# Board 125: Work in Progress: Faculty Experiences and Learning Through Oral-Assessment Implementation in Engineering Courses

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Saharnaz Baghdadchi is an Associate Teaching Professor at UC San Diego. She is interested in scholarly teaching and employs active learning techniques to empower students to attain an expert level of critical thinking. Her expertise facilitates students' journey towards connecting facts with practical knowledge to tackle intricate engineering challenges. She excels in crafting innovative assessments and explores their impact on enhancing students' learning outcomes and fostering an inclusive educational environment.

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Curt Schurgers is a Teaching Professor in the UCSD Electrical and Computer Engineering Department. His research and teaching are focused on course redesign, active learning, and project-based learning. He also co-directs a hands-on undergraduate research program called Engineers for Exploration, in which students apply their engineering knowledge to problems in exploration and conservation.

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# Work in Progress: Faculty Experiences and Learning Through Oral Assessment Implementation in Engineering Courses

Teaching is a critical responsibility and activity for faculty in higher education; however, many faculty report struggling with teaching [1] as they have not had the benefit of extensive training or development around their teaching practices. The sudden move to remote instruction during the pandemic created additional challenges requiring faculty to develop new teaching approaches to help students learn in a new environment. Supporting faculty with sustainable and effective teaching practices became even more important [2]-[4], as many experienced burnout and examined their self-efficacy. Specifically, self-efficacy–the belief that you can be successful in your efforts toward a particular goal or activity–has been identified as an essential component for instructional effectiveness [5]-[7] with highlights to the *experience of mastery* and *social persuasion* [7],[8]. This suggests that effective support for faculty should consist of learning communities that build supportive relationships between members, encourage critical reflection, and include opportunities for research partnerships [9].

***Faculty Communities of Practices***

In work focusing on educational and leadership development, Drago-Steverson [10] shares that effective faculty development experiences allow faculty to *experience* conditions that support adult learners through meaningful shared activities. Such activities enable faculty to experience transformational learning–learning that grows cognitive, emotional, intrapersonal, and interpersonal *capacities*. Beyond individual faculty development, Abigail [11] conducted a meta-analysis on the Communities of Practice (CoP)-groups of people who interact on an ongoing basis by sharing concerns and engaging in deepening their knowledge and expertise on common practices. Crucially, participants in CoP engage together within the context of an *authentic* learning experience. Such context effectively encourages deep learning and changes in teaching-related practices, as well as identifying factors that impact CoP effectiveness (including temporal, personal, organizational, and environmental considerations) [12].

***Growth-Oriented Mindset in Faculty and Impact on their Students in STEM***

Embracing a growth mindset amongst STEM faculty has the potential to significantly impact teaching experiences and interactions with students. Growth mindset environments cultivated by faculty lead to growth mindsets being adopted by students and contribute to successful learning outcomes, such as improvement in courses and retention in STEM fields, creation of a learning community that centered on diversity, equity, and inclusion [13],[14], and encouragement in communal values and behaviors [15]. Moreover, the impact of fostering a growth mindset in students had a *positive long-term effect* on students' improved sense of belonging in STEM disciplines by shaping students' perceptions and trust in their academic environment [16].

Personal growth of faculty in their own teaching practices, such as implementing engagement in cognitively active and collaborative learning practices in science classrooms, positively correlates with students' perceptions of faculty endorsing growth mindset beliefs. Faculty practices such as explicit messages (e.g., "all students can learn and grow") and course policies (e.g., allowing test retakes) also shape students' perceptions of faculty mindsets. Faculty growth

opportunities such as workshops on inclusive education in STEM have also positively contributed to significant gains observed in student-centered practices [18],[19] (but see [20]).

***Impact of Faculty Learning Through Collaborative Educational Research***

In this paper we aim to share our preliminary findings from interviews with six engineering faculty at a research institution who collaborated on an NSF-funded research project aimed at studying the impact of implementing oral exams in high enrollment courses. The primary research questions were: How did the instructor's perspectives and behaviors change as they implemented oral exams in their courses? How did the instructors act on a growth-oriented mindset?

## Methods

We invited six teaching professors from the departments of Mechanical and Aerospace Engineering and Electrical Engineering to participate in the study. To protect the confidentiality of each individual, pseudonyms were used in lieu of using their full names in data analysis (See Table 1).

| Instructor Pseudonym and pronouns | Department | Course(s) that implemented oral exams (Course topic, Course type, Class size) | Years of teaching beyond graduate school |
|---|---|---|---|
| Virgil (he/his/him) | Mechanical and Aerospace Engineering | a course on statics and dynamics (Lecture-based, n = 60); another course on solid mechanics (Lecture-based, n = 100) | 10 years |
| Logan (he/his/him) | Electrical and Computer Engineering | a course on instruction to electrical circuits (Lecture and lab, n = 250) | 15 years |
| Aria (she/her/hers) | Mechanical and Aerospace Engineering | a course on statics and dynamics (Lecture-based, n = 100); 1 course on solid mechanics (Lecture-based, n = 130) | 9 years |
| Michael (he/his/him) | Electrical and Computer Engineering | a course on programming with hands-on projects and lab components (Lecture & Lab, n =30) | 7 years |
| Joseph (he/his/him) | Mechanical and Aerospace Engineering | a course on dynamics (Lecture-based, n = 65) | 28 years |
| Suise (she/her/hers) | Electrical and Computer Engineering | a course on non-linear circuits built using diode and transistors (Lecture & Lab, n =70-180) | 8 years |

Table 1. List of instructor and course information.

Semi-structured interviews were conducted as part of an initiative among engineering faculty to conduct oral assessments from Winter Quarter 2021 to Fall Quarter 2021. The goal of the interviews was to examine faculty experiences with implementing oral exams as a student-centered assessment strategy. Specifically, our interview questions were focused on the impact their experiences had on their teaching practices and perspectives on student learning. A consent

form was collected for each faculty member prior to the interview. Four researchers conducted and recorded interviews on a video call platform (Zoom, M = 69.5 minutes). Researchers reviewed the auto-generated transcripts and recordings and revised the transcripts to correct inaccuracies, followed by member checks [21] to ensure the accuracy of transcription.

Four researchers analyzed the interview transcripts from their sessions using Atlas.ti, a qualitative data management and analysis software. Using growth-oriented mindset [22] as our theoretical framework and constructivist grounded theory guidelines [23], researchers generated and applied codes to data that focused on faculty growth and learning as educators. Each transcript was reviewed and coded by at least one additional member of the research team, and codes were refined and (re)applied to accurately reflect the meaning of the data.

## Results

The idea of implementing oral exams into the courses included in this study was sparked by the sudden move to remote instruction and questions faculty had about how to help students develop conceptual mastery, as well as concerns about academic integrity. The oral exams in our research project were implemented as 10- to 15-minute online sessions of oral exams where one assessor (the instructor or a trained teaching assistant) and one or more student(s) went through a problem solving process on a video call [24]-[25]. In our semi-structured interviews with each instructor, three themes emerged: 1) learning about students; 2) acting on growth-oriented mindset; and 3) reflecting on growth as instructors.

### *Learning about students*

Regardless of the oral exam format used, implementing oral assessments in their courses provided instructors an opportunity to directly observe students' challenges and opportunities for growth. One important learning is that students benefit from explicit communication of instructor's motivations and rationale.

One instructor (Aria) shared an experience in which she received pushback from a transfer student who had to retake a course for credit and claimed he had already learned most of the course content. He had asked the instructor, "Why are you asking those questions? I know how to solve it, that's the most important thing." She learned that this student, as well as others, may not have had a chance to develop deep conceptual learning beyond being able to solve problem sets. By the second oral exam, the instructor implemented prompt questions to homeworks so that her students could better understand the importance of deep, conceptual understanding. In a follow up, the same student "started to actually see the point of why" the instructor was asking those questions.

Faculty also learned that some students experience a fear of failure in a new learning environment. Logan shared that he developed a better understanding of where students are coming from, specifically in their transitional experience from high school to college. He observed that many students experience fear of failure in their college courses as they have been 'near the top' in their high schools but are now exposed to students that seem smarter than themselves. Such a transition may cause doubts in one's ability, low self-confidence, or avoidance of challenges when faced with the fear of failure. He shared that through gaining such understanding he was in a better position to support students' engagement and perseverance.

***Acting on growth-oriented mindset***

Reflecting on their teaching experiences and interactions with students in the courses in which they implemented oral exams, faculty described situations in which they applied a growth mindset to their own teaching practices, thereby implementing more student-centered teaching in their courses.

An example of one concrete action that one instructor took to foster a growth-oriented mindset in their course was diversifying students' learning modality. Having alternative modalities to learning in class facilitates meeting different learning styles of students, and therefore provides opportunities for more students to succeed in the learning environment**.** One instructor (Michael) shared that "the environment plays a big role in certain classes, facilitating certain learning styles, and not so much for others." He also shared that the experience with the oral exam further "validates" this idea and echoes his goal in "making sure that [students] pull up by providing various different learning opportunities in different modalities for them to learn."

Faculty also acted on a growth-oriented mindset by providing multiple opportunities for students to engage with the course content. Virgil shared intentionally reiterating fundamental knowledge as part of the lecture. Doing so provides all students with a consolidated conceptual understanding that can guide them to the next steps. At the same time, doing so may reduce the gap in prior knowledge across diverse student experiences and backgrounds.

***Reflective teaching practices***

The final theme, reflective teaching practices, refers to what faculty learned about themselves and their teaching practices. Through oral exams, faculty gained greater insight into students' struggles. By reflecting on their experiences, they developed questions and insights about how their teaching practices might contribute to why students struggle. They shared how this reflective process could guide their own growth, when faced with their own challenges as an instructor in the context of their teaching practices and their students' conceptual understanding.

> "One of the big surprises for me occurred when a student was making a specific mistake. In this case it had to do with a belt drive and I took extra time to explain it even using a computer cord I had lying around to show how cable tension worked. The student said they understood. Then I asked the next question and the student made the same mistake about belt tension. This drove home to me that my explanation wasn't getting the point across. And I actually went back and I rewatched that video, and so it reemphasized to me the importance of clarity when teaching. I've been teaching for a long time and I learned the material a long time ago. And so I think the student's mistake maybe came from a place that was different than I thought their mistake was coming from." (Joseph)

Instructors also reflected on how they interact with their students, both within the oral exam context and beyond. For example, one instructor (Suise) shared the importance of creating an environment where students can demonstrate their fullest potential with the belief in their ability. She shared that "Keeping calm" and "giving [students] a chance to think and breathe", reduce students' stress and also have been helpful to the instructor herself.

Finally, faculty shared that their experience collaborating with other instructors and educational specialists on campus motivated them to reflect on their teaching and contributed to their growth

as educators and researchers. For example, Virgil shared the synergy effect of collaboration between instructors and educational specialists on campus.

> "This was my first time to get more formally into the educational research area and I was very fortunate to join the team and to work with all our colleagues. (. . .) Every communication was beneficial. Everything from discussions with you and [other educational specialists] and the perspective that you guys have to offer and different dimensions to the problem that you bring up. Oftentimes we don't get a chance to fully pursue everything. But it expands my horizons as an instructor and education researcher very much, so I think that's a really critical and core aspect of our project." (Virgil)

## Discussion

A main goal of implementing oral exams into the engineering courses that were a part of this study was to deepen students' conceptual understanding. While there is evidence from this study of the benefits of oral exams for students [24]-[28], the themes highlighted above reflect the benefits faculty experienced as educators. This resulted in faculty making various changes to their approaches to teaching with a goal toward inspiring student confidence and belief in their abilities, as well as helping students develop skills for conceptual learning.

Along with their reflections on their growth as teachers, instructors also shared recommendations on how to effectively implement oral assessments in Engineering courses to foster a growth-oriented learning environment. Instructors emphasized the importance of communicating the 'why's and 'how's in oral exams with their students to motivate them [25]-[26] and encourage them to see the instructional team as a resource and as people who care about their learning. Prior to the oral assessments, instructors can provide demonstrations of mock exams in class. They can also provide students with digestible tasks to experience their learning gains step by step, such as video recording and reviewing their thinking out loud for a problem solution [28]. Intentional, student-oriented instructional practices such as these can enhance the benefits of oral exams. Along with providing an opportunity for reflective learning for students, designing oral exams with intentionality and in collaboration with colleagues, allows instructors to reflect on their teaching and learn with and from their students and colleagues.

### *Limitations and Future Directions*

This study was conducted at a large research university where instructors benefited from having a pool of teaching assistants. Such access to teaching resources may ease the implementation and grading of oral assessments in high-enrollment classes and enable more time for the instructors to reflect on their teaching. There may be additional variance in the experience of instructors due to the logistics of oral exams that were customized to the size, level, and type of each course. Finally, the faculty who participated in this study were all ladder rank Teaching Professors. Although they all engage in disciplinary and/or educational research, their commitment to teaching excellence and supporting student learning may be influenced by their teaching-focused responsibilities as well as their intrinsic motivation. Future research may analyze student interview data to validate instructor's experience of their course to paint a well-rounded understanding of faculty growth in the context of conceptual mastery and reflective teaching practices.

***Conclusion***

Overall, instructors shared that implementing the oral assessments in their courses augmented their teaching experience by endorsing and practicing growth-oriented mindset for their students and themselves as teachers. They also shared the impact of the community of teaching faculty members and educational specialists on their growth as a teacher and a researcher, where more awareness and execution of student-centered teaching practices were evolved and fostered. This paper provides insights into how faculty growth, both as individuals and as a community, can benefit their students, teaching practices, and the greater scholarship of teaching and learning.

## Positionality statement

Our author team includes six engineering faculty and four education scholar-practitioners at a campus teaching center. We represent a range of social identities and lived experiences. Our racial/ethnic backgrounds include Asian, African-American, Chicana, and White and have an equal number of male and female team members. One-third of us identify as a first-generation college undergraduate student, a first-generation PhD graduate student, or a first-generation immigrant to the United States. We currently serve at a Public R1 University in the United States and bring varied and rich experience to higher education, inspired by our diverse education and/or teaching backgrounds throughout the world. We have been students or instructors in the educational systems of countries in Europe, Central Asia, East Asia, SouthEast Asia, and the United States. As educators and researchers, we aim to implement and investigate pedagogical approaches that empower students from diverse backgrounds to succeed and develop their full potential.

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## References

[1] M. D. Sorcinelli, *Principles of Good Practice: Supporting Early-Career Faculty. Guidance for Deans, Department Chairs, and Other Academic Leaders*. Washington, DC: Association of Higher Education, Jan. 2000.

[2] A. M. Perez, J. McShannon, and P. Hynes, “Community College Faculty Development Program and Student Achievement,” *Community College Journal of Research and*

*Practice*, vol. 36, no. 5, pp. 379–385, Feb. 2012, doi: https://doi.org/10.1080/10668920902813469.

[3] R. Ambrosino and J. Peel, "Faculty Development Programs: Assessing the Impact on Instructional Practices, and Student Learning and Motivation," *The Journal of Faculty Development*, vol. 25, no. 2, pp. 33–38, May 2011.

[4] K. Trigwell, K. C. Rodriguez, and F. Han, "Assessing the impact of a university teaching development programme," *Assessment & Evaluation in Higher Education*, vol. 37, no. 4, pp. 499–511, Jun. 2012, doi: https://doi.org/10.1080/02602938.2010.547929.

[5] M. A. Rowbotham, *The Impact of Faculty Development on Teacher Self-Efficacy, Skills and Perspectives (IERC FFR 2015-1)*, Edwardsville, IL: Illinois Education Research Council, at Southern Illinois University Edwardsville, Jan. 2015.

[6] L. Postareff, S. Lindblom-Ylänne, and A. Nevgi, "The effect of pedagogical training on teaching in higher education," Teaching and Teacher Education, vol. 23, no. 5, pp. 557–571, Jul. 2007, doi: https://doi.org/10.1016/j.tate.2006.11.013.

[7] A. Bandura, *Self-Efficacy: The Exercise of Control*, New York, NY: W. H. Freeman, 1997.

[8] D. B. Morris and E. L. Usher, "Developing teaching self-efficacy in research institutions: A study of award-winning professors," *Contemporary Educational Psychology*, vol. 36, no. 3, pp. 232–245, Jul. 2011, doi: https://doi.org/10.1016/j.cedpsych.2010.10.005.

[9] E. T. Ortlieb, J. P. Biddix, and G. M. Doepker, "A collaborative approach to higher education induction," *Active Learning in Higher Education*, vol. 11, no. 2, pp. 109–118, Jul. 2010, doi: https://doi.org/10.1177/1469787410365655.

[10] E. N. Drago-Severson, "Helping Educators Grow: Strategies and Practices for Leadership Development," Cambridge, MA: Harvard Education Press, 2012.

[11] L. K. M. Abigail, "Do communities of practice enhance faculty development?," *Health Professions Education*, vol. 2, no. 2, pp. 61–74, Dec. 2016, doi: https://doi.org/10.1016/j.hpe.2016.08.004.

[12] L. C. Li, J. M. Grimshaw, C. Nielsen, M. Judd, P. C. Coyte, and I. D. Graham, "Use of communities of practice in business and health care sectors: A systematic review," *Implementation Science*, vol. 4, no. 1, May 2009, doi: https://doi.org/10.1186/1748-5908-4-27.

[13] A. E. Lisberg and B. C. Woods, "Mentorship, mindset and learning strategies: an integrative approach to increasing underrepresented minority student retention in a STEM undergraduate program," *Journal of STEM Education: Innovations and Research*, vol. 19, no. 3, Aug. 2018, Accessed: Feb. 08, 2024. [Online]. Available: https://www.jstem.org/jstem/index.php/JSTEM/article/view/2280.

[14] T. L. Killpack and L. C. Melón, "Toward Inclusive STEM Classrooms: What Personal Role Do Faculty Play?," *CBE—Life Sciences Education*, vol. 15, no. 3, p. es3, Sep. 2016, doi: https://doi.org/10.1187/cbe.16-01-0020.

[15] M. Fuesting, A. B. Diekman, K. L. Boucher, M. C. Murphy, D. L. Manson, and B. L. Safer, "Growing STEM: Perceived faculty mindset as an indicator of communal

affordances in STEM.," *Journal of Personality and Social Psychology*, vol. 117, no. 2, pp. 260–281, Aug. 2019, doi: https://doi.org/10.1037/pspa0000154.

[16] L. Williams, Q. A. Hirschi, C. Hulleman, and J. Roksa, "Belonging in STEM: Growth mindset as a filter of contextual cue," *International Journal of Community Well-Being*, Mar. 2021, doi: https://doi.org/10.1007/s42413-021-00111-z.

[17] K. Muenks, V. X. Yan, N. R. Woodward, and S. E. Frey, "Elaborative learning practices are associated with perceived faculty growth mindset in undergraduate science classrooms," *Learning and Individual Differences,* vol. 92, p. 102088, Dec. 2021, doi: https://doi.org/10.1016/j.lindif.2021.102088.

[18] E. S. O'Leary et al., "Creating inclusive classrooms by engaging STEM faculty in culturally responsive teaching workshops," *International Journal of STEM Education,* vol. 7, no. 1, Jul. 2020, doi: https://doi.org/10.1186/s40594-020-00230-7.

[19] M. F. Durham et al., "Benefits of a College STEM Faculty Development Initiative: Instructors Report Increased and Sustained Implementation of Research-Based Instructional Strategies," *Journal of Microbiology & Biology Education*, vol. 21, no. 2, Jan. 2020, doi: https://doi.org/10.1128/jmbe.v21i2.2127.

[20] *L. Nadelson, S. Shadle, and J. Hettinger,* "A Journey Toward Mastery Teaching: STEM Faculty Engagement in a Year-Long Faculty Learning Community," *Learning Communities Journal, Jan. 2013, Accessed: Feb. 08, 2024. [Online]. Available: https://scholarworks.boisestate.edu/cifs_facpubs/143/*

[21] J. W. Creswell, *Research Design: Qualitative and Quantitative Approaches. SAGE Publications, Incorporated, 1994.*

[22] C. Dweck, *Mindset: Changing the Way You Think to Fulfill Your Potential.* New York, NY: Random house, 2006.

[23] J. M. Corbin, and A. Strauss, "Grounded theory research: Procedures, canons, and evaluative criteria," *Qualitative sociology*, vol. 13, no.1, pp. 3-21, Mar. 1990.

[24] H. Qi, M. Kim, C. L. Sandoval, Z. Wang, C. Schurgers, M. V. Lubarda, S. Baghdadchi, X. E. Gedney, A. Phan, N. Delson, and M. Ghazinejad, "Board 400: The impact of Oral Exams on Engineering Students' Learning," in *Proceedings of the 2023 ASEE Annual Conference Exposition, Baltimore, MD, USA, June 25-28, 2023*, doi: https://strategy.asee.org/43137.

[25] S. Baghdadchi, H. Qi, M. Lubarda, A. Phan, N. Delson, and C. Sandoval, "Student perceptions of oral exams in undergraduate engineering classes and implications for effective oral exam design," in *Proceedings of the 2022 ASEE Annual Conference Exposition, Minneapolis, MN*, *USA, June 26-29,* 2022, doi: https://peer.asee.org/41123.

[26] N. Delson, S. Baghdadchi, M. Ghazinejad, M. Lubarda, M. Minnes, A. Phan, C. Schurgers, and H. Qi, "Can oral exams increase student performance and motivation?, " in *Proceedings of the 2022 ASEE Annual Conference Exposition, Minneapolis, MN, USA, June 26-29,* 2022, doi: https://sftp.asee.org/41127.

[27] M. Kim, C. Pilegard, M. Lubarda, C. Schurgers, S. Baghdadchi, A. Phan, and H. Qi, "Midterm oral exams add value as a predictor of final written exam performance in

engineering classes: A multiple regression analysis," in *Proceedings of the 2022 ASEE Annual Conference Exposition, Minneapolis, MN*, *USA, June 26-29,* 2022, doi: https://peer.asee.org/41102.

[28] H. Qi, M. Kim, Y. Li, C. L. Sandoval, C. Schurgers, M. V. Lubarda, X. E. Gedney, S. Baghdadchi, and A. Phan, "From rote learning to deep learning: Filling the gap by enhancing engineering students' reasoning skills through explanatory learning activities," in *Proceedings of the 2023 ASEE Annual Conference Exposition, Baltimore, MD, USA, June 25-28*, 2023, doi: https://peer.asee.org/43756.