

Joe Bacal

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Educator and software engineer working at the intersection of constructivist pedagogy and technology.

EXPERIENCE

Software Engineering Consultant

2024 - Present

- Contributor to NSF-funded project building an agentic AI system that routes user queries through a tool-using loop, selecting among MCP servers and grounding answers in a RAG corpus via system prompting, all synthesized at query time.
- Built an AI chatbot front end with hybrid architecture: LLM-driven conversation for open-ended queries plus deterministic flows for structured actions (e.g., Jira ticket creation)
- Designer and developer for Self-Evident Education, an educational nonprofit that creates media and curriculum on race and resistance in U.S. history. Owning UX, information architecture, and development; built the curricular schema for learning modules, drawing directly on my classroom teaching experience.

Software Engineer, Concord Consortium, Concord, MA

2022 - 2024

- Designed and developed interactive STEM simulations and tools for K-12 classrooms in collaboration with researchers
- Engineered a bidirectional real-time bridge between a browser-based flow programming environment and Arduino hardware: sensor blocks ingest keyed values from the serial stream on each browser tick while output blocks (servos, motors) push commands back to the Arduino loop, enabling students to build live control systems from visual flow diagrams
- Co-authored a robotics curriculum unit using EMG technology; built companion digital assets and simulations, and assembled hardware kits combining specialized electronics, LEGO elements, and EMG sensors
- Built standards-aligned, simulation-based interactives for Massachusetts state assessment (MCAS); practiced agile development with code reviews, pair programming, and test writing

Technology Teacher, Campus School of Smith College, Northampton, MA

2019 - 2022

- Created and taught project-oriented curriculum in engineering, computational thinking, and design for elementary students, fostering an understanding of computers as tools for creativity and problem-solving
- Developed an open-ended robotics curriculum emphasizing student agency and creative design
- Led school-wide adoption of Google Classroom and Seesaw during remote learning; built internal tools for colleagues (Google Apps Script automations, dismissal notification system, equipment checkout)

Applications Administrator, Smith College IT Services, Northampton, MA

2015 - 2019

- Worked with faculty to translate pedagogical visions into web-based projects: custom Moodle and WordPress themes, plugins, and integrations matched to each project's goals
- Built a multimedia language-learning ePortfolio system on the European Language Assessment rubric; a custom CMS adaptation for piping content into a 3D model museum; and a plugin letting Italian faculty map voice recordings to text passages
- Maintained core platform infrastructure: PaperCut/WordPress integration for secure exam printing, unified login, and a consistent help-doc system

Web Developer, Common Media, Inc., Hadley, MA

2014 - 2015

- WordPress lead; built custom themes, calendar modules, and Highcharts-based data visualizations for clients including Tufts CTSI, The Conversation Project, and healthypeople.gov. Collaborated bilingually (English/Spanish) with developers in Costa Rica.

Co-Founder & Instructor, HolyokeCodes, Holyoke, MA

2013 - Present

- Co-founded community coding initiative; teach Scratch and Robotics workshops for kids and families, and taught a six-week adult HTML/CSS/JavaScript course.

Prior Experience: Classroom Teaching & School Counseling

2000 - 2013

- **School Adjustment Counselor**, Leeds Elementary, Northampton, MA (2012-2013). Counseled students through individual work, family consultation, and IEP-based social-skills groups; developed an early Scratch-based counseling intervention.
- **Guidance Counselor**, Selser Memorial Elementary, Chicopee, MA (2009-2011). Strengths-based counseling; chaired the school-wide Instructional Support Team and managed the pre-referral process.
- **Fourth Grade Teacher**, Crocker Farm & Mark's Meadow Schools, Amherst, MA (2006-2008). Taught differentiated, standards-based curriculum in ELL and Special Education inclusion classrooms.
- **9/10s Teacher**, Bank Street College School for Children, New York, NY (2000-2006). Developed and taught constructivist curricula in literacy, science, and math at one of the country's foundational progressive laboratory schools; supervised Master's-level student teachers; built a web-based intercultural exchange project (National Geographic Teacher's Grant, 2004) and conducted action research on classroom chatrooms for literary discussion.

INDEPENDENT PROJECTS

More at joebacal.work.

- **Invention Playground**. A construction set for Rube-Goldberg-style machines with computational thinking and robotics elements, drawn from years of teaching. In active development with Nuxt, Supabase, Konva (canvas), and Rapier (physics).
- **ChallengeGalaxy**. Repository of open-ended Scratch programming challenges with scaffolded "hints" designed to help learners reason about code rather than copy it. In ongoing use by a small community of learners. Built with Nuxt.

EDUCATION

- **M.Ed. in School Counseling**, University of Massachusetts, Amherst (2010)
- **M.S.Ed. in Education**, Bank Street College of Education (2002)
- **B.A. in Sociology & Anthropology**, Lewis & Clark College (1997)

SELECTED TALKS & PUBLICATIONS

- "Challenge Galaxy: Scaffolding and Differentiation with Scratch." with A. Pasquale, CSTA NE Conference, 2019.
- "Faculty Visions Meet WordPress: Information Architecture." Talk, WPCampus, 2018.
- "Reflections on Using WordPress for ePortfolio." Talk, ATAC Conference, Lafayette College, 2018.
- "New Tools for Documenting Cross-Cultural and Language Learning." Talk with J. Bacal and J. Vanpée, AAEEBL Seminar, Edinburgh, 2016.
- "'We're Studying You': Approaches to Social Studies Curriculum About 'Other' Cultures." M.S.Ed. thesis, Bank Street College, 2002.