Collaborative Research: Type I:
FRABJOUS CS — Framing a Rigorous Approach to Beauty and Joy for Outreach to Underrepresented Students in Computing at Scale

The proposers believe that, given the scaffolding of a visually rich programming environment, a successful outreach course can include a technically rigorous computer programming component. This belief is at the center of the project's research agenda.

Building on the work of two of the five initial pilot sites for the College Board AP CS Principles project, the proposed project will attract and retain female and underrepresented minority students and support the CS10K initiative through course adoption and research based on the "Beauty and Joy of Computing" course[1] using the Snap programming language (formerly "Build Your Own Blocks" or BYOB), an extension of Scratch that combines technical sophistication with an attractive drag-and-drop interface. The project includes

- Outreach and professional development
- Assessing student learning
- Tools development

Intellectual Merit

This project builds on three years' development of the "Beauty and Joy" curriculum and of the Snap language,[2] including a full year of teaching the curriculum to college students at scale. Snap is based on Scratch,[3] which has had well-documented success in teaching basic computer programming to 8-14 year olds because of the power of its visual metaphor. **The novel intellectual content in this project is the idea that the same visual metaphor can be extended to teach more advanced methods (recursion, higher order procedures, and object oriented programming) to 14-19 year olds, and that in combination with a curriculum tied to the social implications of computing, this technically rigorous program can meet the CE21 goals of attracting and retaining traditionally underrepresented student groups.**

Broader Impacts

This project is aligned with the AP CS Principles design effort, and with the CS10K teacher preparation effort. The "Beauty and Joy of Computing" curriculum is designed to feature practical application areas for discussion and for programming projects. The CE21 funding will expand existing teacher outreach and professional development efforts, in partnership with the Golden Gate CSTA chapter and with the STARS Alliance. The professional development model is not limited to a single short-term intervention, but includes two week-long summer workshops with online course activities between them, strong support for participants' curriculum adoption during the following school year, and a follow-up session the next summer for participants who will run the next iteration of teacher preparation. The funding will also support the development of the Snap software that enables the visual representation of advanced computer science ideas and techniques.

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[1] http://inst.eecs.berkeley.edu/~cs10

[2] http://snap.berkeley.edu

[3] http://scratch.mit.edu