Submission Form

Call for Contributions, APRSAF SE4AWG

This form should be used for the submissions of contributions to the Space Education Initiative of the APRSAF SE4AWG 2022. In describing interesting case studies on space education policies or practices in your country, please avoid using acronym or national jargon that may be hard to understand for others. All the submissions will be made publicly available by the organizers.

1. Title of the contribution

Space Education in Taiwan

2. Organization and/or person submitting the contribution

Including full address and contact information (only the organization's and or person's name will be disclosed to the public)

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3. Date of submission

2022/10/27

4. Short description of the space education policy or practice (max. 1000 words)

Please describe the background and origin of the policy or practice, the details of implementation, stakeholders, technical details, etc.

The space especially in the low Earth orbits is full of satellites of different forms and functions. To support the potential communication, remote sensing, navigation, scientific, and other applications brought forth by these satellites for robust and sustainable development, talent incubation is regarded as one of the most important tasks. Indeed, space education through talent incubation paves the way for the development of innovative technologies which in turn lays the foundation for the growth of space industry. The space education practices

in Taiwan have been geared to support the needs of local industry in systems engineering, space science, and satellite engineering. The development of space research and technology in Taiwan essentially follows the so-called National Space Technology Long-Term Development Program. The first phase (1991 to 2006) of the program is devoted to the buildup of the infrastructure dedicated to the development of space technology. The second phase (2004 to 2018) begins to pay attention to academic research and industry involvement, leading to the development of self-made satellite. Currently, the third phase (2019-2028) seeks to facilitate the growth of the indigenous space industry by leveraging Taiwan's unique strengths in semiconductor, precision machinery, and information and computer technologies.

Originally, the space education in Taiwan is weakly correlated with the National Space Technology Development Program. Yet, in 2022, ever since the government declare to have the potential to become a key player in the space supply chain, several talent incubation programs have been announced. The space education in Taiwan is partially stimulated by the development of CubeSat technologies in different countries and can be roughly divided into three phases. In 2002, some professors in universities observed and realized the potential of CubeSats in promoting space systems engineering and education. As the needed technologies to design and realize a satellite even for a CubeSat is inter-disciplinary, it was decided among the participating professors to conduct a web-based space systems engineering course which is distinguished by the joint participation of professors and students. The final of the course is a cross-university design competition to stimulate innovative design ideas and encourage networking. To provide some industrial insights, researchers from National Space Organization (NSPO) were also invited to give some lectures. This first-phase education program was mainly supported by the Ministry of Education. The web-based course leaded to the buildup of CubeSat teams in some universities. A positive outcome is the launch and operation of the PACE and PHOENIX CubeSats of National Cheng Kung University in 2014 and 2017, respectively. Ever since the successful operation of the PHOENIX, some additional universities ventured to carry out space education program. More importantly, NSPO began to play an important to reach out to universities by forming a university alliance and offering some lecturers for space education and training. This second-phase space education is also augmented with the development of CubeSats, three CubeSats from three different universities, National Taiwan Ocean University, National Central University, and National Formosa University, were designed and launched. The third phase of space education begins in 2022 which is characterized by the establishment of graduate programs in space systems engineering in some universities. The establishment of master/PhD degree programs at different universities is orchestrated by the Ministry of Education and supported by the NSPO in a hope to establish a framework for the long term supply of human resources.

5. Successful outcomes and reasons (max. 500 words)

Please describe the successful outcomes of the project and the reasons for such successes.

The space education in Taiwan as mentioned is roughly divided into three phases. The first phase leads to the successful launch of PACE and PHOENIX CubeSats of National Cheng Kung University, which encourages the participation of other universities in the second phase. The second phase space education is primarily organized and supported by the NSPO. In this phase, a more comprehensive education program is offered and three CubeSats are launched. The third phase is manifested by the establishment of regular graduate programs in different universities. The success in the first phase is due to the enthusiasm and involvement of some professors. The success of the second phase can be attributed to the role of NSPO in offering lectures and technical/financial supports. It is also observed that the interactions and networking are important in the resource-limited island of Taiwan. Almost all universities in Taiwan that are involved with space research and engineering are university members of UNISEC TAIWAN.

6. Challenges of implementation and lessons learned (max. 500 words)

Please describe the main hurdles that were faced during the implementation of the policy or practice, and lessons that you would like to share with other countries or organizations willing to try the same approach.

The main challenge in the conduction of space education is the lack of job opportunities. In the past, NSPO is the only organization that demands qualified engineers with space background. Even though in 2022, the Taiwanese government state the desire to use its advantages in the semiconductor sector to occupy a spot in the space industry supply chain, the semiconductor industry appears to be much more attractive to engineering students in terms of salary and job security. As a result, students from space education program may not enter the space related institutes and industries.