



Research Findings

This document summarizes the most important findings from academic research studies involving the Finch Robot.

1. The Finch Robot is the result of a careful research process.

The Finch Robot is the end result of four years of National Science Foundation-backed research at Carnegie Mellon University into creating a robot for computer science education to boost learning and engagement. This research progress is demonstrated in these papers [4, 5, 6, 7, 8].

The research process that led to the original Finch Robot included design feedback from and the direct participation of 30 high school teachers, two community college instructors, and nearly 200 high school and community college students [4,5,6]. Additionally, the Finch Robot 2.0 integrates direct feedback from hundreds of educators who have used the original Finch Robot.

2. The Finch Robot engages students in learning computer science.

In a study [2] of the use of the Finch Robots at a rural elementary school, researchers found that the majority of students would work with the robots during recess and other free time, in addition to required Finch Robot programming activities. Of 258 students surveyed, 70% also reported liking the robots.

In a study [3] of 16 middle school girls using the Finch Robot at a summer camp for underserved youth, researchers report high engagement of the girls while working with the Finch Robot. Girls self-reported increased levels of confidence and increased interest in computer science as a career choice.

In a study [4] of 80 community college students in five sections of an introductory computer science course, use of the Finch Robot was associated with an increase in the percentage of students completing the course.

In a study [1] of a redesign of the introductory computer science course at a state university, the Finch Robot combined with other course changes was found to increase the pass rate (defined as % of students receiving an A, B, or C) from 74 to 81%. Students in classes after the course changes were implemented also reported a much greater degree of comfort with 11 computer science concepts than students that took the class before the changes were implemented, with 20% more students indicating that they were "strongly" comfortable with their understanding of the concepts.

3. The Finch Robot works with a wide variety of age and experience levels.

Studies examining the use of the Finch Robot in elementary school with students as young as five [2], in a middle school summer camp [3], and in several college classrooms [1,4,5] all credit the Finch with engaging students in learning Computer Science.



References:

1. Sotirios Kentros, Manish Wadhwa, Lakshmid devi Sreeramareddy, Komalpreet Kaur, Marc Ebenfield, and Allan Shwedel, Course redesign to improve retention: finding the optimal mix of instructional approaches, *Journal of Computing Sciences in Colleges*, Volume 34 Issue 6, pg 97-106, April 2019.
2. Cecily Heiner, A Robotics Experience for All the Students in an Elementary School, SIGCSE '18 Proceedings of the 49th ACM Technical Symposium on Computer Science Education, 2018.
3. Sarah B. Lee, Rian B. Walker, Engaging Middle School Girls in Computing with a Project-based Summer Experience, *ASEE Southeast Section Conference*, 2014.
4. Tom Lauwers, Designing the Finch: Creating a Robot Aligned to Computer Science Concepts, Proceedings of the First Symposium on Educational Applications of AI, 2010.
5. Tom Lauwers, Aligning Capabilities of Interactive Educational Tools to Learner Goals (Doctoral dissertation), Carnegie Mellon, 2010.
6. Tom Lauwers, Emily Hamner, and Illah Nourbakhsh, A strategy for collaborative outreach: lessons from the CSbots project, *SIGCSE Proceedings*, pg 315-319, 2010.
7. Tom Lauwers, Illah Nourbakhsh, and Emily Hamner, CSbots: Design and Deployment of a Robot Designed for the CS1 Classroom, *SIGCSE Proceedings*, 2009.
8. Tom Lauwers, Illah Nourbakhsh, and Emily Hamner, CSbots: A case study in introducing educational technology to a classroom setting, tech. report CMU-RI-TR-08-41, Robotics Institute, Carnegie Mellon University, 2008.

The summaries above are drawn from one or more research papers, but are not direct quotes from those papers.