



Drawing on Kinship:

Rurally Sustaining
Computational
Thinking Pathways

Building on Rural Ingenuity: Incorporating Appalachian Heritage, Storytelling, and Computational Thinking Into Middle School Project-Based Learning

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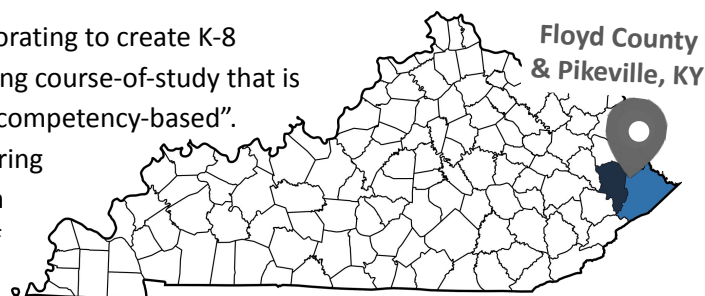
Abstract

We report on eleven middle school project-based learning units designed by fifteen Central Appalachian teachers, following our research practice partnership's first week-long computational thinking curriculum design institute. We investigate whether and how these planned units offer opportunities for students to practice computational thinking while engaging with the region's rich heritage of innovation, community connections and storytelling. We find that all, or the vast majority of unit plans, incorporate computational thinking, heritage/community and storytelling in compelling ways. We discuss implications for our partner community, for rural education, and for the field of computational thinking education research.

Background

In fall 2019, two school districts in Eastern Kentucky began collaborating to create K-8 “computational thinking pathways” – an articulation of a computing course-of-study that is “consistent across classrooms, cumulative from year to year, and competency-based”.

Floyd County Schools and Pikeville Independent Schools, neighboring districts that had rarely collaborated, came together in this design research practice partnership (RPP) based upon a shared sense of urgency, hope, and vision that computing education might enhance future options for students, and support efforts for regional revitalization.



During the course of the project, the Eastern Kentucky project leaders came to hold greater aspirations for their pathways:

Instead of students learning computational thinking skills in a culture-agnostic way, they wanted students to associate computational thinking with the region's history and heritage of making and problem-solving. They wanted students to draw upon the wealth of familial capital (kinship) in the region, and improve their aspirational, linguistic, navigational and resistant capital.

Thus a new RPP was born where teachers in the district would design and implement middle school project-based learning (PBL) units that integrate student-led problem-solving, heritage and community, storytelling, and computational thinking. In this paper, we report on the PBL units planned by local teachers following the project's very first week-long design institute (July 2023), focusing on whether and how these units appear to offer opportunities for students to engage with the rich heritage of innovation and storytelling in their region.

We ask:

- (1) How did teachers integrate **heritage and community connections** into their PBL plans?
- (2) How did teachers integrate **storytelling** into their PBL plans?
- (3) How did teachers incorporate **computational thinking** into their PBL plans?



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Heritage and community connection integration

- All 11 projects focused on Eastern Kentucky and/or students' lives or communities.
- Teachers selected problems impacting the community and found curricular connections

Storytelling integration

- All 11 projects plan for students to publicly present
- 7 projects specifically mention integrating storytelling during the project, including several projects where students gather community stories

CT Integration

- Teachers were more tentative about CT connections
- 5 projects discussed integrating data practices
- 1 project focused on using decomposition
- 4 projects proposed using automated tools

Project Plan Topic/Theme	Heritage/Community Connections	Storytelling	Computational Thinking
Mitigating human impacts on the environment of Appalachia through technologies	Specific focus on environmental impacts felt in Appalachia	Students storytell what they learned in a pitch, lobbying to local officials	Solutions will involve technology so might involve coding, data or modeling; Integrating data practices when looking at the environmental issues
Preserving and telling the untold stories of Appalachian heroes	Focus on preserving the cultural traditions and historical significance of Appalachian heritage in Kentucky; Students encapsulate the story in a product that they present to the community and give as Christmas gift for their family	Digital storytelling using digital tools and analyzing the impact of technology on storytelling and heritage preservation	Students will have options about where/how they create their digital stories including as a digital game in the Scratch programming environment and students will collect data about their impact.
Agricultural innovation: In ancient times and what it could look like in Appalachia today	Focus on agricultural innovations specifically in Appalachia	Students write an argumentative essay on modern farming techniques, which might lead to a debate	Examining data about crops that grow well in the region, how far food is currently traveling to Appalachia, and the cost of setting up subsistence farming
Decreasing the effects of flooding	Connections to local flooding, which is an ongoing challenge for the community	Students learn through interviewing flood victims and hearing stories from speakers and the news	Examine data to learn about the impact/causes of flooding



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