Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025
Paper ID #46878

Work-In-Progress: Using Audience Avatars to Improve GTA Assessment of Student Communication in Large Engineering Classes

Peter Griffiths, University of Virginia

Dr. Griffiths joined the University of Virginia faculty in 2024 as an Assistant Professor, Academic General Faculty to pursue his interest in researching and creating an engaging curriculum which provides a foundation for students' future success in their engineering careers. Prior to joining UVA, he was an Academic Professional at the Georgia Institute of Technology, where he also earned his PhD in Mechanical Engineering.

Dr. Jill Fennell, Georgia Institute of Technology

Jill Fennell, the Frank K. Webb Chair in Communication Skills at the George W. Woodruff School of Mechanical Engineering at Georgia Tech, focuses on advancing written, visual, and verbal communication skills. Her research centers on affect theory and its application to technical communication, specifically information design. Jill studies how to enhance the effectiveness of pedagogical documents by incorporating principles from affect theory. Through her work, she aims to empower students, fostering an environment where they actively shape their communication interactions, including teamwork and ethical discussions. By integrating these principles, she goes beyond traditional methods, ensuring that students not only learn but also take an active role in shaping their communication experiences.

©American Society for Engineering Education, 2025

Work-In-Progress: Using Audience Avatars to Improve GTA Assessment of Student Communication in Large Engineering Classes

1 Abstract

Large lab classes often rely on graduate teaching assistants (GTAs) to operate at scale. However, this approach presents challenges, especially when such courses aim to enhance students' communication skills, which are crucial for engineers in professional contexts. Technical report writing—often used to convey lab experiment findings—can be particularly challenging for students, and GTAs frequently feel uncomfortable with assessing these assignments. While GTAs make it possible to assess report writing in a class of ~230 students, research and anecdotal evidence show that GTAs, who often lack formal training in communication pedagogy, frequently feel uncomfortable with communication-based assignments. This discomfort can lead to inconsistent grading and less effective feedback for students. To address this issue, we implemented audience avatars as a pedagogical tool.

Audience avatars were developed to help students better understand their audiences' needs, enabling more effective communication choices when writing technical reports for laboratory experiments. Additionally, the avatars were designed to support GTAs by providing them with a structured framework for assessing student communication, thus making grading more intuitive and increasing GTA confidence in both written and oral feedback. For example, GTAs were asked to assess lab reports from the point of view of an engineering firm section leader (the internal avatar) as to whether the student team's report was appropriate to be sent to the client (the external avatar).

This work-in-progress paper evaluates the effectiveness of the audience avatars in supporting GTAs in their role as assessors within a lab-based context. To explore this, we conducted a post-semester survey of 19 GTAs (across two complementary mechanical engineering lab courses), with 12 respondents providing feedback on their experience. The survey was complemented by follow-up interviews with four GTAs, which will be coded and analyzed for a later version of the paper. The survey results indicated that 11 out of 12 GTAs found the use of audience avatars either "very helpful" or "helpful" in understanding, guiding, and evaluating students' communication skills. Many also reported feeling more confident in their ability to give constructive feedback to students.

These preliminary results suggest that audience avatars can significantly aid GTAs in assessing student communication, both by providing a clearer framework for evaluation and by increasing GTA confidence in their feedback. The positive reception of the avatars highlights their potential to address common challenges GTAs face when grading communication-based assignments in large engineering lab courses. As this is a work in progress, future analysis will focus on coding and interpreting interview data to further explore how audience avatars influence GTA assessment practices and the broader implications for engineering education. We anticipate that these findings will contribute to refining tools and strategies that support both students and instructors in improving communication skills in engineering.

2 Introduction

2.1 Course Background and Engineering Laboratory Course Sequence

The Woodruff School of Mechanical Engineering undergraduate laboratory course progression (ME 3057, Experimental Methods and ME 4056, Systems Laboratory) is a two-course sequence with the objective of developing engineering judgement by practicing technical experimentation designed to respond to scenarios representing a client's needs. The systems studied, the experiment design, and communication expectations grow in complexity through the lab progressions across the two courses. They aim to have students integrate experiment design and technical communication design in a way that enables them to become decision makers while practicing project management and teamwork skills. During a typical fall or spring semester, 220 to 240 students are enrolled in each course. Both courses consist of two 50-minute lectures a week to support a 3-hour lab section. Each lab contains approximately 24 students divided into student teams of three or four, with two graduate teaching assistants (GTAs) to facilitate and who will assess student work. Multi-week lab blocks, which highlight one or more technical concepts, have a single group deliverable in the form of a short, technical report responding to a scenario with client needs and requirements.

The first course in the sequence, Experimental Methodology and Technical Writing, follows a lab progression exploring the collection of data from a variety of comment sensors in mechanical engineering, post processing & analysis of the data, and then interpreting the results to determine solutions for the client. Students in the course are typically 2nd semester junior-level students who have completed their general education courses (including two English composition courses), a sophomore-level hands on design course with teamwork and technical communication objectives, and foundational mechanical engineering courses such as statics, dynamics, mechanical of materials, and system dynamics. The concepts seen in the foundational courses serve primarily as the background for the experiments. However, the technical focus of the course is experimental methodology with the physics of the systems used as a scaffold for the experimental concepts. Lab blocks highlight one or more aspects of engineering experimentation such as analog and digital signal conditioning, acquisition, and processing, sensor calibration and modeling, uncertainty analysis, and design of experiment.

The second course in the sequence, Mechanical Engineering Systems Laboratory, expands upon the concepts from the first course. Students in the course are typically first semester senior-level students who have completed or are enrolled in the required courses for the Woodruff School curriculum. As such the systems studied are more complex with a focus on thermodynamics, heat transfer, fluid mechanics, and system dynamics and control. They are expected to apply engineering experiment design and technical communication concepts from the previous course.

2.2 Intervention Development and Avatar Development Process

Our program recognizes that communication effectiveness hinges on the specific environment in which it occurs. We employ scenario-based learning to enhance communication learning outcomes, providing students with an immersive engineering communication experience.

Scenarios serve as valuable tools, allowing students to craft communications tailored to a given situation by providing them with audiences and context to analyze. Two avatars were created to help facilitate student growth during this progression and provide an audience for their technical communication.

The first avatar, Aaron Smith, represents a section leader at engineering consulting firm, Burdell, Inc., which students are employed at as part of the scenarios. Aaron's technical and personal background was created based upon one of the instructor's previous experiences working at a large aerospace firm. Aaron has a depth of technical and communication expertise, but in his current role, he is focused on employee development and facilitation to create useful work products for outside clients. During the first course in the sequence, students are new hires at the fictional firm, and Aaron provides specific details and requests for the technical and communication requirements from the students. As part of the lab block scenarios, he builds trust in the student abilities and provides less guidance, asking students to take more ownership in the experiment design and communication development.

The second avatar, Julie Chang, represents a product lead for an engineering firm, Webb Industries, who outsources experimental work to Burdell, Inc. Her avatar was created to represent a client with a technical background and knowledge but whose current role is focused on bridging engineering and business. As such, she is focused on receiving work that is intuitive, trustworthy, and actionable so that it can be implemented to further the business goals of her firm. This avatar was created so that students would have to make sophisticated communication decisions when presenting their work to an outside audience, considering her needs and weighing the importance of information and presentation.

2.3 Research Questions

This study is driven by two key research questions:

1. How do avatars impact GTAs' confidence and performance in assessing student writing?
2. How do avatars influence GTAs' understanding and application of effective communication criteria and rubrics?

We researched these questions by surveying GTAs about the avatars' assistance with tasks such as assigning grades, commenting on student writing, and answering questions, as well as questions about confidence and impartiality. We also included questions about understanding the importance of effective communication, the criteria for effective communication, the rubric, and guiding student learning.

We chose to focus on GTA confidence as opposed to other factors such as quality of reports or quality of assessment because additional changes in the curriculum (new rubrics and new quality expectations) would not have allowed for numerical one-to-one comparisons, which is discussed further in "4.1 Approach."

2.3.1 Literature Review

Existing literature consistently highlights the importance of communication skills for engineering students; however, integrating communication education into engineering curricula remains a

challenge with a lack of consensus on best practices and the preparedness of instructors (to teach and assess communication skills), particularly in technical and engineering fields. This lack of consensus exists in the training of Graduate Teaching Assistants (GTAs), who frequently play a pivotal role in delivering instruction and assessing student work. Current research on GTA training underscores the need for more structured communication programs and targeted resources to equip them with the necessary communication and feedback skills, yet there is limited consensus on recommended specific practices.

2.3.2 General Perception on Communication Integration in Engineering

Effective communication is increasingly seen as a crucial competency for future engineers, influencing their ability to work in teams, convey technical information to diverse audiences, and participate in multidisciplinary projects [16]. Despite this awareness, integrating communication instruction within engineering curricula has proven challenging. Faculty generally agree that students need to learn how to communicate engineering knowledge, yet there is little consensus on how this should be achieved [14]. Standalone communication courses, typically housed outside engineering, provide a foundation but often fail to contextualize communication within engineering-specific tasks, limiting skill transferability [4]. As a result, educators are advocating for the integration of communication instruction within engineering courses themselves [15]. However, there are significant obstacles to this integration, primarily due to faculty preparation in communication pedagogy and time to teach and assess communication. The primary challenge lies in the fact that most engineering faculty and teaching assistants are not formally trained to teach communication skills [1, 12]. Without proper guidance or resources, they struggle to provide effective feedback on student communication efforts, limiting the overall impact of such interventions within engineering courses [7].

2.3.3 GTA Training

Graduate Teaching Assistants (GTAs) play a crucial role in supporting faculty communication instruction, particularly in large undergraduate engineering courses. GTAs are often responsible for grading assignments, leading sections, and providing feedback to students. Given the increasing emphasis on communication within engineering education, there is a need for GTAs to be well-prepared to evaluate and support students' communication skills [3]. However, current preparation of GTAs in this area is limited [2]. GTAs are often chosen for their technical expertise rather than their ability to teach communication skills, leaving them underprepared to assess writing [1]. Current research suggests most GTAs receive minimal formal training on how to assess and teach communication, which is problematic as they are often the primary point of contact for students seeking feedback on their work [5]. Studies have shown that GTAs feel underprepared to evaluate communication aspects of technical assignments, and without structured guidance, their feedback tends to focus primarily on technical accuracy rather than on the clarity, structure, or effectiveness of the communication itself [6, 8, 16]. Additionally, the lack of communication-focused training for GTAs perpetuates the broader issue of communication instruction being marginalized in engineering programs, as it reinforces the perception that communication is a secondary skill, rather than an integral part of engineering practice [6]. Rodger et al. (2014)'s analysis of their "TA's [sic] feedback revealed that the majority of the TA's written feedback was either copied directly from the [course material] or

was given verbatim to multiple teams, irrespective of the variation in teams' solutions" [13]. When these factors are addressed, another obstacle remains, such as TA turnover [8].

2.3.4 GTA Grading and Commenting

Effective grading and feedback are central to the development of students' communication skills; yet one of the most significant obstacles in integrating communication education into engineering courses is the lack of consistent grading and feedback from instructors, including GTAs [10]. GTAs responsible for grading communication tasks often struggle due to limited training and the time-intensive nature of assessing communication effectively [10]. These challenges include not only their limited training in communication assessment but also the inherent difficulty in grading communication, which is often more time consuming and more contextually dependent than technical content [11].

GTAs frequently prioritize surface-level feedback (grammar, formatting) over more substantive elements like argument structure or clarity [12]. This issue is compounded by the fact that many GTAs report feeling uncertain about how to give constructive feedback on communication, as their own experiences as students often emphasized technical accuracy over effective communication [9]. As a result, students may receive inconsistent or incomplete feedback on their communication efforts, which undermines the goal of helping them become better communicators in an engineering context [15]. To address these issues, some institutions have developed training programs and rubrics designed to help GTAs evaluate communication more effectively. These resources aim to provide GTAs with clear criteria for assessing communication and strategies for offering more meaningful feedback to students [4]. However, research indicates that such interventions are not yet widespread, and many engineering programs still lack the necessary resources to fully support GTAs in this area [2].

2.3.5 Communication Resources and Tools

Developing effective resources and tools to support communication training in engineering is crucial. For instance, research suggests that faculty and GTAs often lack structured materials and guidance for teaching and assessing communication effectively [7]. This scarcity of resources can hinder the integration of communication instruction within engineering courses and exacerbate existing challenges.

Developing structured rubrics and training materials is essential to improving GTA communication instruction, yet such resources remain scarce [7]. For example, Tormey et al. (2020) highlight the development of a one-day pedagogical workshop aimed at improving GTA skills, which could be extended to broader resource development [6]. Additionally, there is a call for more institutional support in the form of workshops, training programs, and collaborative initiatives that focus on communication skills, as discussed by Saxena et al. (2022) [2]. Such resources could help bridge the gap between the need for effective communication training and the current limitations in faculty and GTA preparedness.

2.3.6 Addressing Training and Resource Gaps

Addressing these gaps requires a more integrated and holistic approach to GTA preparation, ensuring that GTAs are both technically and pedagogically equipped to teach and assess

communication about engineering effectively. Dai et al. (2023) contend that two factors contributed to more appropriate teaching behavior: 1) "simulated scenarios that induced a more dynamic balance" and 2) a longer training duration [14]. Tormey, Hardebolle, and Isaac (2020) appear to agree, claiming that, "The use of bridging devices like role plays, case studies and disciplinary-specific pedagogics to bridge the gap between the training workshop and the classroom" can create more effective GTA training [6]. Our study advances this technique by creating teaching and assessment resources and training around scenario-based learning blocks. We aim to champion Olds and Miller (1997)'s assertion,

> Holistic evaluation assumes each written piece communicates a complete message to a desired audience and therefore should be graded on the overall quality of communication, much as a manager might evaluate an engineer's communication skills based on the overall quality of written documents. As a result, holistic grading allows rapid but useful feedback because scoring guides (termed "rubrics") can be tailored to the specific objectives of each assignment, class, or curriculum. Finally, holistic grading removes much of the subjectivity from grading written work by providing students with specific criteria for each grade position on the scoring rubric. [12]

Our communication skills implementation into a junior-level technical mechanical engineering lab aims to increase student skills via scenario-based learning while also empowering GTAs to make create holistic and intuitive communication feedback.

3 Methods

3.1 Approach

Our approach to this research project was to focus on what could be studied given multiple curriculum revisions occurring simultaneously, such as: more detailed scenarios, avatars, updated rubrics, and stricter communication expectations. Our new standards lead us to decide to research how the avatars influenced GTAs as opposed to students because we assumed the latter would result in the same finding as Kecskemety, Theiss, and Kajfez (2015)—a decrease in student grades, and that we would also have the same reflection. They wrote:

> We do not believe that this trend represents a difference in the technical writing aptitude of our first-year engineering students but rather indicates that our expanded training program has better prepared our TAs to correctly identify and respond to students' mistakes. This data may indicate a better understanding of both the rubrics and grading policies across the program that will continue to normalize over time. [8]

Therefore, we selected the avatars' influence on GTA confidence to be the focus of our study.[1]

[1] In fact, among our desire to build GTA confidence and bring more consistency to grading for this course sequence was a need to address grade inflation. Therefore, while we elevated our standards, higher grades were not the expectation. In fact, we sought to give GTAs the confidence to grade more accurately, despite their lack of experience assessing communication. The semester before avatars were implemented, ME 3057 was the course with

3.1.1 GTA Communications Training

We onboard GTAs by explaining pedagogical concepts key to the course such as: scenario-based learning, avatars, minimization function assessment,[2] and information design (to emphasize the use-value of data and analysis for the report's audience). Via minimization function assessment, we explain how technical skill and communication skill are inseparable for this course because students' reports are assessed on their actionability—meaning that reports must be both technically accurate and well-written to be actionable by an external client.

As part of the training for student interactions both inside and outside of the laboratory, GTAs were encouraged to refer to or embody the avatars when addressing student questions on both technical and communication topics. Instead of direct feedback on the quality or correctness of work, GTAs were to respond from either the point of view of Aaron, the section leader, or ask the students to view their work from Julie's, the client, perspective based upon the scenario. For example, if a student group asked a GTA if a figure was "correct," the GTA was to ask the student to think about how Julie would view the figure and if it was useful to her in providing or supporting a proposed solution to her problem. This framework was used to not only shift the student's mindset to a more metacognitive evaluation of their own work, but to shift the GTA mindset to a holistic approach to evaluation; is the technical and communication merit of the work useful and appropriate for the intended audience? By shifting the decision of work quality away from the GTA's personal evaluation, even if abstractly, the goal was to increase GTA confidence and comfortability in student interactions and work evaluation.

3.1.1.1 Pre-Semester Workshop

GTA communications training began with a pre-semester 3-hour workshop with both courses' GTAs. Before attending the workshop, GTAs were expected to prepare by reading the *3057 & 4056 TA Training Handbook*, a 46-page guidebook that explains key concepts from the Webb Communication Program, the full avatars, advice on guiding students on specific best practices, and examples of effective assessment comments. The training began with an explanation of scenario-based learning and its place in the course sequence and a deep-dive into the specific avatars. The final hour is dedicated to feedback practice wherein GTAs respond to common writing problems as Aaron giving advice on how to make the writing more appropriate for Julie.

3.1.1.2 Regular Grading Meetings

During the semester, avatars are used both in lectures and in the regular GTA grading training (approximately five per semester per course) to contextualize writing expectations and calibrate grading consistency. We pull two sample reports from across the course to read, discuss, assess, and create feedback. We ask the GTAs to pretend they are Aaron throughout the course and especially when grading, asking themselves: *Would I send this report to Julie? If not, do I trust the team to know how to fix the report (be those fixes technical or communication errors)?*

---

one of the highest GPAs within our school at an average of 3.53. This student was conducted at the end of the Spring 2024 semester, for which the average GPA was 3.25.

[2] The phrase "minimization function" refers to a framework for grading an assignment that has multiple components (e.g., both a technical and a communication component) wherein the overall useability of the deliverable is most influenced by the lowest quality of any/either component, which is thus reflected in the final score.

3.1.2 Post-Semester Survey

Following the semester, a voluntary survey was sent to all GTAs in both courses. After introductory questions focused on previous experience in evaluating technical communication, as series of questions with Likert scale responses about the usefulness of the avatars in student interactions, student assessment, and GTA confidence were asked. Free response sections about the helpfulness of the avatars and comments on previous questions were also provided. GTAs were also prompted to participate in an optional semi-structured interview where additional questions were asked in a dialogue which expanded on the survey themes. The survey and general interview questions can be found in the Appendix.

3.2 Participants

GTAs for the mechanical engineering laboratory course sequence are selected by the Woodruff School from the population of graduate students based upon a priority queue of students who are currently unfunded, not by the instructors of the courses. No additional English language proficiency tests, outside teaching assistant training, or previous teaching assistant experience is required to be selected. The given population of GTAs were a mix of doctoral students, who typically did not complete their undergraduate degrees within the school, and students in a master's extension program who had previously taken the courses as an undergraduate.

GTAs active in the course progression during the Spring 2024 semester were asked to participate in a survey of experiences using the avatars during student interactions and work assessment. Study participation was not incentivized and was completely voluntary. 12 GTAs (six from the junior level course and six from the senior level course) opted to participate in the survey from a possible total of 19. From the study population, five (46%) indicated they had previous experience working with students on communication or evaluating technical writing, and seven (54%) had not. Of the participants who indicated they had previous experience, five responded it was from previous GTA experience in the course sequence, and one responded it was from another course working with undergraduates. Two GTAs indicated either in the survey or during interviews that they also had previous work experience with technical communication and evaluation, but this was not explicitly asked for. GTAs who responded to the survey were invited to participate in a recorded interview (using Zoom), of which four participated.

3.3 Data Analysis

For the preliminary analysis of this study, the results of the survey were scored as positive responses (definitely yes & probably yes), neutral response (might or might not), and negative responses (probably not & definitely not), with the percentage of each group calculated for each question. Overall confidence was scored using a general question, Question 5. Groups of questions were also scored to evaluate the GTA confidence in assessing student work (Questions 9, 10, 12, and 13), commenting on student work (Questions 11 and 12), and answering student questions (Questions 8, 11, and 12).

4 Findings & Discussion

Overall, GTAs found the avatars helpful in assessing and commenting on student work and interacting with students to answer their questions with 83% responding positively and 8% neutral. This was supported with the aggregation of all the questions with an 81% positive rate and a 12% neutral rate. The degree of confidence varied for each of the tasks in the survey. Segmenting the data showed that only one participant provided negative responses.

4.1 Student Assessment

For confidence in assessing student work, GTAs responded positively 77% of the time, with neutral responses 19%. GTAs felt strongly that they were confident in understanding the criteria for effective communication (92% positive), assigning the grades (83% positive), and that they were impartial in doing so (75% positive). This confidence was supported during the free response and interviews. For example, during interviews, one GTA who had worked with student writing before said:

> The avatar has definitely helped me as a grader put myself in a different perspective and … it has helped me become a better communicator myself because I know what someone who is in a position of delivering feedback is looking for and how to make information more concise and readable … It's helped me become a better communicator. In terms of changing my perspective on grading and delivering feedback … it's just made it easier and more standardized and objective for me to point to something: like this is the lens that we should be looking at. Versus before, it could be very subjective. Based on … week to week or like even day-to-day depending; like I could grade a paper on a Wednesday and have a completely different idea of that paper on a Thursday, just because there is so much variation. And I think that's always been one of my larger gripes with the class is like if you gave me a report to grade, and you give another tier of report to grade, like that grade could vary up to like a whole letter grade sometimes … So, standardizing I think is important for the class, but it's really hard to do, and these avatars might be a good way to help that.

This response validates earlier research about GTA grading inconsistencies and supports the belief that simulated scenarios and supplementary resources (such as avatars) can significantly improve preparedness.

However, the survey showed that GTAs were less confident in understanding the rubric than other parts of the assessment process with 58% responding positively and 42% responding neutrally. The discrepancy between the confidence can most likely be explained due to the different styles of rubric used in the classes. The rubric for ME 3057 wholistically evaluated the student work by asking the GTAs to evaluate the work as if they were Aaron to determine if the work would be viewed as responsive, intuitive, trustworthy, and actionable (the four rubric categories) from Julie's perspective. The rubric used in ME 4056 evaluated individual sections of the report. During the free response and interviews with the GTAs they expressed the importance of alignment of the rubric with the avatar framework for evaluation of student work. For example, one participant who was a GTA in ME 4056 and who did not use the new rubric said,

> I don't think the rubric that we use has followed that format change. OK, like the rubric that I was using to grade in the Spring was the same rubric that I used to grade in the Fall, but in the spring we had the whole avatar format, and we changed the way we structured papers, but the rubric still represented the way we had reports framed in the Fall, so I had to do some mental translation; basically like, how would this equate to this new format that we're teaching in? So that's just like the rubrics need to be updated to match the kind of reports we are expecting now.

For this reason, the participant stated that the avatars did not enable quicker and more confident rubric use. This suggests that the near 50/50 split (positive/neutral) on GTA confidence on using the rubric might fall along the course divide. Indeed, a response from a 3057 GTA indicates that aligning the rubrics with the avatars was helpful:

> The rubric (including the statements directly about the avatars) was much more helpful than just the avatars themselves, as it provided distinct criteria to help break down each grading category which were hard to define on their own.

While GTAs did indicate that avatars increased confidence in assessment, updated corresponding rubrics also became important resources.

4.2 Student Feedback

Concerning providing feedback while assessing student work, GTAs responded positively at a rate of 88% with a low neutral rate of 4%. This confidence was directly supported by the free response and interviews with the GTAs. Part of the confidence was being able to relate comments on student communication to interpretation by an audience. This was illustrated well in a participant's response:

> I think the avatars are really helpful, prompting the students to be as concise as possible and pick and choose where to be technically detailed and where to be more to the point and in lay terms, if you will. Because there definitely are parts of the report where you should be describing in technical detail because the end user, Julie, wants to see that the engineers that she hired are technically sound and know what they're doing. But there also has to be a part of the report, maybe at the very end of that paragraph that was technically detailed, where there's a good summation of everything that you just said in terms that are easier to understand.

The comment shows that the GTA was able to use the avatar resources to provide targeted feedback aimed at guiding students to make more appropriate communication decisions.

Additionally, the GTAs found that the avatars helped more with providing comments on the overall quality of the work versus specific examples within the work by 75 to 25%. For example, in an interview, a GTA who has been with the course since before the avatar were implemented stated the following about the avatars:

> It added a bit more structure to the way we were telling students to write their reports, because that was the main gripe that students had a lot of the time. Whenever they got

> their feedback, it was like, oh, the goal posts are always moving for what the TA wants, and it varies between TA to TA as well. … So I think the avatars are good at standardizing the approach and how TAs deliver feedback … When I delivered feedback, I was able to point back to the avatars and be like, "Remember, what does Aaron care about? What does Julie care about? These are the audiences that you were writing for and the perspective that you should be writing from." So if [students] have a question about how you should frame something or whether something is important or not to include, it was easy to always point to them.

The participant suggested that the avatars helped them provide less subjective responses to student writing, which, in turn, could have led to more consistency in numerical evaluation as well. Overall, the survey and interviews indicated that the avatars increased GTA confidence while providing feedback on student writing.

4.3 Student Questions

When asked about confidence in answering student questions on communication using the avatar framework, GTAs had an overall 83% positive response rate and an 8% neutral rate. When asked directly about their confidence in answering student questions, GTAs were slightly less confident with a 75% positive rate and a 17% neutral rate. However, GTAs responded that they found the avatars helpful in understanding the importance of effective communication with a 92% positive rate and that it helped them understand how to guide them with student learning with an 83% positive rate. In interviews, when asked, "Has the Avatars helped you gain any confidence and answering student questions about communication?" One participant answered:

> Yes, definitely; I would say that. … I had this case in Block 2 where the student was curious about whether they should go in depth into the theory of this subject matter, and I was able to [guide them] because I knew who the client was. I was able to tell them. "Oh, these are the specific aspects that you need to highlight and the amount of detail and depth that you need to go into."

The comment demonstrates that this GTA felt confident giving students real-time feedback in labs targeted at communication decisions that would be most appropriate for the client's needs and the genre's expectations.

Relating the avatars and work to "real world" applications was a theme throughout the free response and interviews which the GTAs tied to their ability to leave strong comments on students work. One GTA stated that these resources would have made their initial experiences in industry smoother:

> I think it's a really good mentoring tool because I mean, it's something they're going to see all the time, and I think it's something that, I had [our current instruction], you know, 4056, I think the first year and a half of [my industry work], it would have been a lot easier.

This sentiment was echoed by another participant during the interview process, and both participants stated that they found the “real world” framing provided leverage when pushing students to communicate more clearly.

Overall, our findings demonstrated that scenario-based learning did support GTAs, and the avatar resources increased GTA confidence and readiness for interacting with students as assessors and guides.

5 Current Recommendations and Future Work

5.1 Current Recommendations

Based on current successes, we recommend incorporating audience avatars into engineering lab courses where students are expected to write reports for a specific end user. Avatars help GTAs feel more comfortable providing feedback on communication and assessing the quality of written reports. Furthermore, avatars provide a structured way for students to engage in audience analysis without requiring extensive instructor intervention. By offering a consistent reference point for expectations, avatars reduce ambiguity in technical writing assignments, particularly in courses where instructors or GTAs may not have direct industry experience.

To maximize effectiveness, avatars should realistically represent audience concerns aligned with the course’s learning goals. Our philosophy is that engineering labs should create avatars that reflect the expectations of real-world clients, sponsors, or industry professionals. Faculty can develop these avatars using their own industry experience or by collaborating with industry alumni to ensure authenticity and relevance.

5.2 Forth Coming Research

Due to the limited sample size of participants in the initial surveys and interviews, additional surveys and interviews of GTAs involved in the lab course progression will be conducted. These will be limited to GTAs who are new to the courses and have not previously been exposed to the avatars to eliminate bias. While we selected some quotes from interviews that best illustrated GTA sentiment for this paper, we plan to fully transcribe and code all interviews from the process to determine if any other grounded themes emerge.

Although this study focused on avatars' usefulness to GTAs, we believe students also benefitted from their use. Early research by Jariwala, Fennell, and Sims (2024) found that student perceptions of avatars in a design course were mixed; however, they also identified factors that may have influenced these attitudes and recommended further study of this question [17]. While we have not yet directly measured changes in student performance, future studies could explore whether increased GTA confidence and rubric alignment translate to improved student writing quality. Additionally, expanding avatar use to oral presentations may offer insights into their impact on verbal communication skills, an area not yet examined in this study.

5.3 Curriculum Changes

Since the completion of the surveys and interviews, curriculum revisions have been implemented based on GTA feedback. One major change addressed critiques regarding the clarity of scenario integration. While the scenarios were essential in helping students make appropriate communication decisions, retrofitting them into existing lab blocks created ambiguity regarding the source of certain information (Webb vs. Burdell).

To resolve this issue and improve student understanding of workplace communication circulation, lab manuals were restructured into three workplace-style documents:

1. An email from the client (Julie) soliciting the work to be done, often including attachments of machinery or parts to be tested.
2. A memo from Aaron to the team providing guidance on the work to be done, with scaffolding that decreases as the semester progresses.
3. A test procedure specification outlining how the experiment should be conducted within Burdell, Inc.

These changes were implemented in ME 3057 during Summer 2024 and have been continued to date. ME 4056 began implementing these changes in Spring 2025. Additionally, in Spring 2025, both courses transitioned to an updated rubric emphasizing the usability of reports for the client avatar.

Acknowledgements

The authors thank the support from The Frank K. Webb, Jr. Endowment.

References

[1] E. M. Alford, "Training TAs to Help Students Learn Engineering Discourse," in *Proceedings Frontiers in Education 1997 27th Annual Conference. Teaching and Learning in an Era of Change*. Stipes Publishing, 2002. [Online]. Available: https://doi.org/10.1109/fie.1997.632748.

[2] A. Saxena, L. Hood, G. Manogharan, and C. Berdanier, "Characterizing the Training and Evaluation of Graduate Teaching Assistants (GTAS) at Research-Intensive Universities: Highlighting Best Practices and Opportunities for Reform," in *Proceedings of the ASME 2022*

International Mechanical Engineering Congress and Exposition IMECE 2022, Columbus, Ohio: ASME, 2022, pp. 1–8.

[3] D. Christenson, D. Baldwin, M. Brundrett, P. Monaco, K. Nguyen, and A. Morse, "Student and Teaching Assistant Perspectives on Characteristics of an Effective Teaching Assistant," in *2015 ASEE Annual Conference and Exposition Proceedings*. ASEE Conferences, 2015. [Online]. Available: https://doi.org/10.18260/p.24748.

[4] K. Trellinger, B. Jesiek, C. Troy, J. Boyd, and R. Essig, "Engineering Faculty on Writing: What They Think and What They Want," in *2016 ASEE Annual Conference & Exposition Proceedings*, 2016. [Online]. Available: https://doi.org/10.18260/p.26645.

[5] M. F. Cox, J. Zhu, O. Cekic, R. Chavela, and J. London, "Knowledge or Feelings: First-Year Students' Perceptions of Graduate Teaching Assistants in Engineering," *The Journal of Faculty Development*, vol. 24, no. 1, pp. 27–34, 2010.

[6] R. Tormey, C. Hardebolle, and S. Isaac, "The Teaching Toolkit: Design of a One-Day Pedagogical Workshop for Engineering Graduate Teaching Assistants," *European Journal of Engineering Education*, vol. 45, no. 3, pp. 378–392, 2020.

[7] R. Kajfez and H. M. Matusovich, "Competence, Autonomy, and Relatedness as Motivators of Graduate Teaching Assistants," *Journal of Engineering Education*, vol. 106, no. 2, pp. 245–272, 2017.

[8] K. Kecskemety, A. Theiss, and R. Kajfez, "Enhancing TA Grading of Technical Writing: A Look Back to Better Understand the Future," in *2015 ASEE Annual Conference and Exposition Proceedings*. ASEE Conferences, 2015. [Online]. Available: https://doi.org/10.18260/p.24005.

[9] D. Kim and J. Lynch, "Perspectives and Practices of Undergraduate/Graduate Teaching Assistants on Writing Pedagogical Knowledge and Lab Report Evaluation in Engineering Laboratory Courses," in *2020 ASEE Virtual Annual Conference Content Access Proceedings*. ASEE Conferences, 2020. [Online]. Available: https://doi.org/10.18260/1-2–35052.

[10] Y. Li, P. Jensen, P. Jensen, and K. Jensen, "Board # 9 :"blinded" Grading Rubrics for Bioengineering Lab Reports (Work in Progress)," in *2017 ASEE Annual Conference & Exposition Proceedings*, 2018. [Online]. Available: https://doi.org/10.18260/1-2–27951.

[11] H. M. Malladi, P. S. Lottero-Perdue, and J. Buckley, "Experienced Teaching Assistants' Perceptions of a Simulated Environment for Facilitating Discussions with Individual Student Avatars from a Design Team in Conflict," 2023, vol. 24.

[12] Olds, B., & Miller, R. (1997, June), Using Holistic Grading To Evaluate Writing In Engineering Classes Paper presented at 1997 Annual Conference, Milwaukee, Wisconsin. 10.18260/1-2--6874

[13] K. J. Rodgers, A. K. Horvath, H. Jung, A. S. Fry, H. Diefes-Dux, and M. E. Cardella, "Students' Perceptions of and Responses to Teaching Assistant and Peer Feedback,"

Interdisciplinary Journal of Problem-Based Learning, vol. 9, no. 2, 2014. [Online]. Available: https://doi.org/10.7771/1541-5015.1479.

[14] C.-P. Dai, F. Ke, Z. Dai, and M. Pachman, “Improving Teaching Practices via Virtual Reality ‐ supported Simulation ‐ based Learning: Scenario Design and the Duration of Implementation,” British Journal of Educational Technology: Journal of the Council for Educational Technology, vol. 54, no. 4, pp. 836–56, 2023.

[15] Ely, S. J., & Chen, J. E. (2021, July), Educational Opportunities for Technical Writing in Engineering Education Paper presented at 2021 ASEE Virtual Annual Conference Content Access, Virtual Conference. 10.18260/1-2—37004.

[16] S. S. Taylor, “Comments on Lab Reports by Mechanical Engineering Teaching Assistants,” Journal of Business and Technical Communication, vol. 21, no. 4, pp. 402–424, Oct. 2007, doi: https://doi.org/10.1177/1050651907304024.

[17] A. S. Jariwala, J. Fennell, and C. Sims, "Communicating Effectively with a Range of Audiences: Audience Avatars in Engineering Design Education," in Proceedings of the 2024 ASEE Annual Conference & Exposition, Portland, OR, USA, Jun. 2024. DOI: 10.18260/1-2--48473.

Appendix A - GTA Survey Questions

Experience

- Which class did you TA for?
- Beyond this semester, do you have any experience working with students on communication or evaluating technical communication?
- Please briefly explain your experience working with students on communication or evaluating technical communication.

Likert Scale: Definitely yes, Probably yes, Might or might not, Probably not, or Definitely not.

- Did the avatars help you with your GTA tasks, specifically assigning grades, commenting on student writing, and answering student questions about writing?
- Did the avatars help you understand the importance of effective communication?
- Did the avatars help you understand the criteria for effective communication?
- Did the avatars help you understand the rubric?
- Did the avatars help you understand how to guide student learning?
- Did the avatars help you feel more confident with your tasks?
    - Assigning grades.
    - Leaving feedback.
    - Answering student questions.
- Did the avatars help you be impartial and consistent while grading?
- Did the avatars help you guide students towards progressing their communication skills for future reports?
- Did the avatars help more with in-text comments or end-of-text comments?

Appendix B - Avatars

Internal Audience Avatar

His Story

Aaron Smith started his career with a passion for engineering. He climbed the corporate ladder and now holds the role of Section Leader at a reputable engineering firm in Minneapolis.

Aaron's career began as a bright engineering graduate. He excelled in solving complex technical problems and was known for his innovative solutions. With time, his expertise earned him promotions, and he found himself in a leadership role. This transition wasn't seamless, though.

As Aaron moved into leadership, he faced a new set of challenges. He was now responsible for managing people, ensuring timely project deliveries, and communicating effectively with both his team and upper management. However, he wasn't trained in business management, and this lack of experience causes anxiety as his time is now demanded from a wide variety of people with differing needs and expectations.

He worries about managing people who were once his peers, about delivering projects that meet client expectations, and about presenting work to his supervisors in a way that makes him look good. Aaron's background in engineering gives him immense technical knowledge, but now he is in a position in which he must trust the production of technical knowledge to others. Aaron still loves the technical aspect of his work. He knows the ins and outs of engineering concepts, but he has to work harder at translating this knowledge to non-technical stakeholders, and can get annoyed at employees whose communication slows down this process for him.

Aaron's primary goal is to cultivate a great team and ensure that the work produced by his team is a strong reflection of their collective skills. He understands that to achieve this, he needs workers who can bridge the gap between technical expertise and effective communication. He constantly must consider how his superiors will perceive the work his team produces. He wants his team to give him more confidence in their abilities to deliver work that is ready to progress beyond his desk.

Aaron Smith

Section Leader

Level of education:
Bachelors (ME)

Challenges

- Extremely Busy
- Balancing Budgets
- Managing Time and People
- Quickly Assessing New Hires
- Communicating to Non-Technical Stakeholders

Needs

- Evidence to Trust Team
- Quality Technical Work
- Communication from his Team that Expedites his Process

BURDELL, INC.
TECHNICAL DIVISION

External Audience Avatar

Julie Chang

Title: Product Manager (External Client)
Level of education: Bachelors (IE) and MBA

Challenges

- Time Constraints
- Balancing Multiple Responsibilities
- Explaining Delays and Costs
- Communication Between Technical and Non-Technical Teams

Needs

- Actionable Recommendations
- Relevance to Business Goals
- Practical Solutions
- Executive-Level Language
- Clarity and Conciseness

Her Story

Julie Chang began her career as an entry-level engineer, diving into product development and production optimization. She was no stranger to switching roles frequently to broaden her skill set and climb the corporate ladder. Her journey has taken her through different product lines, from the nitty-gritty technical aspects to the customer-facing world.

In her current role, Julie faces a new set of anxieties. Hard deadlines, cost management, and ensuring products meet customer and design goals are her daily concerns. She's juggling multiple tasks and is perpetually seeking practical solutions. But she thrives on providing solutions to clients and buyers. She enjoys being part of the business world, rubbing shoulders with upper management, and sees her current position as a steppingstone, as her primary goal is advancement and building a legacy of delivering exceptional products. She believes that consistently delivering products on time, under cost, and meeting goals will lead to better opportunities in her career.

Julie's workdays are long, filled with a flurry of activities and meetings. She dedicates around 60 hours a week to work. Her job involves managing many moving parts, working with numerous teams simultaneously, and bridging the gap between technical teams and the overarching business objectives. Therefore, she values concise, actionable content that can be readily reused for her needs.

Julie's main frustrations revolve around engineers taking too long, overspending, and not appreciating her needs. Her role entails explaining to her supervisors why overspending or time delays happen, which adds to her workload. She hasn't been directly involved in technical design for a while and no longer cares about the same details of technical production engineers do. While she understands the technical details of how the product will be used, she wants to operate at product-level language. She's comfortable with most technical language but doesn't have time to refresh on detailed systems jargon, nor is it useful for her purview.

Julie values her time and the company's money; she demands clear, precise answers. She typically wants to know if a solution is worth her time, if it meets her requirements, if it solves her problems, and if she can present it effectively to her superiors.

WEBB
INDUSTRIES