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Using CubeSats to develop critical thinking skills

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Providing students with hands-on experience in emerging technologies, and engaging them in discovering new knowledge are ongoing challenges in undergraduate engineering and science education. CubeSats are playing an increasingly significant role in scientific research and exploration, as demonstrated by NASA's successful Insight Mission. Challenging students to design, build, and test these small satellites has the potential to increase their problem-solving, computational, and critical thinking skills. Furthermore, since CubeSats can be built with commercial-off-the shelf (COTS) components, they are relatively inexpensive and accessible to a diversity of programs and students. This work describes a successful program in which students were challenged to design, build, and test a 1U (unit) COTS CubeSat. CubeSat student projects incorporate both technology demonstrations and sensors as scientific payloads. Programmatic and technical successes and challenges faced by students especially during the COVID-19 pandemic are discussed, and some strategies are offered on how to implement such a program at different institutions with diverse student populations.