

## **BlockPy Interactive Demo:**

Dual Text/Block Python Programming Environment for Guided Practice and Data Science

### **Presenters**

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### **Abstract**

Introductory non-major learners face the challenge of mastering programming fundamentals while remaining sufficiently motivated to engage with the computing discipline. In particular, multi-disciplinary students struggle to find relevance in traditional computing curricula that tend to either emphasize abstract concepts, focus on entertainment (e.g., game and animation design), or rely on decontextualized settings. To address these issues, this demo introduces BlockPy, a web-based environment for Python (<https://blockpy.com>). The most powerful feature of BlockPy is a dual text/block view that beginners can freely move between, using advanced Mutual Language Translation techniques. The environment contextualizes introductory programming with data science by integrating real-world data including weather reports, classic book statistics, and historical crime data. A fusion of Blockly and Skulpt, the entire interface runs locally with no need for server sandboxing. BlockPy is also a platform for interactive, guided practice problems with automatic feedback that scaffolds learners. This demo will walk through the novel features of BlockPy's environment, including the instructor's perspective of creating new problems and how BlockPy can be embedded in modern LTI-compatible learning management systems. BlockPy is available online for free and is open-sourced on GitHub. This material is based on work supported by the NSF under Grants No. DGE-0822220, DUE-1444094, and DUE-1624320.

### **Significance and Relevance of the Topic**

This work follows several trends in the literature. First, it promotes the use of Python as an introductory programming language thanks to its friendly syntax and powerful libraries. It also leverages the dual block/text paradigm that is emerging as a popular system for transitioning students to maturity. Similarly, it supports Data Science to motivate introductory learners that are already domain-identified outside of CS (i.e. non-majors), providing a sense of utility instead of relying on situational interest. Finally, it builds on the literature of active learning, program analysis, and automated feedback through the guided practice problem utilities.

### **Expected Audience**

We expect many SIGCSE attendees will be interested in BlockPy. The relevant audiences include: instructors interested in teaching introductory computing to complete beginners;

instructors interested in using data science as an introductory context; instructors interested in using Python; developers interested in developing an online Python environment; developers interested in developing intelligent tutoring programming systems; instructional designers interested in building beginner programming experiences.

## **Presenters Biography**

Austin Cory Bart is a doctoral Computer Science student at Virginia Tech with a certification in the Learning Sciences. He is the primary developer of BlockPy as part of his research on contextualizing and scaffolding introductory programming experiences. In addition to his experience developing educational technology, he has co-taught several semesters of a course using BlockPy.

Dennis Kafura is a Professor of Computer Science at Virginia Tech. He is the PI on two NSF IUSE awards both of which involved the development of a general education course in Computational Thinking at the university level which uses the BlockPy environment. He has provided requirements and participated in the evaluation of BlockPy.

## **Materials Provided**

Attendees will be provided a handout that contains brief descriptions of the BlockPy environment. Attendees will be encouraged to try out BlockPy on their own devices (laptops, tablets, and to a limited extent mobile phones).

## **Rough Agenda for the Demo**

*0-5 minutes:* Setup and Introduction to BlockPy

*5-10 minutes:* Discussion of dual block/text view (advantages, disadvantages, and limitations)

*10-20 minutes:* Discussion of interactive programming problems design and implementation

*20-25 minutes:* Discussion of data science features

*25-30 minutes:* Questions from the audience

## **Audio/Visual and Computer Requirements**

1. Wireless/Ethernet access and power socket (a laptop will be brought, and it would be nice to be able to connect to the internet)
2. Projector to display the screen of the computer/laptop above

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