Education 4.0: A Case Study Based on the Design and Launch of a High Altitude Balloon Using the STEAM Approach

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Abstract

The emergence of new disruptive technologies, allied to the combination of different scientific and technological bases, brings significant productivity and quality gains in industrial processes. This is the fourth industrial revolution or Industry 4.0, which affects virtually all segments of human activity, with social and economic consequences. In this situation, education is faced with new challenges to train citizens who are ready for this new scenario. Education 4.0 is a model of education proposed to face these new challenges. In this model, the educator becomes the orchestrator of multiple information available in global networks along with the students, seeking to organize and synthesize the information and transforming it into knowledge. On the other hand, students become the protagonists in this teaching-learning process, where, through multidisciplinary projects, they face challenges and look for solutions that allow the construction of knowledge about different disciplines, making possible the development of their skills and abilities aligned with the new reality. Given this new model of education, new approaches are being developed so that the teaching-learning process is aligned with this new reality, such as the STEAM (Science, Technology, Engineering, Arts and Mathematics) approach, which integrates different areas of knowledge and is based on multidisciplinary projects. This approach provokes students’ interest in scientific research for problem solving, and knowledge is constructed in a collaborative and harmonious way among them. The purpose of this work is to investigate the use of the STEAM approach by educators in Humberto de Campos and Fernanda Pires public high schools, located in the city of Sorocaba - SP — based on the proposal to develop a high altitude balloon (HAB) project, from its design to its launch — is aligned with the Education 4.0 model. In the first phase of the project, its objective was to collect from the atmosphere the following information: cosmic radiation, altitude, velocity and temperature for further study on the behavior of cosmic radiation with variations in temperature and pressure. During the development of the project, the students experienced the following stages of an engineering project: (a) the technical specification of the HAB; (b) the use of different technologies to build a mechatronic system based on a small and low-cost single-board computer, but with the functionalities of a large computer; (c) the process of integrating the computer with sensors, cameras and GPS; (d) the programming of the computer; (e) the test of computer integration with the other components; (f) the development of all project documentation and (g) the launch and actual operation of the equipment. An initial qualitative assessment showed that using the STEAM approach caused a significant improvement in students’ behavioral attitudes regarding cooperative work, scientific research,
communication and facing new challenges. Thus, in a preliminary analysis, the STEAM approach proved to be adherent to the Education 4.0 model, although other studies involving quantitative methods are needed to evaluate the efficacy of this approach.

**Keywords**
Industry 4.0, Education 4.0, STEAM approach, High Altitude Balloon.

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