Chapter 6

Leveraging Food as the Context for Developing Computational Algorithmic Thinking in an Entry-Level College Course

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ABSTRACT

Over the course of three years, we have developed the It's All In The Mix module as part of an introductory Computer Science (CS) course that is a required course for all STEM majors. It's All In The Mix currently consists of a set of integrated food-focused activities that expose students to computational algorithmic thinking (CAT) – the ability to design, implement, adapt and assess algorithms. In the context of using recipes to prepare food, It's All In The Mix provides an anchoring experience for African American undergraduate STEM majors, bridging the gap between students' enactment of algorithms in everyday settings and algorithms in an introductory CS course. As a result of the integration of the It's All In The Mix module, we achieve 100% retention of students in the introductory CS course. This chapter examines how this food module has influenced students' development of CAT and their perception of CS.

INTRODUCTION

According to the 2014 Taulbee Survey, African American women comprise only 1% of all the Bachelor's Degrees awarded in Computer Science (CS) in the United States (Zweben, 2013). This casts a bright light on the vast underrepresentation of African American women in CS. The literature reveals a number of efforts focused on pedagogical strategies designed to engage and impact the persistence of African Americans and women in CS from K – 18, including the use of gaming, robotics, computational textiles, and intergenerational collaboration (Barnes, Richter, Chaffin, Godwin, Powell, Ralph, Matthews & Jordan, 2007; Clegg, Bonsignore, Yip, Gelderblom, Kuhn, Valenstein, Lewittes, & Druin, 2012; DiSalvo, Guzdial, Mcklin, Meadows, Perry, Steward & Bruckman, 2009; Gardner, Clegg, Williams, & Kolodner, 2006; Maloney, Burd, Kafai, Rusk, Silverman & Resnick, 2004; Owensby, 2006; Rankin, Thomas Irish & Hawkins, 2014; Rankin, Thomas, Brown & Hatley, 2013; Repenning, 2008; Thomas, 2014). However, in spite of these efforts, the needle seems to have barely moved on African American women choosing CS as a major, and ultimately, graduating with a Bachelor's Degree in CS (Zweben, 2013). The question remains: how can we improve the retention of African American women in CS, thereby increasing the number of African American women in the CS pipeline? Part of the solution begins with the use of innovative pedagogical strategies that leverage students' everyday experiences to help them understand and apply fundamental CS concepts.

Students often design, adapt, apply, and assess algorithms---defined as *computational algorithmic thinking* (CAT) (Rankin & Thomas, 2016; Thomas, 2008; Thomas, 2014), in their daily lives (e.g. using an automated teller machine to retrieve money or crossing a busy street). Yet they often fail to make the connection between the use of algorithms in their everyday lives and its application in more academic settings. Consequently, students often struggle with how to apply CAT capabilities to basic problem-solving activities (Thomas, 2008; Thomas, 2014). If the goal is to transition students of color from being consumers to being producers of technology, then we must help them develop their CAT capabilities, a prerequisite for creating technology. Thus, it becomes imperative to make salient students' experience with applying CAT capabilities in the context of their daily lives and to build upon these experiences as a bridge to understanding the discipline of Computer Science.

While many African American women enter college with little, if any, prior programming experience, food touches the lives of every individual in every culture and from every walk of life. All students have experiences with eating or preparing food, ranging from the simple act of fixing a bowl of cereal for breakfast to cooking or watching someone else prepare a main entrée for dinner. Moreover, prior research demonstrates that cooking and baking can provide an effective context for

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