

The Oral Exam—Learning for Mastery and Appreciating It
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Abstract. To reduce academic dishonesty and strengthen learning outcomes, I adopted in-depth oral examinations as my benchmark and summative assessments in a Human Anatomy & Physiology course taught in an online asynchronous setting. This decision led my students and me down the transformative path of mastery learning. This was a *threshold experience* for my students who were learning how to think and express themselves as physiologists. This was also a threshold experience for me as I explored the scope of the oral examination in promoting skill acquisition while nurturing a relationship-rich learning environment. By employing *deliberate practice* principles including basic drills, one-on-one weekly check-ins, and small group recitation sessions, students exceeded benchmarks for conceptual understanding, mastery of fundamentals, and application of concepts to clinical scenarios. Students consistently reported that they were happy within this learning environment. With meticulous planning, it is possible to motivate students to learn for mastery and acquire expertise by employing oral exams as the pivotal assessment strategy in an online course thereby also making academic dishonesty almost irrelevant.

Keywords: oral exams; mastery learning; threshold concepts; deliberate practice; pedagogy of care

Most Human Anatomy & Physiology instructors believe that academic integrity is compromised in online courses (Carrasco, 2022). However, it has been shown that oral exams can hold the key to avoiding academic dishonesty while promoting excellence (Schurgers & Qui, 2022). In fact, oral exams can deepen engagement in a way that traditional assessments cannot (Theobald, 2021). I decided to adopt the oral exam for both benchmark (monthly) and summative (end of semester) assessments not just to reduce academic dishonesty issues but also as a potentially powerful vehicle to assess mastery of the subject matter. When instruction is designed with mastery learning in mind, the oral examination can serve as a highly effective assessment vehicle to evaluate mastery learning (Carrasco, 2022; Joughin, 2010) because it provides a wealth of information about student understanding (Theobald, 2021).

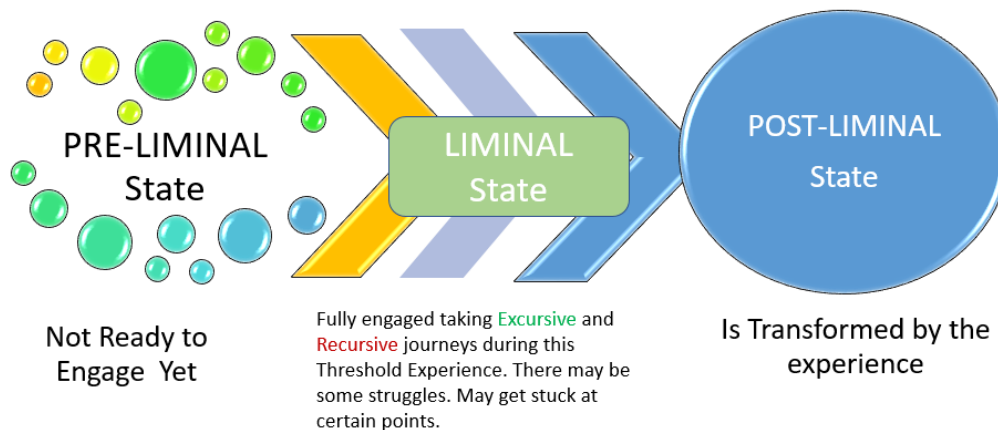
Mastery learning requires a great deal of scaffolding, allowing learners to engage in *deliberate practice*, which culminates in the demonstration of expert performance (Ericsson, 2008). The principles of deliberate practice that have been established in the training of elite athletes, musicians, dancers, and chess grandmasters have a lot in common (Coyle, 2009; Ericsson, 2008; Ericsson & Harwell, 2019). They all need unlimited trials that provide opportunities to focus on fundamentals, form mental representations, engage in repeated performance, practice slow learning, receive immediate feedback, and learn from errors (Ericsson & Pool, 2017).

For the instructor, deliberate practice requires meticulous planning and streamlining of content, making mastery learning design a *threshold concept*. A threshold concept is a doorway that leads to an experience that is both troublesome and transformational resulting in an entirely new way of thinking about something (Meyer & Land, 2003). A threshold concept is troublesome because at the beginning of the learning period, it may appear to be counterintuitive. It is transformational because by the end of the learning period, there is a major shift in thinking. Mastery learning and expert performance can appear to be counterintuitive for most instructors because we do not normally expect introductory biology students to “think and talk like physiologists.” We expect such behavior from college seniors or graduate students; for this reason, mastery learning is a troublesome concept. If we were to demonstrate that college students taking an introductory course can acquire expertise, then we are entering the zone of transformation. The threshold experience itself is not without struggle, a sometimes-messy process which is played out within the learning environment known as the *liminal space*. Those who are yet to engage in the threshold experience are said to be *pre-liminal*; whereas, those that have exited the liminal space fully transformed are said to be *post-liminal*. All others are *liminal* (Land et al., 2005).

For students, mastery learning via oral exams is troublesome because it is unfamiliar, challenging, and demands deliberate practice to succeed. It is also transformational because students gain confidence in their ability to “speak physiology” not only during oral exams and practice sessions but also in everyday life with their family and friends. Typically, within the liminal space, students struggle to achieve success as they take *excursive* (bold and exploratory) and *recursive* (timid and retreating) journeys during the threshold experience (Figure 1). Therefore, it is imperative that the instructor create a *supportive liminal environment* in which the students can engage and flourish (Cousin, 2006).

Figure 1

Learning for Mastery is a Threshold Experience for the Instructor and Student



In the context of our collective trauma of the pandemic, the need for a highly supportive liminal environment and concepts such as pedagogical love, pedagogy of kindness, and relationship-rich education have become increasingly relevant (Akkaraju et al., 2019; Cho, 2005; Lambert & Felten, 2020; Loreman, 2011; Maatta & Uusiautti, 2012; Wilkinson & Kaukko, 2020). It has been shown that student success is attributable to a relationship-rich learning environment (Lambert & Felten, 2020). Care in pedagogy is classified as *aesthetic care* and *authentic care* (Valenzuela, 1999). Aesthetic care is superficial and limited to caring about student performance and disposition. Authentic care is the deeper version that emphasizes a reciprocal relationship between a student and teacher in which the student feels cherished. To fulfil the conditions of aesthetic care, the tone, frequency, ease, and mode of communication becomes a crucial part of the instructional design (Pritts, 2020). The use of a mobile messaging application can be a powerful way to impact student success (Sherr et al., 2019) by making the students feel cared for while gently nudging them into completing all assignments on time. Combined with the use of laughter, smile, thumbs up, and other positive emojis, text messaging allows for more relaxed communication with the students.

In this article I address the following: (a) scaffolding formative assessments that are congruent with oral exam outcomes; (b) assessing for mastery; (c) structuring deliberate practice to result in mastery; (d) viewing mastery learning as a threshold experience to help create and maintain a nurturing liminal environment; and (e) creating a nurturing liminal environment which is central to mastery learning.

Methods

I studied the effectiveness of oral exams in promoting mastery learning for a period of three consecutive semesters in an online, asynchronous section of Human Anatomy & Physiology course at Bronx Community College of the City University of New York (CUNY). Each section consisted of 17–20 students with a total of 57 students. Student performance data on oral exams was collected for all benchmark and summative assessments. Student perceptions of weekly formative assessments, oral exams, and weekly check-ins were collected using an anonymous survey at the end of the semester. The project gained approval from the CUNY Institutional Review Board prior to the start of this project.

Scaffolding Formative Assessments to Match Oral Exam Outcomes

A major learning outcome for the oral exam was that the student would demonstrate conceptual clarity. As a result, weekly formative assessments were geared towards enabling the student to develop knowledge and skills that would gamely meet this outcome. Content was streamlined which helped to focus on the fundamentals, deepen understanding of core concepts, and enhance the learner's ability to readily apply physiological concepts to clinical scenarios. To achieve conceptual clarity, students were expected to engage in a series of scaffolded learning experiences that helped them to connect with the material, master the basics, dig deeper into the concepts, amplify learning through sketching and writing by hand, and teach concepts assigned for the week (Figure 2).

In step 1, students were expected to take notes from mini-lecture videos that I had created and uploaded to my YouTube channel (Akkaraju, n.d.). In step 2, students answered multiple choice or matching questions at specific checkpoints of the mini-lecture video. In step 3, students practiced vocabulary and basic conceptual information by taking a quiz that was designed with the purpose of drilling the fundamentals. In step 4, they re-wrote notes to make sure that their information was accurate. These handwritten notes were provided by me and were congruent with the questions on the oral exam. In step 5, they took a comprehensive quiz addressing deeper conceptual and application questions. I held a weekly recitation session to review the quiz that students attended on a voluntary basis. Recordings from these recitations were made available to the entire class. In step 6, students picked a time slot of their convenience to meet with me individually for 15 minutes to explain the concept of the week and to track their progress.

Figure 2

Weekly Formative Assessments Congruent with Oral Exam Outcomes



The formative assessments were scaffolded to maximize congruence. A core concept such as blood pressure travels through several learning experiences (formative and benchmark) by the time a student achieves conceptual clarity (Table 1).

Table 1

Concept Tracking to Maximize Congruence

Learning opportunity	Assessment type	Software used	Description of activity	Learning outcome (Skill)	Learning outcome (Knowledge)
Notetaking	Formative	Explain Everything Basics & YouTube	Watch mini-lecture video & take detailed notes including sketches	Transcription fluency Spelling Sketching to learn	Factual
Check understanding	Formative	PlayPosit	Answer questions at various checkpoints	Retrieval practice	Factual Vocabulary
Gamify learning the basics	Formative	Quizlet	Practice with flashcards & self-testing	Retrieval practice	Vocabulary Factual
Conceptual & Contextual learning	Formative	GoodNotes	Practice redrawing & sketching to engage with the concepts	Retrieval practice Flow charting Sketching	Conceptual Procedural
Teaching to learn	Formative	Zoom	Engage in weekly check-in session to orally explain concepts of the week	Oral communication	Conceptual clarity
Digging deeper	Formative	Google form Zoom	Complete a worksheet with deeper conceptual & contextual questions	Retrieval practice	Factual Conceptual Procedural
Recitation session	Formative	Zoom	Appear on Zoom voluntarily to practice for the oral exam Recorded sessions shared with the class	Oral communication Retrieval practice	Factual Conceptual Procedural
Oral exam Objective test	Benchmark (monthly) Summative (End-of-term)	Zoom Google form	Complete online objective test & appear for a 20-minute oral exam	Oral communication Retrieval practice Problem solving	Conceptual Clarity Factual Conceptual Procedural

Use of Software to Develop Learning Opportunities

I experimented with a variety of software applications to develop and deploy learning opportunities:

- To develop explainer videos in a sketch-note style, I used a software application called Explain Everything Basics (Explain Everything, 2020) which allows you to create animated videos and upload them directly to YouTube.
- To create real-time questions that appear at certain checkpoints of the YouTube video, I uploaded the video to a software application called PlayPosit (PlayPosit, 2013) and used this software to create objective type questions to check basic understanding.
- To gamify learning vocabulary, labeling, and basic facts, I created quizzes in a software application called Quizlet (Quizlet, 2005) and added it to a class that I had created. Students sign into this Quizlet class at the beginning of the semester to access their homework.
- To demonstrate how sketch-notes can help create mental representations in biology and provide students with an open educational resource, I created a set of notes for the major concepts and clinical scenarios on a software application called GoodNotes (GoodNotes, 2011), which makes it easy to share with students.
- To create a quiz with deeper conceptual and contextual questions, I used Google forms (Google, 2008).
- To conduct small group recitation sessions, I used the Zoom videoconferencing platform (Zoom, 2020).

Designing Deliberate Practice

I incorporated deliberate practice principles into the weekly formative assessments by doing the following: (a) allowing students unlimited trials on *all* formative assessments; (b) providing immediate feedback wherever appropriate via apps; (c) promoting mental representations by writing to learn (notetaking and making sketches); and (d) practicing oral skills by “teaching” concepts. For all six weekly assessments, students were only given credit if they demonstrated proficiency, allowing for slow learning.

Assessing for Mastery

Students were provided with the oral exam questions, notes with answers, mini-lecture videos, and recitation sessions prior to each oral exam. There was full transparency. I used a score of 90% and above on the oral exam as an indicator of mastery and at least 80% on the oral exam as an indicator of proficiency. My benchmark for students achieving mastery in this course was set at 70% meaning that I expected at least 70% of the students to achieve mastery. For achieving proficiency, I set the benchmark at 80% meaning that at least 80% of the students would achieve proficiency. Each oral exam session, which lasted 20–30 minutes was scored using a rubric (Table 2). The students were required to have their camera on and were not allowed to refer to notes during the oral exam. Each student received a completed rubric within a few hours of taking the oral exam.

Maintaining a Nurturing Learning Environment

I designed a caring learning environment that focused on three aspects: communication, connection, and intervention. To keep communication channels open, I used the mobile messaging application called Remind (Remind, 2014). To forge a personal connection with each student, I included 15-minute one-on-one weekly check-in on Zoom. Students were allowed to pick a time slot that suited their schedule from a wide range of choices that included evenings and weekends. These sessions were useful in tracking progress, clarifying course information, evaluating conceptual clarity via the “teach it” exercise, and getting to know each other. Throughout this process, I was guided by the threshold concept theory, which allowed me to observe the student learning experience with empathy as they journeyed from pre-liminal to liminal to post-liminal stages (see Figure 1). Following along the rules of mastery learning, students were allowed multiple attempts on the oral exam. If a student’s performance on weekly check-ins and oral exam sessions indicated that they needed intervention, additional online practice sessions were scheduled.

Two weeks prior to each oral exam, students were provided with a detailed study guide that was broken up into three parts: part A consisted of a list of “essay” type questions; part B consisted of a collection of figures and graphs; and part C consisted of a long list of questions dealing with the basics reminiscent of the oral exam format (see Table 2). As a way of practicing for the oral exam, several 30-minute small group online recitation sessions were arranged during the days leading up to the exam that students attended on a voluntary basis. During these sessions, students took turns to practice answering each question with their peers helping them when they got stuck. Recordings from these sessions were made available to the entire class.

Table 2

Sample Rubric for Oral Exam

Criteria	Concept/question	Unfamiliar (60 and below)	Familiar (61-79)	Proficient (80-89)	Master (90-100)
Comfort level (Ease of explanation)	Nodal/Non-nodal action potentials				
	Blood Pressure				
	Cardiac Output				
	Circulatory shock				
	Edema				
Completeness (Right amount of detail to support big picture)	Nodal/Non-nodal action potentials				
	Blood Pressure				
	Cardiac Output				
	Circulatory shock				
	Edema				
	Nodal/Non-nodal action potentials				

Criteria	Concept/question	Unfamiliar (60 and below)	Familiar (61-79)	Proficient (80-89)	Master (90-100)
Conceptual understanding (Cause and effect relationships evident)	Blood Pressure				
	Cardiac Output				
	Circulatory shock				
	Edema				
Logical Reasoning (Can think on feet)	Walk me through the Graphs Part B				
Basic Knowledge (Strong fundamentals)	Let's check your Basics Part C				

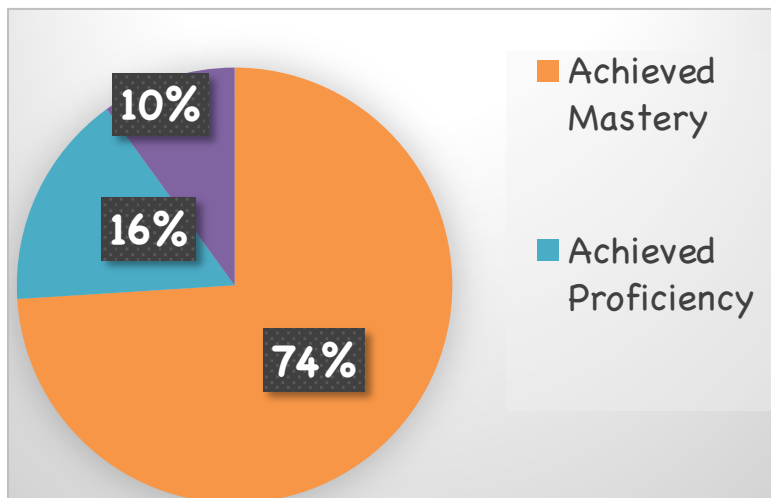
Results

A major discovery of this study was that it is possible to assess for mastery using the oral exam as the assessment vehicle. The oral exam made thinking visible, allowing me to observe mental flow, fluency, and conceptual clarity. It was also possible to easily assess if the student had prepared for familiarity, proficiency, or mastery (see rubric in Table 2).

It turned out that 74% of the students (n = 57) demonstrated mastery and 16% achieved proficiency in the summative oral exam (Figure 3). Altogether 90% of the students achieved proficiency, which was well above the benchmark of 80% for proficiency.

Figure 3

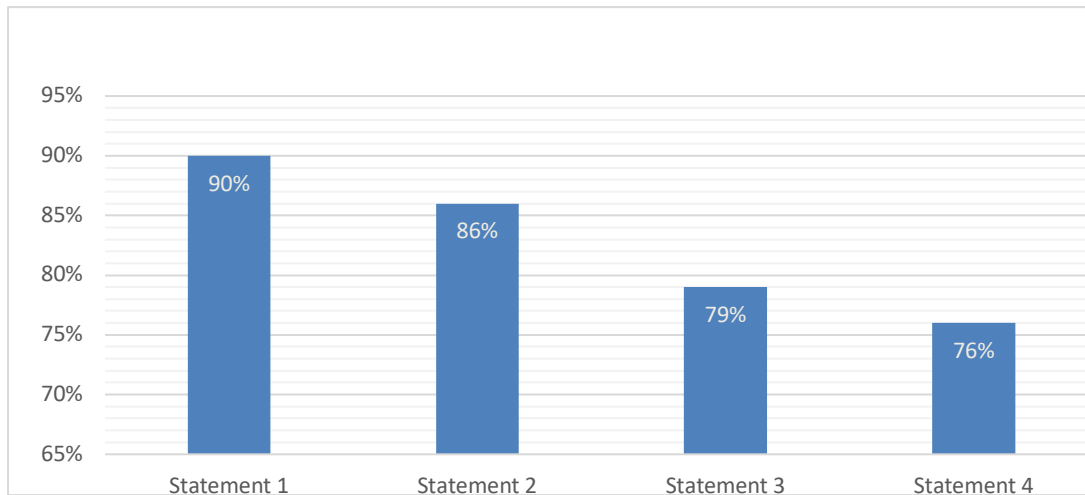
Majority of Students Learned for Mastery



As for mastery, the students scored above the benchmark, which was set at 70%. Student perceptions of the oral exam was favorable in general and specifically to the following statements (Figure 4): (S.1) Preparing for and taking the oral exam was a powerful learning experience; (S.2) Taking oral exams helped me realize that I need to focus on understanding concepts rather than memorizing them; (S.3) Over the course of the semester I became more comfortable speaking about physiology; and (S.4) I like this way of testing.

Figure 4

Students who Chose "Strongly Agree" or "Agree" to Statements 1-4



Students were generally positive about the oral exam format, process, and outcomes (Figure 5) when responding to the following statements: (S.5) Oral exams helped me to become more aware of my strengths and weaknesses in my approach to learning; (S.6) The oral exam felt like a conversation about physiology with my instructor; (S.7) I left each oral exam knowing my strengths and areas for improvement; (S.8) I felt nervous taking oral exams; and (S.9) The oral exam format was clear to me.

Students unanimously strongly agreed to statements about the efficacy of the weekly check-ins and small group sessions (Figure 6). The students responded positively to the following statements: (S.10) The weekly check-ins helped to keep me on track; (S.11) The weekly check-ins helped to know my instructor better and discuss any issues I was having with the class; (S.12) Video recordings of the small group sessions were helpful to me in preparing for oral exams; (S.13) The "Teach it" exercise helped me a lot to master concepts and apply them to clinical scenarios; and (S.14) I am happy that I took this class.

Figure 5

Students who Chose "Strongly Agree" or "Agree" to Statements 5–9

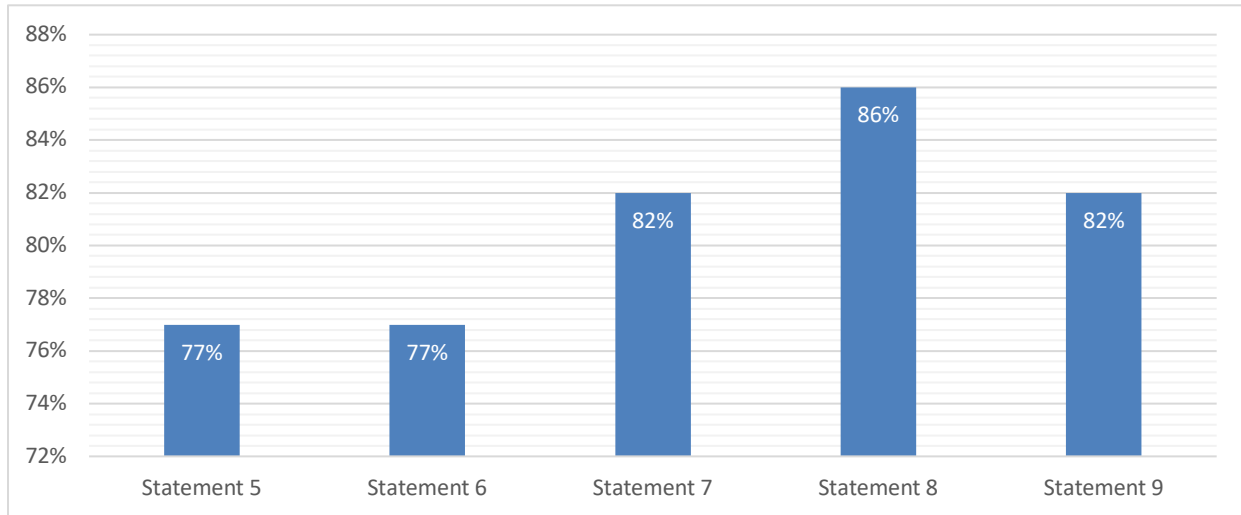
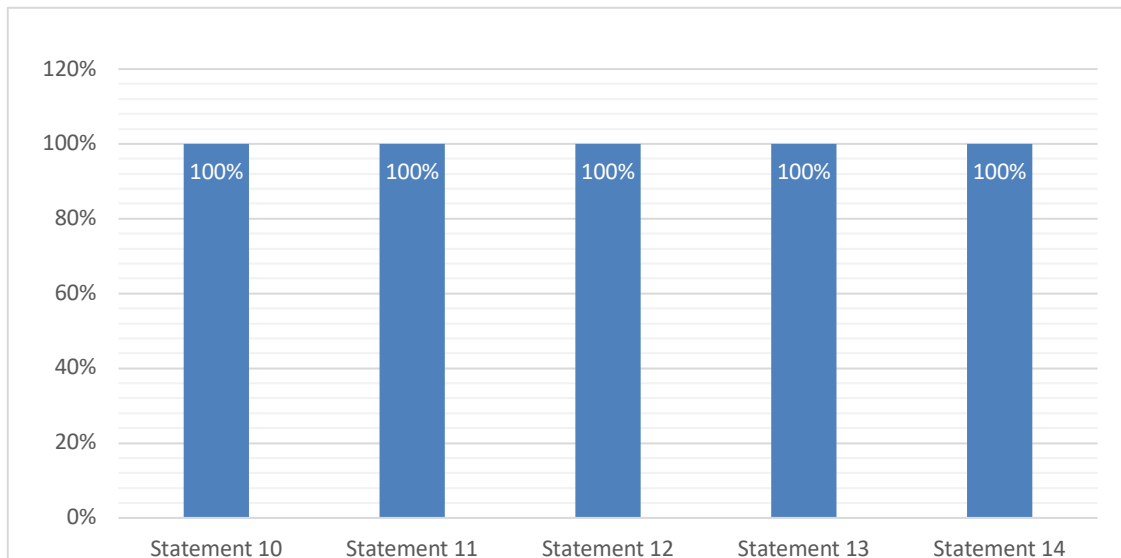


Figure 6

Students Unanimously Favored the Weekly Check-ins and Small Group Recitations



More than 95% of the students responded favorably to the weekly formative assessments. When asked to respond to the statements, "What study tips would you give to your peers on how to approach this exercise for the best results? Describe your unique method of approaching this exercise," many of them were eager to share their advice with their peers (Table 3).

Discussion

The students responded favorably to the organization of the weekly formative assessments, and all students agreed that the repetition of information in weekly assignments and weekly check-ins were very helpful with the oral exams. The amalgamation of intentional content, deliberate practice, and a highly supportive liminal environment had the desired effect on mastery learning (see Figure 2). More importantly, it became apparent that it is possible to assess whether a student is learning for familiarity, proficiency, or mastery based on their oral exam performance (see Table 2 and Figure 3), which is difficult to discern in a more traditional written or objective type exam. The mastery design guided by deliberate practice principles helped student engagement to the extent that students were able to think and speak like physiologists.

Table 3

Study tips to Peers on how to Approach an Exercise

Formative Assessment	Level of Difficulty	Study tips to peers on how to approach this exercise
Write/Sketch	Low	<ul style="list-style-type: none"> • Good to keep specially for any oral exams • Have fun drawing and writing down the notes while you learn them!
Play Posit Quiz	Moderate	<ul style="list-style-type: none"> • Watch the video at least twice • Focus on the videos first, bypass the questions until u understand. Take Many notes, small details can be important for the next step. Repetition is your friend.
Quizlet Quiz	Moderate	<ul style="list-style-type: none"> • Take detailed notes of the material provided and go through the flash cards first to learn the material • Do all of them. It helps a lot!
Google Quiz	Difficult	<ul style="list-style-type: none"> • Don't get discouraged if you do not get everything right on the first try. Use what you learned from playposit as well as quizlet to complete this. Keep trying until you have a better understanding of what is being presented to you • The google quizzes helped a lot with testing my knowledge on all the information I learned with the quizlet, and playposit. I think they were really beneficial - using your notes from playposit and understanding the concepts will help you complete your google quiz's successfully
Teach it!	Difficult	<ul style="list-style-type: none"> • I love "teach it" as it applies to real life scenarios, and you need to understand the material in order to teach it thoroughly which can give clarity on the cause and effects and allows you to start recognizing patterns or even curiosity to solve different clinical scenarios that it might relate to.

Viewing mastery learning as a threshold experience was reassuring to me when students would become stuck or discouraged with the process. Students found the process of mastery learning to be challenging, time-consuming, and even nerve

wrecking, thereby providing support for the troublesome nature of a threshold experience (Land et al., 2005). Most students who successfully emerged from this experience were also transformed by it (see Figure 3). For example, there was the realization that they needed to understand and not just memorize physiological concepts.

Nearly all the students (90%) felt that preparing and taking oral exams was a powerful learning experience. Many were surprised that they were able to “talk physiology” to their friends and family members, which was perhaps the most transformational change, making mastery learning a threshold concept (Meyer & Land, 2003). About 90% of the students entered the liminal space. They engaged in deliberate practice hoping to achieve conceptual clarity and demonstrate the ability to think and speak like a physiologist. The majority of the students (74%) stepped over the threshold and achieved mastery, thereby showing that oral exams can motivate students to learn for mastery without raising any red flags regarding academic dishonesty—something that has also been observed by others (Schurgers & Qui, 2022).

The construction and maintenance of a warmly supportive learning environment focusing on both esthetic and authentic care (Valenzuela, 1999) paid off with 100% of the students responding favorably to the pedagogy of care model (see Figure 5). They all felt that the weekly check-ins and small group recitation sessions were especially useful. This level of support may have spilled over to their learning experience because even if the deliberate practice was sometimes onerous, the students remained eager to engage at a deeper level and help their peers (Table 3).

Conclusion

From an instructor’s perspective, creating and maintaining optimum conditions for mastery learning to occur was both challenging and exhilarating. This was indeed a threshold experience. It was troublesome because of the extensive planning involved before the semester began and the laborious progress tracking that occurred throughout the semester. However, to observe student growth over the course of the semester during the weekly check-ins, small group recitations, monthly oral exams and the final oral exam was truly a powerful experience.

With the rapid improvements in educational software, it should be possible to streamline progress tracking and simplify the workflow for both the student and the instructor, thereby making mastery learning via oral exams even more attractive. On the flip side, fears of plagiarism arising from the abuse of artificial intelligence can be allayed by a well-planned oral examination. The oral exam, when designed to humanize the learning experience, can create a learning sanctuary for students in an online environment.

Conflicts of Interest

The author declares that there is no conflict of interest regarding the publication of this article.

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