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"BEYOND THE HORIZON: SPACE CONCORDIA'S IMPACTFUL SPACE EDUCATION INITIATIVES AND INNOVATIVE LEARNING EXPERIENCES FOR FUTURE AEROSPACE LEADERS"

Abstract

This paper explores Space-Concordia, a Canadian university student-led space program dedicated to fostering innovation and hands-on learning in space-related disciplines. Operating within a structured framework, Space-Concordia comprises four specialized divisions, each offering unique learning opportunities in space exploration and research.

The Rocketry Division pioneers the development of one of the first student-built liquid-fueled rockets with potential space reach. Participants gain immersive experiences in aerodynamics, avionics, propulsion, materials science, and systems engineering. They actively engage in rigorous testing and analysis, developing skills in data interpretation and iterative design processes. Notably, the division has successfully built and tested the most powerful student-built rocket engine.

In the Robotics Division, students delve into the mechanical design of Mars rovers, acquiring expertise in 3D printing, fabrication, and the construction of reliable robotic systems. Programming autonomous functionalities enhances skills in navigation algorithms and control systems, crucial for real-world applications throughout their engineering degree.

The Spacecraft Division focuses on CubeSat development, providing hands-on experience in electronics, communication systems, and space systems integration. Students navigate satellite launches and deployment intricacies, honing project management and logistical skills. Notably, students successfully deployed their first satellite to space under the Canadian Space Agency's supervision in 2023.

The pioneering Space Health Division researches on the physiological impacts of space exploration and extreme environments on the human body. Students design and implement an analog astronaut training program, fostering interdisciplinary collaboration and research methodologies. They receive training in biology, 3D printing, modeling, materials science, and scientific research publication. Students engage in scientific research methodologies, including data collection and statistical analysis, gaining skills applicable across various scientific and engineering disciplines.

These projects not only impart technical knowledge but also nurture essential soft skills such as teamwork, communication, leadership and project management.

Space-Concordia's commitment to holistic learning ensures students cultivate not only expertise but also skills crucial for success in engineering and space exploration. The paper provides an in-depth exploration of educational methodologies, transfer of knowledge in project-based learning, and skill development opportunities, shaping future aerospace leaders.

Additionally, the paper explores Space-Concordia members' roles as educators for the undergraduate community at large, organizing educational and technical workshops, and professional development activities. Initiatives like the "Canadian Space Exploration Conference SPEX," the "Moving2Mars Summit," the "Intro to Astronautics Workshops Series," the "SpaceCast: Podcast," and various other educational and outreach endeavors are discussed, emphasizing the impact and lessons learned from these initiatives in a post-mortem standard.