Harnessing Personal Storytelling to Support Teachers' Initial Grasp of Understanding Computational Thinking

Abstract

Traditional professional development aimed at integrating computational thinking (CT) into K-12 classrooms frequently fails to link abstract technical terminology with teachers' personal experiences or real-world situations, which can impede overall teacher understanding and effective classroom implementation. This paper investigates an alternative method that employs personal storytelling to introduce CT to educators. We discovered that storytelling helped build emotional connections and prompted deeper reflections on CT concepts. Participants shared how CT appears in various settings, including teaching, parenting, and outdoor activities, which transformed their understanding and forged significant connections between theory and practice.

Introduction

Recently, implementing CT in K-12 classrooms has gained popularity (Tedre & Denning, 2016). In 2006, Wing termed computational thinking as involving "solving problems, designing systems, and understanding human behavior, by drawing on the concepts fundamental to computer science" (p. 33). Not many teachers had the background knowledge to teach CT, hence many teacher education efforts focused on providing teachers with CT instruction (Kong & Lao, 2019, Grover & Pea, 2013). However, many CT professional development programs decontextualized the concepts by foregrounding technical terminology and canonical concepts with little to no connections to personal experience or real-world phenomena (Dong et al., 2019). For teachers who may not have much experience with CT, the lack of deep and personal understanding of an abstract topic poses an obstacle for introducing CT topics into their classroom.

Personal storytelling plays a crucial role in learning by enhancing engagement, fostering empathy, and facilitating deeper understanding of complex concepts. By contextualizing knowledge within personal experiences and emotions, storytelling makes learning more relatable and memorable (Bruner, 1990). Thus storytelling can serve as an effective and meaningful modality for teachers to learn about new topics, including CT.

In this paper, we explore the role of storytelling in supporting teachers' CT understanding. More specifically, as part of an NSF-funded project focused on leveraging a Research Practice Partnership (RPP) to support teachers' CT-STEM integration efforts, we deliberately designed one of our first conversations about CT to elicit personal storytelling. We argue that the personal storytelling allowed participants to draw connections between CT and their daily lives in a way that enhanced their sense-making about both domains. Furthermore, we found that as participants told stories about instances of CT in their daily lives, they conveyed emotions reflecting the deep connections they were making between their lived experiences and CT. This emotional

connection encourages learners to reflect on their own experience and knowledge, promoting critical thinking and reflection. As a result, members began to form a meaningful connection with CT which serves as a foundation to continue developing their understanding of CT. With this personal connection to CT, it is more likely for teachers to incorporate CT understanding into class curriculum, in turn setting up students to make their own meaningful connection to CT.

Here, we illustrate a "bottom-up" approach to introducing computational thinking by eliciting personal storytelling. This approach enabled practitioners to reflect on computational thinking in a manner that connects to their daily lives while simultaneously drawing on emotional connections to their stories. We reveal the significance of incorporating opportunities to share personal narratives for enhancing engagement, evoking emotional connection between content and personal life, and fostering a shared understanding of CT among participants.

Theoretical Framework

'Personal storytelling' is defined as a process in which a person uses their voice and language to convey a story to an audience (Lucarevschi, 2016). This can appear in a plethora of forms, taking into account people's unique background and experience. Storytelling, in that sense, is a way for people to incorporate their experiences into an abstract concept.

Applying storytelling to learning has shown to help knowledge construction in many disciplines (Hung et al., 2012). Storytelling's strength in education lies in its ability to decompose complex topics into manageable pieces that are memorable to the individual (Smith et al., 2023). By leveraging this characteristic, storytelling can be applied to abstract ideas, not only to find a common relationship between complex topics and personal experiences, but also open a point of access. Furthermore, telling the story positions the individual at the center and gives meaning to their experience (Drumm, 2013). As a result, emotion shines through, and sharing those experiences with others allows people to gain different perspectives that may not have been apparent previously (Clark & Rossiter, 2006).

By recounting personal anecdotes, individuals contextualize abstract concepts and make them relatable and memorable. This process not only enhances understanding but also encourages critical thinking as listeners engage with diverse perspectives and alternative viewpoints (Agosto, 2016). Ultimately, personal storytelling transforms learning from a passive accumulation of information into an active, participatory process that encourages introspection, collaboration, and a deeper appreciation for the diversity of human experiences.

Study Context and Methods

The data for this paper are from an NSF-supported research practitioner partnership (RPP) project involving ten researchers, content specialists, informal educators, and classroom teachers. The collaboration explored here focuses on refining elementary STEM curriculum by integrating

computational thinking and sustainability education using a "bottom-up" methodology that aims to contextualize CT within real-world phenomena and experiences. Monthly Zoom meetings since November 2022 centered on developing shared visions and goals, reflecting on professional practices, and exploring sustainability and CT integration through activities. During the meetings, we prioritized fostering a collaborative environment with a flattened power structure, valuing the expertise of all participants equally. Additionally, the group engaged in contextual CT inquiry and modified county curricula to include more CT and sustainability practices/content. Each two-hour session began with icebreakers to encourage personal sharing and concluded with reflective "exit tickets," and made ample space for both large and small group discussions.

In this paper, we analyze the second activity of a monthly meeting in March 2023: the CT discussion. The primary meeting objective was for the group to develop a nascent sense of CT: how is it defined, what does it mean to each member, and what does it mean to this project? More importantly, the CT activity was designed such that the practitioners connect the complex topic of CT to their daily lives to create an individualized understanding. The discussion began with the facilitators sharing a presentation about the variety of ways that CT is conceptualized in the literature. The facilitator prefaces the discussion with saying “there's not really consensus about what counts as computational thinking and what computational thinking is…. what we really want folks to get out of it is to think about it in terms of what becomes really useful for us as we're doing this work”, which focuses on connecting CT to personal experience. Members were then asked to respond to the following prompt: “Share an example of when you engaged with computational thinking in your everyday life”. Firstly, we transcribed members’ contributions using Jeffersonian Notation. Then, we used discourse analysis to identify emotions within the contributions. We see that members all shared unique stories that held meaning to them as well as a connection to CT.

Results

The first member to share, Content Specialist, is the group expert on CT. She was a computer scientist before transitioning to teaching whose passion for CT was conveyed in each meeting. Content Specialist shared an example about a time she taught a CT lesson in an elementary class. She immediately exhibited excitement, exclaiming “I probably do this every minute of my life. This is, this is my jam”, and pride by referring to CT as “my superpower”. The example detailed her time as both a teacher and a computer scientist, illustrating CT in her daily life. More importantly, Content Specialist reminisced about her time teaching students a subject that she loves. She stated that “[her and the students] were [all] doing computational thinking. [Her] to develop the instruction and [the students] to solve the puzzles”, which illustrated the convergence of her wholesome experience as an elementary school teacher and CT. Her storytelling enthusiastically conveyed warm emotions, comfort, and expertise while explaining how it related to CT.

Following Content Specialist, Researcher posed a different interpretation of the prompt. Researcher prefaced that CT “isn’t my jam” yet she was willing to contribute to the conversation. She described a story where she tried to identify patterns to analyze her toddler’s behavior. She mentioned, “And so I was like, okay, so 3-year-old doesn't get a nap, he is going to be cranky later, and so as simple as that is, like that's a pattern that I can recognize.” The deep connections to her identity as a parent allowed Researcher to see CT as a tool that applies to her daily life. Throughout the example, Researcher reflected on her developing understanding of CT and had an ‘aha’ moment that this moment of everyday reasoning was in fact an example of “computational thinking”. Despite not having the CT expertise of Content Specialist, Researcher was able to see herself as powerfully engaged in CT while reasoning through ‘situations in [her] life’. The example goes further than drawing a connection between CT and her daily life; Researcher “realized that this conditional reasoning thing was something [she] was doing too”. Her realization that even the simplest tasks hold a grand amount of CT makes her story a memorable example of how computational thinking appears in daily life.

Immediately after Researcher shared, Teacher, an avid hiker with a great love for the outdoors, shared an experience about hiking and rock scrambling. Despite being uncertain about whether the example “counts as CT or not,” Teacher came to realize that the strategizing she does during her hikes–e.g., breaking the route down into smaller pieces in order to make progress–is indeed CT. Teacher “discovered the joy of every inch or foot, figuring out how can [she] just go six inches higher” on her hikes. She reflected on how CT not only makes the hike manageable, but it enables enjoyment saying, “you know, and so when you break that down into these little things it's really really fun”. More importantly, Teacher states that “it's the first time [she] really put a lot of thought into making it up a wall or something, and [she] love[s] it”, once again reinforcing the bond between her emotional experience with hiking and CT. Overall, we see that Teacher reflects on the connections between CT and her personal experience, creating a nexus point for emotion and instruction.

Each member's contributions, which included many we lacked space to include here, shaped and reshaped the group’s burgeoning conceptualization of “computational thinking” and allowed us to build more meaningful connections between daily lives and often abstracted and inaccessible computational concepts. More importantly, engaging in personal storytelling in detail speaks to the members’ unique experience and their personal connection to CT.

Significance

Understanding the technical definition and applications of CT is a daunting order for teachers, especially as an addition to their usual tasks. Our approach to computational thinking attempts to connect computational concepts and practices to peoples’ lives in ways that are personally meaningful. We propose that personal storytelling could help support CT learning by

contextualizing and personalizing the content and creating a point of access for teachers to feel comfortable teaching the topic in their own classroom. Equally important, the RPP's framing of CT invites teachers who do not position themselves as experts into the conversation, further increasing their confidence in engaging with the topic in their classroom.

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