



# How Instructors Incorporate Generative AI into Teaching Computing

James Prather\*  
Abilene Christian University  
Abilene, TX, USA  
james.prather@acu.edu

Juho Leinonen\*  
Aalto University  
Espoo, Finland  
juho.2.leinonen@aalto.fi

Natalie Kiesler\*  
Nuremberg Tech  
Nuremberg, Germany  
natalie.kiesler@th-nuernberg.de

Jamie Gorson Benario  
Google  
Chicago, IL, USA  
jamben@google.com

Sam Lau  
UC San Diego  
La Jolla, CA, USA  
lau@ucsd.edu

Stephen MacNeil  
Temple University  
Philadelphia, PA, USA  
stephen.macneil@temple.edu

Narges Norouzi  
University of California Berkeley  
Berkeley, CA, USA  
norouzi@berkeley.edu

Simone Opel  
FernUniversität in Hagen  
Hagen, Germany  
simone.opel@fernuni-hagen.de

Virginia Pettit  
Virginia Tech  
Blacksburg, VA, USA  
vpettit@vt.edu

Leo Porter  
UC San Diego  
La Jolla, CA, USA  
leporter@ucsd.edu

Brent N. Reeves  
Abilene Christian University  
Abilene, TX, USA  
brent.reeves@acu.edu

Jaromir Savelka  
Carnegie Mellon University  
Pittsburgh, PA, USA  
jsavelka@cs.cmu.edu

David H. Smith IV  
University of Illinois  
Urbana, IL, USA  
dsmith2@illinois.edu

Sven Strickroth  
LMU Munich  
Munich, Germany  
sven.strickroth@ifi.lmu.de

Daniel Zingaro  
University of Toronto Mississauga  
Mississauga, ON, Canada  
daniel.zingaro@utoronto.ca

## ABSTRACT

Generative AI (GenAI) has seen great advancements in the past two years and the conversation around adoption is increasing. Widely available GenAI tools are disrupting classroom practices as they can write and explain code with minimal student prompting. While most acknowledge that there is no way to stop students from using such tools, a consensus has yet to form on how students *should* use them if they choose to do so. At the same time, researchers have begun to introduce new pedagogical tools that integrate GenAI into computing curricula. These new tools offer students personalized help or attempt to teach prompting skills without undercutting code comprehension. This working group aims to detail the current landscape of education-focused GenAI tools and teaching approaches, present gaps where new tools or approaches could appear, identify good practice-examples, and provide a guide for instructors to utilize GenAI as they continue to adapt to this new era.

\*Co-leader

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## CCS CONCEPTS

• **Social and professional topics** → **Computing education**; • **Computing methodologies** → **Artificial intelligence**.

## KEYWORDS

generative AI; large language models; artificial intelligence; pedagogical practices; teaching computing

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## 1 INTRODUCTION

Early work on GenAI in computing education, starting in 2022, showed amazing accuracy in solving programming problems [5, 6, 8, 18]. GenAI can also provide opportunities and resources for educators [3, 4, 10, 11, 14, 17]. However, many educators have raised concerns about adapting their curricula, student learning, inherent biases, over-reliance, and educational misconduct [2, 9, 15, 16].

In the midst of these ongoing discussions around adoption [13], educators and researchers are beginning to take next steps. For instance, early work showed that programming error messages

could be automatically enhanced via a large language model (LLM) like GPT-3 [11]. Very recent work has expanded and implemented this at scale and shown that it directly benefits students [19]. It was also shown that GenAI can provide customized help and feedback to students working on programming exercises [1, 7, 10, 14]. In very recent work, custom AI programming tutors have been implemented at scale in computing classrooms to provide students with “a pedagogically-minded subject-matter expert by their side at all times”, thereby providing constant custom support for learners, and freeing human educators to focus on more complex issues [12].

## 2 GOALS

The overall goal of this working group is to explore what computing instructors are doing to implement and integrate generative AI and large language models into their courses. This goal can be split into the following subtasks that the working group will undertake:

- (1) Conduct a literature review to examine the types of teaching approaches involving GenAI employed by computing educators.
- (2) Gather data from multiple institutions through a survey and interviews with educators to understand approaches that might not yet have been presented in the literature.
- (3) Expose gaps in the current landscape of pedagogical approaches to incorporating GenAI for future work by researchers.

## 3 PROPOSED METHODOLOGY

We will conduct a literature review of existing work to contextualize the findings. The main focus of the literature review will be to look for articles that report on approaches and tools that incorporate generative AI that have been used to teach computing. However, this will likely only include established approaches and tools that are mature enough for having been published.

The main source of data for this report will be a multi-national multi-institutional interview study. We will seek to interview both educators and researchers who are purposefully integrating GenAI tools and approaches into their classrooms. To collect this data, we plan to send out calls on relevant mailing lists, solicit interviews at conferences, use snowballing and personal connections. In addition, we will gather data from educators via an online survey.

The data will be analyzed in two ways. First, we will identify current approaches to GenAI tool integration, and other important trends mentioned in the interviews by using thematic analysis. This will help expose gaps in current approaches for future work. Second, the survey data will be quantitatively analyzed.

## 4 EXPECTED DELIVERABLES

We expect to produce the following contributions:

- (1) Create an open repository of resources on tools, guidelines, and pedagogical approaches used to teach with GenAI.
- (2) Outline possibilities for future work to benefit student learning.

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