Understanding novices' perceptions of "authentic" programming

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ABSTRACT

Authentic learning, characterized by engagement with real-world problems and tools, has long been of interest in education due to its impact on student motivation and learning outcomes [2, 7]. In computer science (CS) education, however, students and teachers face the challenge of balancing the desire to teach and learn "real" programming with the need for a gentle and scaffolded introduction to this highly abstract and cognitively demanding discipline [4]. As a tool-dependent discipline, the tension between authentic and scaffolded is particularly evident in the perceived in-authenticity of educational programming tools. While scaffolded blocks-based programming tools are approachable [14] and beneficial for learning [3, 10], they are often perceived as less authentic by high school students [4, 14], which can be demotivating. Conversely, "real" text-based programming, while authentic, can be difficult and intimidating, creating a barrier to learning and engagement [10, 14]. This dichotomy exemplifies a challenge in CS education: how can we provide an authentic learning experience through tools that are both approachable and representative of authentic programming practice?

Addressing this challenge necessitates understanding what "authenticity" means in the context of CS education. Authenticity, a multi-dimensional and complex concept, encompasses dimensions of real-world relevance, disciplinary relevance, and personal relevance, each of which can be further decomposed [8, 9, 11–13]. Crucially, it is each individual student's perception of authenticity, rather than an objective measure, that impacts their learning [2, 5]. While efforts have been made to create more authentic educational programming tools and curricula [1, 4, 6], these efforts adopt a top-down approach, with limited understanding of students' rich, multi-faceted perceptions of authentic programming.

Our study takes a bottom-up approach. We aim to first understand high school students' perceptions of authentic programming. Our research questions for this study are: (1) What do students mean by "real programming"? (2) Do theories of authenticity accurately model students' perception of authentic educational programming tools? (3) How do students assess existing educational programming tools' authenticity and what affects that assessment? (4) How does identity, background, and experience affect perceptions of authenticity? We employ a mixed-methods approach, combining quantitative surveys with qualitative interviews. Informed by frameworks [8] and models [11] of authentic learning, we have designed a survey instrument to explore our research questions. Subsequent interviews will identify the characteristics of a given tool that lead to student perceptions of its authenticity, and probe how these perceptions affect student motivation to learn using said tool.

This first stage of our research will enhance our understanding of the qualities of programming tools that affect students' perception of authenticity. This understanding could lead to insights about the design of authentic learning tools and how to match students with educational programming tools that they find to be authentic. A later stage will leverage those insights to discover design techniques to create a sense of authenticity without sacrificing scaffolded learning. Overall, our research aims to contribute to an understanding of authentic learning in CS education and to develop theories and methods to design for perceived authenticity.

CCS CONCEPTS

• **Social and professional topics → K-12 education**.

KEYWORDS

authentic learning, programming, student perception, high school

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