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An investigation of the Perceptions of High School Teachers and Students on Educational Robotics in STEM delivery. A case study of Tynwald High School and Harare High School.

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ABSTRACT

The demand for STEM trained workers continues to increase globally. The acronym STEM stands for Science, Technology, Engineering, and Mathematics. It is the process of teaching that integrates these four disciplines to promote real-world experience, teamwork, and the authentic application of technology. It has become increasingly important to emphasize STEM connections at an early level in order to encourage student career exploration as they continue their education. Educational robotics represents a unique alternative to traditional methods, especially at the high school level. Educational robotics provides many opportunities to enhance science, technology, engineering, and mathematics (STEM) education for students and teachers by using engineering and computer programming techniques integrated into the curriculum. Considering the use of educational robotics having largely been ignored at this level, the purpose of this study was to investigate the perceptions of students and teacher on Educational Robotics on STEM delivery and the interactive process and outcomes using educational robotics to facilitate high school students understanding of STEM concepts. A multi-case approach was used for the design as it is in line with the underlying conceptual framework for the study. The study was conducted involving high school teachers and students at two schools in Harare Zimbabwe. The sample size consisted of Ordinary level and Advanced level students selected participants doing STEM subjects. Case study methodology was employed and 3 data collection methods were used questionnaires, observations and interviews. The results showed that students found the lessons interesting and enjoyable. They managed to easily build the robots and relatively easily program the robots. The study highlights educational robotics' effectiveness as a tool to develop students' knowledge and skills in STEM subjects. The Chronbach alpha test was utilized to determine student's interaction with educational robots, impact of STEM understanding, as well as their impact regarding the understanding of STEM attitudes. With regards to perceptions, attitudes and opinions towards the use of ER in class, questions were asked and results of Chronbach's alpha test showed that there existed some good relationship as indicated by α coefficient value of 0.7160 for all participants in both schools, 0.6551 for Tynwald high school and 0.7657 for Harare high school. The Mann-Whitney test was used to test the hypothesis of the study, on Technology preferences to answer the first hypothesis, on Perceptions attitudes and opinions of the use of ER in class to deliver STEM education. Results indicate that more than 60% are in agreement that ER is perceived as a tool for delivering STEM in both schools. The second hypothesis was to test the differences in perceptions towards the use of ER in class by both schools. Results indicate that more than 60% from Tynwald high and more than 50% from Harare high are in agreement to the favourable perceptions that support the usefulness of ER in class. This study is significant as it yielded valuable information concerning the use of educational robotics in the school environment. In particular, this study supports the idea that STEM concepts can be promoted utilizing authentic instructional strategies like the use of educational robotics. This study suggests there is a potential impact regarding the use of educational robots(ER) in the education setting. The results reflect that ER has the potential to facilitate learning of STEM subjects. Tynwald high school has the highest number of participants who supported the motives with 66.10% of participants having agreed that ER has the potential to facilitate learning Maths, while Harare high school had 50% of participants who reported the same. The same order was reported for Science and Technology where Tynwald 78.98%, Harare high 72% participants for Science and Tynwald 78 %, Harare high 66% participants for Technology indicated the same that ER had potential to facilitate learning of Science and Technology respectively. Participants from both school were of the motion that using robotics in schools encourage students to pursue their education and career in STEM related