EFFECTIVENESS OF INTEGRATING STEM EDUCATION INTO SCIENCE TEACHING AND LEARNING PROCESS

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The key elements of STEM education are integrating Science, Technology, Engineering, and Mathematics into the curriculum with a commitment to hands-on, collaborative learning. Improving students' knowledge, skills, and attitudes is essential to overcome existing problems in schools' science teaching and learning process. A study which conducted science national cognitive achievement tests for Grade 8 students in 2005 and 2008 achieved the lowest mean score for sub-skill synthesis. This could be due to weakness in applying concepts to real-life incidents. Therefore, high scientific literacy can be achieved through STEM education. This study aimed to investigate the effectiveness of STEM integration into the science teaching and learning process in three selected schools: A, B, and C, facing natural disasters in Wattegama Educational Zone. The Mixed method approach was used in this study. Quantitative data was collected from a pre-test and post-test, and a purposive sample of 136 Grade 8 science students was selected. Qualitative data was collected using activity sheets, teacher interviews, and observations. The quantitative data were analyzed using Statistical Package for Social Sciences, and qualitative data was analyzed thematically. It was identified that STEM-integrated teaching and learning activities enhanced student performance in School B ($p < 0.05$) and C ($p<0.05$) except A ($p>0.05$). Independent sample t-test showed that post-test marks of both groups in 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. This could be due to various reasons, such as crowded classrooms and differences in teaching qualities. Moreover, there was no considerable difference in the science performance of students who taught with STEM integration in schools A, B, and C ($p>0.05$). This could be due to similar social and cultural settings. Furthermore, it was revealed that the effect of gender is present in STEM integration, and that the highest performance was indicated by 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) respectively. Less number of students and male students are the most influential factors for the highest students' performance in School B. Findings revealed important aspects of STEM integration, which are helpful for students and teachers to develop personal qualities in authentic learning for solving real-life problems and experiences in natural disasters.

Keywords: Authentic learning, 21st-century skills, Lifelong learning, STEM education, Wattegama Education Zone