

Identifying Spheres of Influence for a Culturally Relevant Computing Curriculum Through Participatory Design

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Abstract: As part of the development of a culturally relevant computing curriculum, we held a series of participatory design sessions to gather ideas reflecting the interests of learners. We examine the emergent ideas from these sessions to understand what influences learners and their ideas of cultural relevancy. We further examine how participatory design can advance our understanding of the domains influencing youth. This work identifies the resources children draw on and organizes them to extend the *Spheres of Influence* framework (Archer, DeWitt, & Wong, 2014). We present seven distinct, yet interconnected spheres: Home and Family, School and Work, Hobbies and Leisure, Media, Interests, Peers, and Perceptions of Self.

Introduction

The integration of culture-based and interest-driven activities within a curriculum can improve student attitudes toward content and increase learning (Ladson-Billings, 1995). This work is part of a larger project using students' own culturally relevant and interest-based ideas to build a curriculum teaching upper elementary and middle school students advanced computing skills (Franklin et al., 2020). In our project, we used participatory design (PD), a design technique where users work alongside researchers and designers to develop a product (Druin, 2002; Roschelle & Penuel, 2006), to involve the very students we want to serve in the design process of our curriculum. In this poster, we present a thematic analysis of the different theme ideas and situate them within the broader resource categories that students drew upon while designing. This work builds off of the *Spheres of Influence* framework of Archer et al. (2014) using a novel methodological approach to identify further spheres. Contributing to the field both theoretically and methodologically, we pursue the questions: "What *Spheres of Influence* do youth draw upon when designing a computing curriculum?" and "In what ways are students' *Spheres of Influence* expressed in artifacts created through PD and crafting based methodologies?"

Methods

We hosted four distinct 4-hour PD sessions in a large midwestern city. Sessions were comprised of students, parents, teachers, and administrators. This paper focuses exclusively on the design ideas of the 34 youth (10 male, 23 female, 1 other) present. The average age of the students was 11.35 years old and the group was racially diverse. For a full description of the design sessions and participants, see Coenraad, Palmer, Franklin, & Weintrop (2019). Data were collected through video, photographs, design artifacts, and demographic surveys. Coding of the collected data took place in 3 phases: identifying ideas and salient themes, developing *Spheres of Influence* using deductive and inductive coding, and coding for *Spheres of Influence*. Two researchers applied the first phase idea codes, achieving substantial agreement: $\kappa = 0.65$ ($z = 24.1$, $p < 0.001$). Ideas presented as themes salient to students (as opposed to materials or game/story elements) were extracted and coded using Archer et al.'s (2014) *Spheres of Influence*. Ideas that did not fit into the four original spheres were coded through open-ended initial coding and discussed amongst the research team to inductively develop new *Spheres of Influence*. A final set of seven *Spheres of Influence* were used to code the full set of salient ideas, with two researchers achieving a moderate level of agreement $\kappa = 0.60$ ($z = 41.3$, $p < 0.001$), resolving disagreements through discussion.

Findings: The Seven Spheres of Influence

The design sessions yielded 3,828 ideas, 2,641 of which were relevant. After duplicate and adult responses were removed, 818 unique and youth-generated ideas remained. The seven *Spheres of Influence* are summarized in Table 1. Our analysis began with the four categories generated by Archer et al. (2014), *Home/Family*, *School*, *TV*, and *Hobbies/Leisure*. Using the data collected through PD, we translate *School* and *TV* to the broader categories of *School and Work* and *Media*. Additionally, we propose three new categories, *Interests*, *Peers*, and *Perceptions of Self*. A small number of ideas (33; 4.0%) did not fit within the seven *Spheres of Influence*.

Spheres of Influence could be seen throughout the design activities. When designing a module, students drew upon their knowledge of *Peers*, *Hobbies and Leisure*, and *Perceptions of Self* to design a two-player

basketball game that reflected both what they value and their *Hobbies*. Design ideas switched between one-on-one games and drills from their own basketball practices. In the final game, a boy and a girl play one-on-one. The boy scores first, but the girl is quick to follow and “prove that she can make a point too.” In the end, she wins, showing that she can play basketball just as well, if not better, than the boy. The all-girl design team showcased their common *Hobby* of basketball with *Peers* while also commenting on how gender impacts gameplay and their *Perceptions of Self* as female athletes. While *Hobbies* and *Leisure* activities generated the topic of the design, the designers also shared their *Hobby* of drawing. In this way, PD allowed the girls to express themselves not only in what they created, but also in how they created it.

Table 1. The 7 Spheres of Influence

Sphere of Influence	Use	Definition
Home and Family	89 (10.9%)	The people, activities, and beliefs that surround a person’s family and home including their neighborhood and broader community
School and Work	125 (15.3%)	People and activities specifically related to school or school programs as well as focus on future schools and careers
Hobbies and Leisure	158 (19.3%)	The things that students do such as arts, sports, or interacting with media forms such as music and video games
Media	98 (12.0%)	Things that youth consume including social media, television, movies, books, videos games, and characters/locations from these media sources
Interests	197 (24.1%)	Things that attract youth attention but are not an activity that can be done such as animals, sports teams, locations, and things like hair and fashion.
Peers	45 (5.5%)	Activities referenced as done with a peer or people considered to be peers including neighbors, classmates, and online “friends”.
Perceptions of Self	73 (8.9%)	Learner characteristics such as gender, age, and appearance, views of self such as “beauty girl” and “vegetarian,” and personal qualities.

Discussion

When creating interest-driven and culturally relevant curricula, definitions and ideas of the concepts applicable to youth need to attend to the broad resources that youth draw upon and the many *Spheres of Influence* within their lives. We examined youth generated ideas and themes elicited during PD sessions to develop a computer science curriculum. Using that analysis, we expanded the theory of *Spheres of Influence* to understand all of the resources youth draw upon when considering cultural relevance. The unique methodology of PD allowed us to see how creativity-based methodologies with power equalizing goals could bring forth new ideas to incorporate in our expansion of the theory. With an extended understanding of the spheres influencing youth lives, curriculum designers can better integrate student interests and the cultures they bring with them into learning activities.

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