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# DREAMCODER 2.0: AN EXAMPLE OF DIGITAL TRANSFORMATION FOR EDUCATION

**Abstract**

DreamCoder is a coding-in-space program in which students execute their own Python code on hardware on the International Space Station. The program guides students through team building, formulating research questions, designing code, and ultimately, analyzing and presenting results. This program was designed for small teams of students working collaboratively in the classroom. Specifically, multiple student teams connect via Wi-Fi to one "Sagan Spacelab," with the same sensors as the Sagan installed on the ISS.

However, due to COVID-19, students began learning remotely, making the execution of programs like DreamCoder challenging or impossible. Recognizing the broad challenge of educating students during the pandemic, the European Space Agency (ESA) announced a funding opportunity entitled, "Space in Response to the COVID-19 Outbreak," in collaboration with the Italian Minister for Technological Innovation and Digitalization, the Italian Space Agency, and other European Countries. Specifically, this opportunity asked applicants to leverage a space asset to assist Italian students impacted by the pandemic.

Nanoracks Space Outpost Europe (Nanoracks-Europe), in collaboration with DreamUp, the developer of DreamCoder, and Rina Consulting, SpA, responded to this call and in July 2020, began development of "DreamCoder 2.0," an upgraded version of DreamCoder with a virtual classroom to enable its use in remote learning.

An initial pilot in Teggiano, Italy in September 2020, helped set the development team's priorities. Four more schools from Bagheria in Siciliy, Ronciglione in Lazio, Novi Ligure in Liguria, and Brindisi in Puglia are testing the first iteration of DreamCoder 2.0 in February and March 2021, and the development team will use the schools' feedback to further update the platform so that it is most useful for students and teachers' current circumstance.

The upgraded platform is more sensitive to the emerging user needs of schools, tech enthusiasts, and space fans. It directly enables an e-learning experience for stand-alone users as well as collaborative groups (i.e., a class, team, etc.). It also allows users to plan and connect in a common virtual space – the virtual classroom – for collaborative sessions and to program the Sagan board remotely. The overall system also accommodates more users with disabilities, with adaptations for those with dyslexia and other visual issues.

Ultimately, the goal of DreamCoder 2.0 is to create a comprehensive experience so that more students in Italy and worldwide can interact with space and gather critical real-world skills in computer engineering, from either an in-person classroom setting or while learning remotely.