Your Voice is Power

Integrating Computing, Music, Entrepreneurship, and Social Justice Learning

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ABSTRACT

Computational thinking has become pervasive across many technical and creative disciplines. Creating a computationally literate workforce capable of recognizing and eliminating algorithmic discrimination requires diverse perspectives and lived experiences. Diversity within computing is a persistent problem; in 2014, several large tech companies released diversity reports and made commitments to improvement. As of 2020, improvements have been minor, especially for Black employees. Compared to US demographics, the percentage of Black and Latinx students pursuing degrees in computing remains low, even as numbers improve in STEM more broadly. It is more important than ever to prioritize a diverse computing workforce and a computationally literate workforce, more broadly, whose interests reside with equitable outcomes.

In addition to workplace inequities, the financial inequality prevalent in our society is also multi-layered. Racially based wealth gaps continue to widen, emphasizing the educational and financial disparities between underrepresented populations and the societal majority. As we attempt to facilitate the reduction of the financial gap, we can increase opportunities for lucrative careers in technology and computing and promote financial freedom by encouraging students with more entrepreneurial spirits to learn about and engage with ideas of entrepreneurship. We can also promote creative mindsets capable of taking advantage of connections between creativity, technology, and entrepreneurship. Additionally, we can enable spaces for students to begin having conversations about racism and its effects.

Many recent efforts to develop new and creative K-12 computing curricula have incorporated the arts and emphasized the creative aspects of computing. The approach to Your Voice is Power goes a step further. A Lyrical analysis integrates content around the messages within music to make racial and social justice discussions accessible to middle and high school students. Your Voice is Power includes a competition component, encouraging students to submit original remixes based on Pharrell Williams's "Entrepreneur," incorporating their own messaging around social justice.

The Your Voice is Power curriculum experience builds on significant prior work, including the OUTKAST Imagination, a framework for analyzing messages in music, and EarSketch, a learn-to-code through music platform developed by researchers at Georgia Tech. Your Voice is Power goes beyond recruiting diverse students into computing. It emphasizes different roles and

pathways to equity, and diverse perspectives are valued within the curriculum and guided conversations. Coding is only part of the experience; the outcome is a creative artifact representing the student's voice.

EarSketch is a novel approach to teaching computer science concepts via algorithmic music composition and remixing in a digital audio workstation paradigm. EarSketch runs entirely in a web browser and includes a Python/JavaScript coding environment, a digital audio workstation (DAW), an audio loop library, a social sharing site, and an integrated curriculum. Our prior research of EarSketch has demonstrated the power of music to engage diverse student populations in computing education authentically and increase their intentions to persist in computing, especially among women and underrepresented minority students.

To complement students' use of EarSketch to produce sound remixes for "Entrepreneur," students and teachers are also introduced to the OUTKAST Imagination (The OI) to better understand the messaging in "Entrepreneur" and to facilitate discussion around themes of social justice. The OI samples the narrative modes and perspectives of the original acronym associated with the Atlanta-based rap duo, OUTKAST ("Operating Under The Krooked American System Too-long"). It layers on the sociological imagination of C. Wright Mills and the techno-pedagogical innovations, aesthetics, and impacts native to Black cultural production and the hip hop aesthetic to build a hip hop-informed taxonomy of design principles that rely on a set of cultural affordances to guide culturally resilient computational media-making, design thinking, and analysis of messaging in media such as music and film. For YVIP, students and teachers use seven principles: Open-minded thinking, Uprightness, Truth, Kinship, Accountability, Sequence, and Teach-love to engage in sentiment-mining in "Entrepreneur."

Your Voice is Power is a curriculum and competition for middle and high school students that aims to bolster long-term diversity and participation in computing and STEM. The competition offers a $5000 prize to support academic scholarships or entrepreneurial ventures. The program targets three broad areas: 1) student use of EarSketch, competition submissions, and quality, 2) student attitudes and values, and 3) teacher outcomes. The EarSketch usage and entry goals primarily focus on counts, including the total number of users, unique visits, and entrants of the competition, including repeat entrants over the two rounds of competition. High-quality submissions are also a goal that will be determined by reviewing the judge scores.

The goals related to student views and values reflect the expectation that, through participating in this competition, students will gain a more comprehensive understanding of what coding and computer science entail and how these areas might play a role in future coursework and career goals. Through the curriculum's emphasis on social justice and activism, students should understand these societal issues and how the fields of coding and computer science can be used to advance positive change. This program focuses on helping students be aware of potential uses of coding and empowering them to make positive changes in their communities and sustain interest and aptitude in computer science and coding and pursue coursework and careers in computer science and music technology.

A pre-post survey design was used to assess student experiences within the curriculum pilot, carried out with a small group of 16 teachers during December 2020 – January 2021. All high school students participating in the pilot were invited to register to take online surveys at the beginning and again after the curriculum pilot. Sixteen of the students who participated in the pilot program responded to the post-survey. Their feedback indicates generally positive reactions to the Your Voice is Power learning experience. Students were asked to rate the learning experience overall on a scale from 1 to 5 (1 = "Not good, I really didn't like it," five = "Awesome! I loved this learning challenge"); the mean response was 4.13 (SD = 0.89), indicating a largely positive overall assessment of the curriculum. Over 80% of respondents provided a rating of 4 or 5 on this general feedback item.

Students provided responses at or near a level of "Agree" ("Agree" corresponds to 4.0 on the five-point response scale) when asked to rate their level of agreement with a series of statements about specific aspects of the curriculum and their impact on students: "I had fun completing the Your Voice is Power Learning Experience" (mean = 3.81, SD = 1.05); "I now have a better understanding and awareness of different types of racial injustice" (mean = 4.06, SD = 1.00); "I now have a better understanding of the different ways that people can promote equity as an activist or ally" (mean = 4.13, SD = 0.96); "I now have a better understanding of how music, computer science, and entrepreneurship are pathways to racial equity" (mean = 3.88, SD = 1.15); I would recommend that other teachers and students participate in the Your Voice is Power Challenge" (mean = 4.19, SD = 0.98).

Students provided somewhat fewer positive ratings about the questions regarding future career path intentions: "After this challenge, I am more interested in a career in computer science, robotics, or engineering" (mean = 2.94, SD = 1.39); "After this challenge, I am more confident that I can be successful in a career in computer science, robotics, or engineering" (mean = 3.13, SD = 1.15). However, this is a small sample (n=16), so this will be investigated further after the full implementation of Your Voice is Power, completing in June 2021.

The Your Voice is Power team represents a unique partnership between academia, industry, and a non-profit to amplify reach and impact. Initial results from a pilot study show students' awareness of racial injustice, what it means to be an activist or an ally, and how computing, entrepreneurship, and music can be pathways to racial equity. In future work, we plan to collect data from a larger population of students to see if these results are maintained and whether students are more interested in computing and STEM careers upon completing the Your Voice is Power curriculum.