

How to Introduce Computing Concepts to Your Classroom Using Emerging Technologies in Engaging Projects

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Abstract: We are proposing a workshop that instructs K-12 teachers on how to implement fun and engaging projects involving different technologies in their classrooms. These types of projects can be used by faculty to introduce programming skills and other computing concepts, and they are also a fantastic resource for outreach activities. Our students developed these outreach projects in a service learning course as a way to develop and promote their technical skills. We thoroughly documented these projects and developed various tutorial videos and instructions on how to interact with the technologies. We maintain these projects in a searchable online repository that we will introduce during the workshop. We will also share best practices and allow for discussion in utilizing these projects and possibly creating new ones at their institutions.

Keywords: project-based learning, teaching, emerging technologies, critical thinking, cs, education, it, outreach, programming

Objectives

There is a great need for a diverse and capable workforce to maintain our nation's excellence in science, technology, engineering, and mathematics (STEM). In particular, women and minorities are severely underrepresented in the information technology (IT) fields. In addition to a standard curriculum, outreach activities have been successfully used by many institutions to attract more students to IT. Our Technology Ambassadors Program (TAP) at Georgia Gwinnett College (GGC) has been a successful IT outreach program for eleven years, training a diverse population of college-level students to develop and conduct engaging and fun technology outreach projects to audiences ranging from K-12 students to general education college classes.

More recently, we have found that these projects (Robertson and Doloc-Mihu 2023), originally designed as outreach activities, are also very good resources for introducing basic programming concepts in our classrooms. These projects employed various techniques such as block coding and emerging technologies such as mixed reality, drones, and programmable toy robots. In addition to programming, we have found that it was possible to use same approach to introduce other computing concepts such as binary conversion, 3D modeling, computer security, near-field communication (NFC) chips and QR codes, constructing web pages. We have since organized these projects online in a searchable repository (Technology Ambassadors Program 2024).

In this workshop, we aim to spark lively discussions about how to best introduce computing concepts to engage audiences of any age and establish new collaborations with audience members.

Topical Outline and Content

(15 min) Part 1. Introduction to our Program: Introduction to our Technology Ambassadors Program (TAP) outreach program, its history and mission, and our newly NSF-funded project.

(20 min) Part 2. Ice Breaker and Sign Up for Online Resources: Participants will introduce themselves on our forum, which will allow them to interact with the community as they implement the projects in their own classes. Then, we will showcase our project repository website (Technology Ambassadors Program 2024) which contains projects that participants can use in their classrooms.

(100 min) Part 3. Engaging Technology Project Demos: Hands-on sessions demonstrating different projects created and successfully implemented in our classrooms by our students.

(30 min) Part 4. Discussions: During this session our panelists, consisting of both faculty and students, will engage the audience in lively discussions related to best practices for introducing technology and programming concepts, and running a successful outreach program.

Execution Plan: Each part of the workshop will be conducted by 1-2 designated faculty from our program. The Demo session will include projects conducted by our students who will showcase the various projects on our website. This is a hands-on session where the audience will interact directly with technologies. The Discussion session will include both faculty and students and aims to engage the audience in discussions of best practices for introducing technology, programming, and algorithmic thinking into the classroom.

Prerequisites

This workshop is designed to demonstrate how K-12 teachers can use engaging technologies to introduce computing concepts in their classes. There are no prerequisites other than the desire to be innovative in the classroom and the willingness to learn a new technology.

Key Takeaways/ Comments

This workshop will showcase our service-learning outreach program Technology Ambassadors Program (TAP), which has been using programming workshops to recruit minority students to the field of IT since its inception. This program was the catalyst for our new approaches to introducing programming in our classrooms. The workshop will allow attendees to experience both short demonstrations and longer workshops focusing on a single technology. We will share our experience in implementing engaging programming and technology projects in the classroom to entice a diverse student population to become future technology professionals. The attendees will interact with a panel of faculty and students to discuss best practices for using these projects effectively and learn about our newly constructed project repository from which they can adopt our freely available materials, or if interested, how to set up an outreach program at their institution.

Instructor's Qualifications

The co-authors are professors and associate professors of Information Technology and have a combined teaching experience at the college level of over 50 years. They have run the IT service-learning based outreach program for over 10 years and have been actively guiding students in developing fun projects and activities.

To expand the impact of the program, the co-authors proposed and were granted an NSF-Broaden Participation (BPC) grant. The grant allows us to thoroughly document these projects, develop various tutorial videos and instructions on how to interact with these technologies, and maintain them in a searchable open-access online repository.

This proposed workshop will be a mini version of the two workshops we successfully conducted in 2024 that helped K-12 teachers utilize these outreach projects in their classrooms or for extra-curricular activities. Through the teacher workshops, We have gained valuable knowledge of the needs of K-12 teachers and gained experience in conducting effective workshops for teaching teachers how to introduce computing concepts in their classrooms using emerging technologies in engaging projects.

References

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