STEM Education through Robotics and Coding Competition-based Learning

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COVID-19 has brought many challenges in the education front. Competitions, which are often incorporated into game-based learning, have also moved to virtual modes. Integrating competition components into project-based-learning (PBL) is a great way to motivate students during virtual learning [1]. Rero Annual Championship (RAC) is a national level robotics and coding competition inaugurated in 2016 to promote Science, Technology, Engineering and Maths (STEM) content and skill learning among primary and secondary school students through educational robotics competition [2]. Design and Technology (RBT) subject was introduced to Form One students since 2017 and to Year Four students since 2020 for them to learn micro-controller programming. In RAC competitions, goal-oriented and PBL approaches are employed whereby participants use rero Planner software, MakeCode Editor and Arduino IDE to program their robots to perform various tasks. The students are required to pass state-level qualifying round before proceeding to national level. RAC moved to virtual mode in 2020 due to the pandemic. Researches on gender and STEM have indicated that female students are less inclined to learn robotics than male students [3]. Gender stereotyping can be changed positively by creating situational interest in robotics and coding subjects. It is observed that the percentage of female students' participation has increased to better reflect the male-female ratio of our school population when the competitions moved from physical to virtual mode. Robotics competition provides benefits such as increased confidence in using technology, STEM usage in solving real-world problems, increased interest in STEM careers and the importance of teamwork [4]. In order to reduce the gender gap in robotics, exposure to educational robotics activities at an early age will have an added advantage.

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