Social and Cultural Relevance: A Design Principle For the Next Generation of Data Science-based Computer Science Education

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Data and Computer Science (CS) are widespread and their increasing ubiquity has revolutionized modern society in myriad fields (NSF, 2022). Examples include healthcare, manufacturing, and public policy where Big Data is used to study disease (Stella, 2021), produce therapies (Dash, 2019), and make public health decisions (Saunders, 2020) — all of which leverage data science through computational processes used to support understanding data characteristics and how they can solve modern and sometimes wicked problems (Auld, 2021). The recent COVID-19 pandemic can be used to appreciate the importance of Data Science on—for instance— on social media where computational savvy content creators have a significant impact on public awareness (Wu, 2018). This importance underscores an urgent need for a design principle that supports data science education consistent with prevailing national calls for CS4ALL (Adams, 2020) and at earlier stages of the data science CS education pipeline—among pre-college learners who represent the next generation of public consumers. Fulfilling such a need would not only support pipeline innovation, but would also create a cohesive, and federated infrastructure for the job industries and public awareness, which are quintessential to developing a 21st-century computationally literate and data-capable workforce (NSF, 2022).

Efforts to address this need have flourished across colleges and universities as data science is often taken up in math and computer science departments (Adams, 2020; Berinato, 2019). Fewer efforts have gained traction in high school (Harris, 2017), an age group that has shown promise in engaging productively in this area of study (Lee, 2021; Hendrickson 2021). Others have cited a problem in the extant literature and coursework among pre-college groups where learners typically engage with datasets generated by others—rather than potential social and culturally rich data sets learners themselves might create (Walker, 2021). Such an approach would support equity-driven educational praxis by providing opportunities for learners to personally connect with data science and acquire CS technical skills (Kafai, 2022).

We leverage *relevancy* as a design principle to overcome access and engagement challenges related to data science-based CS teaching and learning. We developed a culturally relevant data science-based CS curriculum visualized in Figure 1 using relevancy as a guiding design principle. We draw on the foundational work of Gloria Ladson Billings (1995) to frame learner experiences such that they connect to their personal interest, cultural backgrounds, and sociopolitical landscape. We designed and implemented a series of technical lessons under the umbrella of computer science but utilizing data drawn from Twitter and aligned with learners' personal interests, cultural, and socio-political concerns. Learners are generally engaged with social media platforms like these and thus serve as a space where learners build data and computational literacy. To ensure such engagement, we use programming concepts and tools (Reza, 2022) to mine, analyze and visualize social media data under the CS framework and prepare learners' skills enough to identify and critically discern between potentially massive data

sets. Such a design principle forefronts learners' interest, and affirms their cultural identity while developing critical perspective engagement with computer science.

Figure 1: Culturally relevant data science-based CS curriculum

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