An Interactive Generative AI Tool to Help Teachers Contextually Customize Scratch Projects

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Background

Overview: This work is part of a research project aimed at empowering K-8 educators to create customized computing instructional materials [4].

Scratch Encore is an intermediate CS curriculum organized into 15 modules [1]. Each module consists of two lessons: Use-Modify and Create. For each Use-Modify lesson, the curriculum provides three example Scratch projects (with different themes and accompanied student worksheets).

Conjuror is designed to help teachers customize Use-Modify lessons from Scratch Encore, situating the materials in contexts relevant to:

- Interests, cultural backgrounds, and lived experiences of their students, or
- Curricular priorities in their classrooms (e.g., Social Studies, Science, or ELA).

Preliminary Findings

Teacher Experience:

- Most teachers were able to customize a lesson in less than 30 minutes during a summer PD, and they were positive about the AI suggestion quality.
- Teachers largely retained text-based suggestions, but they refined the more detailed project ideas more often than the general themes.
- Teachers tended to follow a streamline process, but when they did backtrack, they often re-ran a step to get more AI suggestions rather than refining their prior choices to get better results.

Classroom Use: (What have teachers made?)

- Created a project just a few day before an upcoming holiday (e.g., St. Patrick's Day, Kwanzaa).
- Collaborated with a science teacher to create an integrated project (e.g., Newton's 2nd Law Demo).
- Co-created a project with all students in the classroom within a class period.

[1] Diana Franklin et al. 2020. Scratch Encore: The design and pilot of a culturally-relevant intermediate Scratch curriculum. SIGCSE '20.
[2] David Gonzalez-Maldonado et al. 2025. Evaluating GPT for use in K-12 Block Based CS Instruction Using a Transpiler and Prompt Engineering. SIGCSE '25.
[3] Minh Tran et al. 2025. Can GPT Help? Supporting Teachers to Brainstorm Customized Instructional Scratch Projects. SIGCSE '25.
[4] Minh Tran et al. 2024. Harmonizing Scratch Encore: Scaffolding K-8 Teachers in Customizing Culturally Responsive Computing Materials. SIGCSE '24.

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Year 1
Identified challenges in customization and co-designed scaffolds and PD to support teachers [4].

Year 2
Teachers implemented customized lessons in the classroom,
Researchers evaluated GenAI for brainstorming Scratch projects [3] and generating block-based code [2].

Year 3
Conjuror pilots, iterative refinement, and first Conjuror PD.

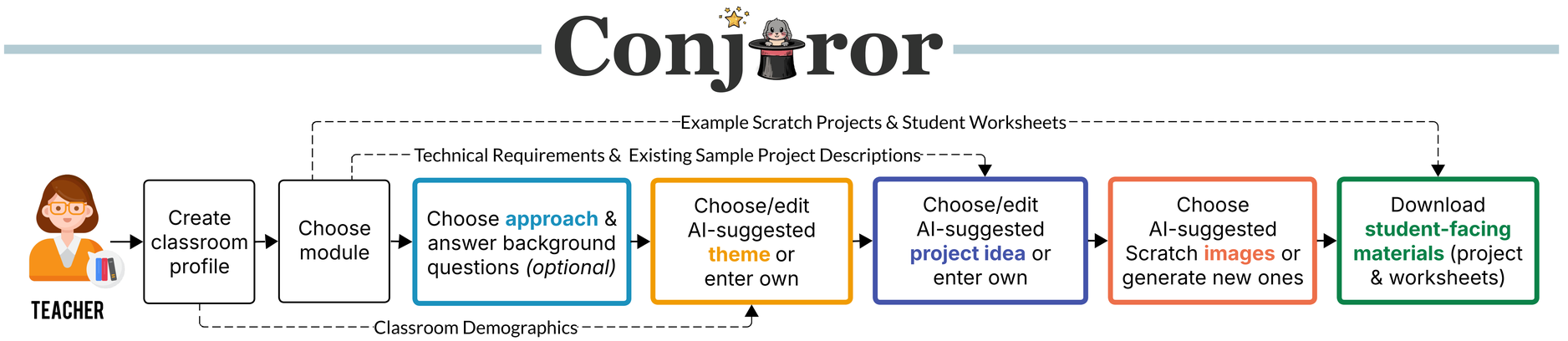
Year 4+
Teachers customize with Conjuror and implement "conjurored" lessons in the classroom.

Motivation:
Less than half of the teachers customized new lessons during the school year due to time constraints.

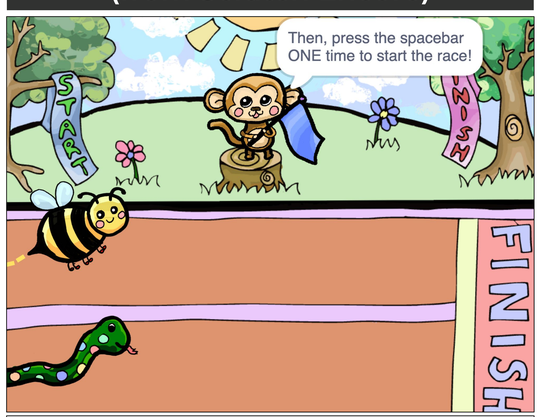
Main Research Question:
How can we create a tool to help teachers create high-quality customized lessons in a short time, so it is feasible to complete during normal class preparation time?

Main Design Goals:
[1] Retain teacher agency
[2] Reuse existing code
[3] Require no prompting

Conjuror



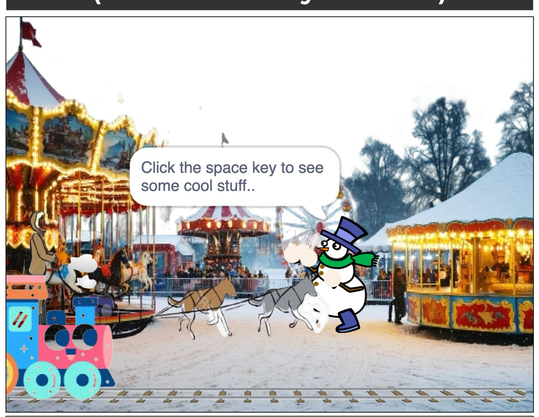
Theme: Animation Race (from Scratch Encore)



3. When I pressed the space bar:		
talked waved flag did nothing	hissed raced wiggled did nothing	buzzed raced did nothing

9. Remove the [move 10 steps] block (leave `next costume` in `repeat` block).
When I press the space key, the **snake** moves:
☐ slower ☐ quicker ☐ a shorter distance ☐ a longer distance ☐ no distance.

Theme: Winter Bazaar (customized by teacher)



3. When I pressed the space bar:		
talked juggled did nothing	honked rolled wiggled did nothing	wiggled moved did nothing

9. Remove the [move 20 steps] block (leave `next costume` in `repeat` block).
When I press the space key, the **train** moves:
☐ slower ☐ quicker ☐ a shorter distance ☐ a longer distance ☐ no distance.

Theme: Newton's 2nd Law (customized by teacher)

3. When I pressed the space bar:		
talked wiggled did nothing	talk moved danced did nothing	moved danced did nothing

9. Remove the [move 20 steps] block (leave `next costume` in `repeat` block).
When I press the space key, the **Empty Cart** moves:
☐ slower ☐ quicker ☐ a shorter distance ☐ a longer distance ☐ no distance.