

# South Fayette

## Finch Robotic Devices Pilot Study Brief

### Product Info

**Product Name:** Finch Robotic Devices by BirdBrain Technologies

**Product Description:** The Finch is a small robotic device that students learning computer science can program to provide a tangible and physical representation of their code.

**Learning Focus:** Finch robots were embedded into the Java II course and in the APCS-A course for grades 9th - 12th.

**Teacher Training:** Over the course of the pilot there were two professional development opportunities, which we required our teacher to participate in, that were offered by BirdBrain Technologies. The first experience was 2.5 hours and the second 1.5 hours.

**Student Usage Minimum:** In Java II class, the students used the Finch robotic devices for the last unit of their semester long course, for approximately 12 days. In the APCS A course, students used the Finch robotic

devices for one of their exercises which lasted approximately 5 days. The Finches were used during the month of May.

**Device Specifications:** The Finch can be programmed using a variety of code. The device is made of plastic and has wheels for mobility. On-board features include accelerometers; motors, buzzer, full-color beak LED, light temperature and obstacle sensors, pen mount for drawing capabilities, and USB port connection. The Finches' main restriction is its cord which restricts long distance mobility since the device must be tethered to the computer through a USB cable.

**Cost:** We purchased 12 Finch Robotic devices for a total cost of \$1,069.20. The devices can be used individually or in teams, so it is possible to serve 25 students per class with a set of 12. In some cases you may design activities of three students per team which would allow you to serve 36 students with a set of 12 Finches.

### District Context

**District demographics:** 3100 students, 13 percent receive free and reduced price lunches; for the last six years, the District has been implementing a K-12 vertically aligned computational thinking initiative; very progressive and innovative district that created STEAM Teacher positions in the elementary school, intermediate school, and middle school to work with students on integrating science, technology, engineering, art, and math.

**Pilot demographics:** Students ranged from 9th through 12th grade. There were 21 students who piloted this device: 9 students in the Java II course and 12 students in APCS-A course. In this study there was one building involved, South Fayette High School, and one teacher who taught JAVA II and APCS-A.

## Pilot Goal

The goal of this study was to determine if we could deepen students' understanding in computational thinking through computer programming and increase motivation and engagement in learning a programming language by having students program a robotic device.

## Implementation Plan

**Duration:** Planning began with the teacher February 2, 2017. Professional development occurred twice before the implementation date with students which began on May 15 (since this was a capstone activity designed to help students compare and contrast different experiences using computer programming). The project ended in early June.

**Quality of Support:** Professional development was offered twice. The teacher felt prepared to work with the Finches after the first training but we added the second shorter professional development experience to build confidence before she started the project. The teacher was supported by all administrators, her building principals as well as the district administration.

**Implementation Model:** We used the Finch Robots after students had completed methods and arrays in Java II and after students completed the APCS-A test. The student was

designed to give students an opportunity to learn programming in a traditional way and then change the construct to introduce coding an external device to see if motivation increased and if their understanding of computer science concepts was enhanced. The way we used the device matched the way we intended to use it. However, we originally structured the study to be implemented in Java II, but we were able to add the APCS-A class into the study and compare the use of the device between students with less programming experience and those who were more advanced.

**Data collected:** We administered a pre and post-test to students in both classes. In addition, we held student focus groups with both classes. We also included a post-survey for the computer science teacher that included her qualitative findings.

## Findings

**Actual implementation model:** The implementation model was aligned to plan.

**Educator engagement:** The teacher used the tool for a 10-day (+) period and loved the reaction the students had to the device. She wants to embed it in Java I and Java II next year.

**Educator satisfaction:** We were extremely satisfied with the functionality of the tool and especially the level of support we received from the product developer. We noticed changes we would like to see in the product and they introduced us to a new iteration of

the tool that will be out in 2018 that will meet our needs exactly. We are looking forward to studying and investing in the new product in the future.

**Student engagement:** According to student survey responses, most students found the Finches highly engaging. Many students reported that they enjoyed the opportunity to see the physical representation of their Java codes. A few students noted that they would prefer to use wireless Finches in the future, a change that the company intends to make so South Fayette can beta test the new version in the 2017-18 school year.

**Student satisfaction:** The students very much enjoyed working with the tool and have listed their hopes in terms of product improvements (creating a stand-alone version that is not tethered to the computer and a robotic device that has additional functionality with additional motors and sensors).

**Student learning:** Through student surveys, several students stated that the product improved their confidence in problem solving. One student stated, the Finches “force you

to program dynamically to adjust to different circumstances.” Most students in the Java II course learned many new Java concepts by using the product. While few students in the AP CS class learned new ideas, most reported gaining a deeper understanding of coding and appreciated the opportunity to build their collaboration skills by working through challenges in a team-setting, as they expect work to be in the real-world.

## Outcome

**Purchasing Decision:** Based on our preliminary findings we are planning to purchase additional Finches to be used with the new 8th grade Python course. The model we are planning to purchase is a new iteration that operates without the USB cable. It will be a stand-alone robotic device that will be coming out in 2018.