STEM EDUCATION INTO SCIENCE TEACHING AND LEARNING PROCESS

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Vital elements of STEM education are the integration of Science, Technology, Engineering and Mathematics into the curriculum with a commitment to hands-on learning. Science national cognitive achievement tests were conducted for Grade 8 students in 2005 and 2008, and the lowest mean score was achieved in sub-skill synthesis due to weakness in the application of concepts to real life. Therefore, high scientific literacy can be achieved through STEM-integrated teaching-learning activities. This study aimed to investigate the effectiveness of STEM integration into the science teaching-learning process of Grade 8 students of three selected IC schools (named A, B and C) in Wategama Educational Zone. The study employed mixed methods to triangulate information. The soil erosion subunit (15.3) was selected under Natural Disasters (unit 15) of the Grade 8 science textbook. The purposive sampling process was utilised to select 136 Grade 8 students for the study. Quantitative data were collected from pre-test and post-test. Qualitative data were collected using activity sheets, teacher interviews and observations. The quantitative data were analysed using SPSS, and qualitative data were analysed using Thematic Analysis. It was identified that STEM-integrated teaching-learning activities enhanced the performance of students in schools B ($p < 0.05$) and C ($p < 0.05$). However, there was no significant difference in performance of the school A ($p > 0.05$). The reason for not increasing student performance in school A may be due to crowded classrooms. An independent sample t-test showed that post-test marks of experimental and control groups of school A ($p > 0.05$) and C ($p > 0.05$) were not significantly different. However, post-test marks of the control and experimental group of school B were significantly different ($p < 0.05$). The highest performance of students was shown in school B, and student performance was not at a significant level in schools A and C. It may be due to various reasons, such as crowded classrooms and differences in teaching qualities in STEM-integrated teaching. It was also revealed that there was no considerable difference in the science performance of students who were taught with STEM integration in schools A, B and C ($p > 0.05$). This may be due to similar social and cultural settings in school sub-systems. Furthermore, it was revealed that the highest performing were male students (School B mean = 98.77), the second highest was female students (School C mean = 97.94), and the lowest was School A (mean male = 95.71 & mean female = 91.80). The low student number and male students in the classroom is the most influential factor for the highest students' performance in school B, sequentially followed by school C and A. Additionally, the important aspects of STEM-integrated teaching-learning activities were revealed, which are helpful for students and teachers to develop personal qualities in authentic learning for solving real-life problems.

Keywords: Authentic learning, Lifelong learning, 21st Century skills, STEM Education