# Preparing Graduate Teaching Assistants with Structured Orientation and AI-Simulated Students

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## Abstract

Graduate Teaching Assistants (GTAs) support a substantial share of undergraduate computing instruction, yet many enter their roles with limited preparation and opportunity for feedback. To create greater consistency and scalability, we implemented a redesigned GTA training at a large R1 university that integrates multiday workshops, asynchronous modules, and AI-simulated student communication practice. The model emphasizes professional communication, classroom management, and equitable teaching practices while generating diagnostic data to inform ongoing instructional coaching.

In two cohorts (n = 266), GTAs who completed workshops and simulations reported higher confidence and demonstrated stronger communication and adaptability performance than peers who completed online modules alone. These findings suggest that a structured, evidence-based orientation supported by AI student simulations shows promise for scalable implementation across large programs while maintaining pedagogical depth.

## CCS Concepts

• **Social and professional topics → Computing education**.

## Keywords

GTA Orientation, Instructor Training, AI-Simulated Students, Computing Education Research, Scalable Pedagogy, Learning Analytics

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## 1 Introduction

Graduate Teaching Assistants (GTAs) are integral to undergraduate computing education: staffing laboratories and office hours, grading and sometimes creating assignments, responding to online discussion forum posts, and providing one-to-one academic support that shapes students' early experiences. However, preparation for these roles often varies widely. At a large R1 university, more than 250 GTAs are assigned annually in the computer science department, entering with varied experience levels and pedagogical training.

Historically, this inconsistency produced uneven communication practices, uncertainty in classroom management, and elevated faculty concerns about policy enforcement. Such challenges echo findings in computing-education research: fragmented training contributes to inconsistent pedagogy, elevated stress, and higher attrition among novice instructors [2, 4].

To address these gaps, our department of computer science redesigned its GTA orientation to establish a common baseline of expectations and measurable readiness indicators. The model integrates asynchronous modules, interactive workshops, and AI-simulated teaching practice to build confidence and professional judgment through iterative learning and feedback.

## 2 Program Overview

The orientation was redesigned to transform onboarding from a compliance exercise into an applied learning sequence that develops teaching identity and produces analyzable growth evidence. Four design principles guided the revision: establish a common baseline, provide authentic practice, embed feedback cycles, and scale delivery without additional faculty load. The resulting model unfolds in three coordinated phases.

*Phase 1 – Asynchronous foundations.* The pre-semester modules introduce grading workflows, communication protocols and netiquette policies, and academic integrity policies. These modules equalize baseline knowledge for more than 180 new GTAs each academic year and refresh expectations for roughly 70 returning GTAs, providing completion data used to monitor compliance.

*Phase 2 – Interactive Workshops.* Two days of in-person sessions emphasize communication, cultural exposure, and decision making under pressure. Staff instructional specialists facilitate case analyses such as redirecting off-topic questions or handling grade disputes.

**Table 1: Post-orientation survey responses (n=180).**

| Survey item | Agree (%) | Neutral (%) | Disagree (%) |
|---|---|---|---|
| The training materials were clear and well-organized. | 53.9 | 34.4 | 11.7 |
| The training prepared me for my TA responsibilities. | 61.7 | 29.4 | 8.9 |
| The training covered topics relevant to my role. | 63.9 | 25.6 | 10.6 |
| Overall, I am satisfied with the TA training experience. | 54.4 | 27.8 | 17.8 |

Reflection prompts at the end of each session ask participants to connect their choices to professionalism and student experience.

*Phase 3 – AI-Simulated practice.* Participants "help" AI students in short, pseudo-random, timed chat-based scenarios featuring various AI student personas (Confused, Passive, Aggressive). The system records response time, tone, and instructional strategy and provides immediate feedback in five rubric domains: student-driven learning, conceptual understanding, time management, adaptability to student needs, and professional communication. This data enables both formative feedback and analysis of aggregate trends that inform mid-semester coaching.

The three phases operate as a prepare → practice → feedback loop. The trainings are designed to be course-generic, while the modular structure allows the framework to adapt across disciplines, institutions, and large GTA populations with minimal overhead. Completion of all three phases was required for GTAs enrolled in the full orientation pathway; participants did not self-select into Phase 3.

## 3 Methods and Metrics

Two cohorts (n = 266) participated in the redesigned orientation. Data sources included (1) pre/post self-efficacy surveys, (2) simulation analytics such as response time and behavioral patterns, and (3) structured rubric evaluations. Rubric evaluations (3) were collected and its analysis is a work in progress.

*Survey Findings.* Post-orientation results (n = 180) show consistently positive perceptions on key measures (Table 1). The readiness and relevance received the highest agreement, underscoring the value of contextualized workshops and simulations. As shown, over 60% of respondents agreed that the orientation prepared them for instructional responsibilities, and nearly two-thirds endorsed its relevance. Slightly lower ratings and written feedback pointed to pacing and workload as areas for refinement.

Simulation analytics supported these perceptions. GTAs who engaged with simulations reported higher mean confidence in addressing complex student behaviors—such as managing distress ($\mu$ = 4.20 vs. 3.98) and responding to aggressive students ($\mu$ = 3.83 vs. 3.59)—and greater comfort handling grade disputes and uncertainty. Both groups showed strong confidence when responding to student solution requests ($\mu \approx 4.5$).

These results indicate that simulation-based practice yields measurable benefits beyond traditional orientation, particularly in developing interpersonal skills difficult to model in static settings.

## 4 Discussion and Implications

GTAs who completed AI-simulated practice reported greater self-efficacy in managing student interactions and exhibited stronger communication indicators in the simulation analytics.

Beyond immediate gains in professionalism and confidence, the triangulation of surveys, rubrics, and simulation analytics yields evidence that can guide resource allocation, mentorship matching, and course-level policy refinement. The orientation also provides a low-stakes environment to surface and address issues of professional judgment and responsive communication - key components of equitable and effective computing instruction.

Importantly, this initiative situates GTA training within the broader conversation about human-AI collaboration in education. As generative systems become embedded in academic workflows, the ability to teach with and about AI ethically and effectively is itself a professional competency. Embedding those practices early in GTA development ensures that future instructors model responsible AI use for their students.

## 5 Future Work and Broader Impact

Building on these findings, several strands of work will expand both research depth and institutional reach.

**Longitudinal Learning Analytics.** Linking simulation data to faculty evaluations, retention, and student satisfaction will enable predictive modeling of GTA growth and identify which training elements most impact teaching quality [2, 3].

**Cross-Departmental Replication.** Pilots in engineering and data science programs will test the framework's adaptability beyond computing and assess how simulation fidelity and feedback transfer across disciplines [2].

**Scalable Infrastructure and Open Resources.** An anonymized repository of simulation scenarios, rubrics, and facilitation guides will foster a community of practice for data-informed GTA growth.

**Human–AI Pedagogical Dynamics.** Future analyses will examine how repeated AI-based feedback influences GTA reflection, confidence, and professional identity in hybrid human–AI training contexts building on emerging work exploring human-AI collaboration in computing education [1].

Together, these strands extend the work from program innovation to sustained research, advancing scalable and ethical models for GTA preparation in technology-rich learning environments.

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