



Artificial Intelligence For Georgia

Co-Designing an AI Curriculum with University Researchers and Middle School Teachers

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Project Overview

Our AI4GA team of university researchers and middle school teachers engaged in a year-long co-design process to collaboratively design a 9-week middle school AI elective [1].

Through this process, we learned

- how to engage and scaffold middle school students
- about the types of resources teachers need to confidently teach AI

In this poster we share how we used co-design both as a tool for collaboratively developing engaging AI activities and as a mechanism for mutual professional development.

Co-Design Background

Co-design is a collection of processes for engaging groups of stakeholders in collaboratively identifying requirements and brainstorming and prototyping ideas for products and technologies [2].

Co-Design Scorecard

	Pros	Cons
Process	Experts and stakeholder work together to identify needs	Subject to power dynamics: It is challenging for non-technical stakeholders to feel comfortable contributing.
Product	Prioritizes stakeholder's ideas, needs, values reflected in the design and final product or system	Designer is the interpreter of the needs and makes final design decisions. Final design may be subject to expert bias.
Product	Resulting product or system more usable by the stakeholders	Final design fixed in the case of technology and products.

Co-Designing Educational Resources

In the context of our project, we were focused on designing a middle school curriculum that teachers can adapt to their students interests and needs and the instructional style.

Planned - Our co-design process was initially envisioned as a semester (16 wks) of collaborative work. Then classroom deployment of the curriculum by the teachers.

Actual

- After the initial phase of co-design, the student and teacher resources didn't reflect enough of the needs and values of the teachers.
- During Phase 2, we observed the organic adaptation of resources and materials by the teachers as they taught.
- Ultimately, the our team engaged in three phases of co-design to arrive at the place where teachers and researchers were able to truly design together.

Structure

The team met for 1 hour weekly for 33 sessions.

The activities for each session varied depending on the phase of co-design and/or curriculum development the team was engaged in.

Team Composition

- 5 Researchers
- 3 Curriculum & Professional Development Specialists
- 2 Evaluators
- 5 Teachers

Goals of the AI4GA Project

Co-develop a 9 week AI elective, *Living and Working with Artificial Intelligence*, that can serve the needs of all Georgia middle school students.

- Understand how to make AI relevant and exciting to African American, Latinx, and rural students.
- Understand how to help students develop personal identities as STEM creators preparing for future AI-powered careers.
- Determine what kinds of support Georgia middle school CS and CTE teachers need in order to feel comfortable teaching AI.

Develop an *online AI teacher PD course* offered by Georgia DOE to prepare teachers to teach an AI elective. Cultivate an *AI education teacher community of practice* in Georgia.

Curriculum - Living and Working with AI

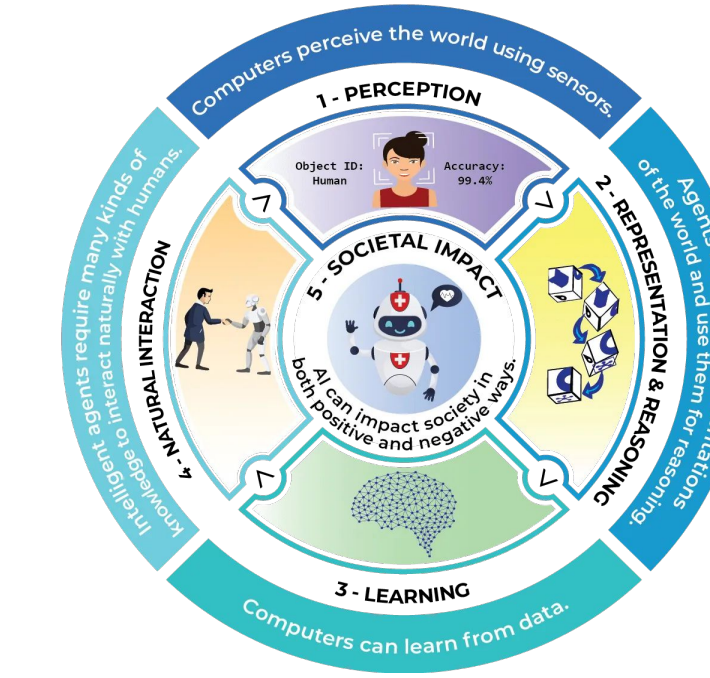
(9 weeks, 5 Units)

The curriculum will provide students with opportunities to

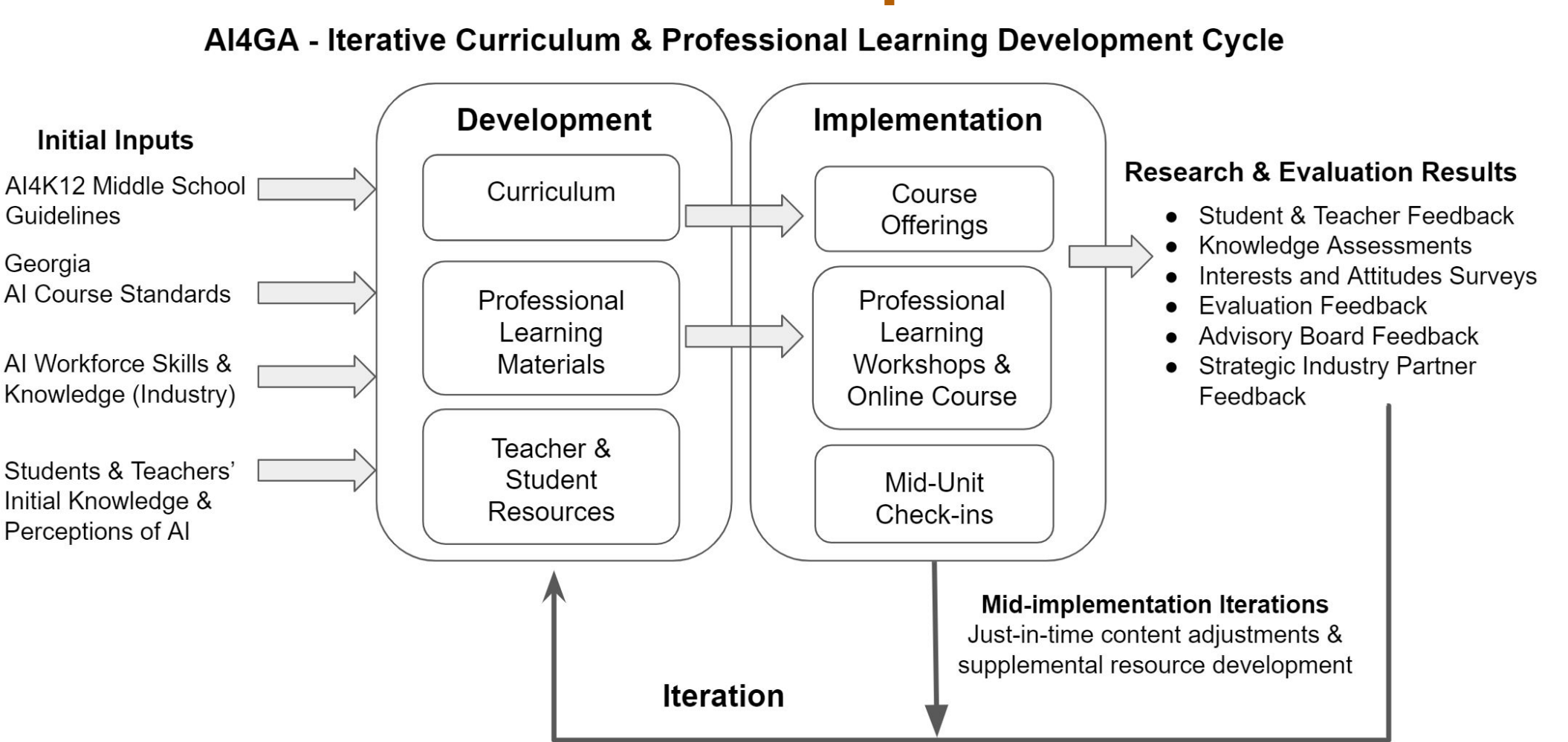
- explore how AI works, how it is designed, and how it impacts their community
- learn about the wide range of professions in which people design and use AI applications in their daily work.

Curriculum Units

- Unit 1: Autonomous robots and self-driving cars
- Unit 2: Understanding language
- Unit 3: Machine learning and automated decision making
- Unit 4: Intelligent agents (*Still underdevelopment*)
- Unit 5: AI and robotics careers (*Still underdevelopment*)



Curriculum & PD Development Process



Co-design can be used as both a tool for collaboratively developing engaging AI activities and as a mechanism for mutual professional development.

Phase 1 (12 wks)

Ideate Curriculum:

Researchers framed curriculum ideas and teachers provided suggestions and feedback



CO-DESIGN TASKS: Determine

- Scope of concepts to explore in curriculum
- Nature of student activities
- Resources and supports needed to teach the concepts



INPUTS

- Overview of units topics
- Types of activities and experiences
- [PD] Teachers completed 30 hrs of professional development learning AI concepts through lecture and interactive activities.
- [PD] Researchers interviewed the teachers to learn more about their teaching experience, style, students, and CS background

SESSION STRUCTURE

1. Researchers prepared an unit outlines with activities and learning objectives
2. Researchers presented outlines and activities to the teachers
3. Teachers provided feedback about the level of the content, asked questions about content knowledge and learning objectives.
4. Teachers talked about their students and their needs for materials to be useful

TEAM ROLES

1. Research team played different roles
 - a. Facilitator (Post Doc-Judith)
 - b. Curriculum content creators (Christina & Dave)
 - c. Positioning Teacher Expertise - (Janet)
2. Teachers -Experts on teaching in middle school and middle schoolers

QUESTIONS FOR PHASE 1 CO-DESIGN

- Do the concepts make sense?
- Would this work in your classroom? With your students?
- What do supports do you need to teach and engage students?
- What might other teachers need who didn't have PD?

PHASE 1 OUTCOMES



CHALLENGE BALANCING POWER DYNAMICS

- Constant vigilance and focus on empowering the teachers to share their ideas about what will work and won't work.
- Consistent focus on positioning teachers knowledge and expertise.
- Researchers monitoring their level contributions.

CO-DESIGN CHALLENGES

- Getting teachers to create content in sessions or outside of sessions
- Fear of failure and time pressure to develop curriculum due to implementation schedule



PROFESSIONAL DEVELOPMENT OUTCOMES

- **[Researchers]** Increased understanding of instructional time and constraints of classroom
- **[Teachers]** Increased understanding of the goals of the curriculum and materials available to them

CURRICULUM & TEACHING MATERIAL GUIDANCE

- **[Teachers]** Suggestions about how to tailor the depth of the content, information and explanation to include
- **[Researchers]** General sense of feasibility and activities students would enjoy, challenges students might encounter, needs of teachers, and possible strategies to address teacher and student needs.

TEACHER REQUESTED RESOURCES

- Vocabulary
- Explicit learning objectives
- Materials need to span a wide range of reading abilities
- Options for student choice
- Additional Examples

Phase 2 (16 wks)



Teachers adapted the curriculum resources to meet their instructional styles and student needs, and piloted the course



CO-DESIGN TASK & QUESTIONS FOR PHASE 2

- How are they adapting the materials to their students and teaching needs?
- What is working or not working with the curriculum materials?
- How are students engaging?
- What additional resources are needed?

INPUTS

Teachers review slide and activity materials given to them by the research team as they prepare instruction and materials for their students each week or day.

TYPES OF TEACHER ADAPTATIONS TO RESOURCES

- Personalization**
 - *Stylize the slides* - Change background color or template, add images or GIFs
 - *Trimming & Pacing Lessons* - Skip or Remove slides, break slide deck into multiple parts
- Engagement**
 - Creating Student Decks
 - Creating worksheets
 - Creating Bell Ringers or Tickets out the Door
 - Creating interactive unplugged activities
 - Kahoots
- Course Management**
 - Creating Daily or Weekly Assignments
 - Creating Quizzes
- Cohort 2 Additions - Engagement**
 - Pulling in current events, connecting to robotics or other computing curricula, add PearDeck/NearPod.

SESSION STRUCTURE

- Teachers shared how their implementation is going, student artifacts, new resources they've created.
- The team (researchers and teachers) debug what is going on, clarify AI concepts, make pedagogical recommendations, brainstorm resource modifications.

TEAM ROLES

1. 5 Middle school teachers as implementers & peer mentors
2. Research team observers and coaches

CO-DESIGN AMONGST TEACHERS/ITERATIVE ADAPTATION

- Teachers shared materials and adapted each other's materials for their students
- Teachers re-adapted materials between classes within a semester
- Teachers refined materials and created new materials across semesters

CURRICULAR OUTCOMES

- Refined slides and pacing
- New and refined activities
- Full range of resources that are classroom ready
- Pedagogical Best Practices for teaching AI

PROFESSIONAL DEVELOPMENT

- Teaching helped to refine teachers' knowledge and confidence
- Talking with other teachers and peer mentorship assists with pedagogy and resource adaptation
- Researchers - Given the amount of AI knowledge teachers had, it is important for teachers to try it out to be able to provide better feedback and to take ownership in the design process.

Phase 3 (5 wks)



Teachers framed new curriculum ideas and adaptations of materials, which researchers helped refine.



CO-DESIGN TASKS

- Re-scope concepts covered in curriculum
- Refine student activities for engagement and depth of knowledge
- Create Lesson Plan for new teachers
- Refine resources and supports needed to teach the concepts
- Address engagement & curricular connectivity challenges

INPUTS

- Modified curriculum and activities from the teachers after teaching it for two 9-wk cycles to 2 sections each.
- Awareness that the curriculum needs to be more hands-on, it has been challenging to create a more hands-on curriculum during the implementation.
- Current content is too focused a lot on knowledge and awareness and not on skills.

TEAM ROLES

1. 5 Middle school teachers - Experts in teaching AI Curriculum - > positioned as Curriculum Developers
2. Research team played different roles
 - a. Facilitator (Post Doc-Judith)
 - b. Curriculum Content Experts (Christina & Dave)
 - c. Positioning Teacher Expertise - (Janet)

SESSION STRUCTURE

- The team (researchers and teachers) reviewed each unit and discussed the changes that should be made:
 - Big Picture: Scope of content, Pacing, Connectivity
 - Activity Level: keep, refine, remove
- Collaborative work time, activity by activity

CO-DESIGN - ENTIRE TEAM WORKS COLLABORATIVELY TO CREATE NEW ACTIVITIES & RESOURCES

- Teachers bring their own ideas
- Team refines implementation of teacher ideas.
- Researchers bring ideas & suggestions, teachers develop 1st pass

CURRICULAR OUTCOMES

- Refined slides and pacing for Cohort 2 teachers
- Merged & refined student activities & resources across teachers
- Pedagogical Best Practices for teaching AI

PROFESSIONAL DEVELOPMENT OUTCOME

- **[Teachers]** Dedicated time during the summer helped the teachers to create resources
- **[Teachers]** Teachers ask questions about content they were still unsure of
- **[Researchers]** - Increased trust in the expertise of teachers to teach AI. => Gave final veto power to the teachers

[1] AI4GA. 2022. Artificial Intelligence for Georgia. <https://AI4GA.org>.
 [2] M. Steen. 2013. Co-Design as a Process of Joint Inquiry and Imagination. *Design Issues* 29 (2013), 16–28. Issue 2. https://doi.org/10.1162/DESI_a_00207.
 [3] M. Farr. 2018. Power dynamics and collaborative mechanisms in co-production and co-design processes. *Critical Social Policy* 38, 623–644. Issue 4. <https://doi.org/10.1177/0261018317747444>