

## Designing Online Professional Development Courses Using Video-Based Instruction to Teach Robotics and Computer Science

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**Abstract :** Educational robotics is an effective tool for teaching and learning STEM curricula. Yet, most traditional professional development programs do not cover engineering, coding, or robotics. This paper will give an overview of how and why the VEX Professional Development Plus Introductory Training courses were developed to provide guided, simple professional development in the area of robotics and computer science instruction. These training courses guide educators through learning the basics of VEX robotics platforms, including VEX 123, GO, IQ, and EXP. Because many educators do not have experience teaching robotics or computer science, this course is meant to simulate one on one training or tutoring through video-based instruction. These videos, led by education professionals, can be watched at any time, which allows educators to watch at their own pace and create their own personalized professional development timeline. This personalization expands beyond the course itself into an online community where educators at different points in the self-paced course can converse with one another or with instructors from the videos and learn from a growing community of practice. By the end of each course, educators are armed with the skills to introduce robotics or computer science in their classroom or educational setting. The design of the course was guided by a variation of the Understanding by Design (UbD) framework and included hands-on activities and challenges to keep educators engaged and excited about robotics. Some of the concepts covered include, but are not limited to, following build instructions, building a robot, updating firmware, coding the robot to drive and turn autonomously, coding a robot using multiple methods, and considerations for teaching robotics and computer science in the classroom, and more. A secondary goal of this research is to discuss how this professional development approach can serve as an example in the larger educational community and explore ways that it could be further researched or used in the future.

**Keywords :** computer science education, online professional development, professional development, robotics education, video-based instruction

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