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Impact of the Classroom Learning Environment on Graduate Health Science Students' Clinical Reasoning

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Abstract

Purpose: The purpose of this study was to investigate how learning in two graduate health science courses at a comprehensive state university was structured and provided opportunities for clinical reasoning.
Method: This study adopted a grounded theory approach. Participants included two graduate instructors, one in Occupational Therapy (OT) and one Communication Disorders (CD), and their students (n = 62). Three data sources included transcripts from 36 h of instructor–student discourse within graduate health science classrooms over the course of a full semester, detailed field notes about the environment and instructor–student interactions, and transcripts from in-depth, open-ended interviews with each instructor focusing on their intended participation frameworks and scaffolding strategies.
Results: The findings indicate that students' demonstration of clinical reasoning skills in the classroom were impacted by the participation frameworks instructors adopted and that instructor perceptions did not always match recorded interactions.
Discussion: The pedagogies instructors use, the social dynamics in the classroom, class structure and format, and instructor expectations are highly influential on the high-level problem solving required in clinical reasoning that graduate health science students need to demonstrate.
Conclusion: Results of this study highlight how instructional practices can inadvertently undermine the clinical reasoning skills students demonstrate in the classroom environment and are representative of a common struggle in education.

Keywords: Clinical reasoning; Active learning; Health science

1. Introduction

Clinical reasoning skills are essential for employment in the health professions and are therefore a chief focus in graduate health sciences training, along with technical skills and theoretical knowledge.[1–3] Much previous research on clinical reasoning has focused on its use in medical and nursing training.[4–6] Although such research may be broadly applicable to other health science programs, studies specific to ancillary health fields is limited.

The high-level thinking skills used in clinical reasoning are required competencies set by health

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professions organizations and governing bodies.[7–12] In order to better address these competencies instructional philosophies and practices have shifted over the past few decades from teacher-centered approaches toward student-centered approaches. These approaches include collaborative hands-on learning that challenges students to actively engage in the learning process, utilize higher level thinking necessary in clinical reasoning and decision making, and reflect on their learning.[13–17] This collaborative learning should be purposeful and include both peer-to-peer interaction and interaction with the instructor who takes on the role of facilitator.

Collaborative active learning models assume that participants interact as they work together on a task with the ultimate goal of learning from both the task and the teamwork. When carefully constructed, such active learning encourages student engagement in the learning process and ownership of their own learning. As Rotgans and Schmidt[18] assert, instructors play an influential role in increasing students' situational interest and active participation. This engagement promotes the knowledge construction, higher-level thinking, and problem-solving skills that students will eventually use to formulate recommendations for patient care.[19–22] Consequently, students learn to make assessments about patient care and justify their thinking; however, they often struggle to synthesize multiple kinds of information and make sound clinical decisions. The instructor's role is pivotal, as students in collaborative problem-solving groups often find it difficult to weigh multiple factors in the decision-making process. However, as Pinnock and Welch[23] found experts in clinical reasoning often utilize processes unconsciously and may need to explain how they are thinking to their students through cognitive apprenticeship.

Consequently, teaching strategies that employ scaffolding to increase learner understanding are more effective than teacher-centered lectures.[24,25] Hence, instructors and students must engage in purposeful discourse with carefully constructed, high-order questions so that, as experienced clinicians, they can provide guidance in making diagnostic and clinical decisions, provide supervised practice, give effective feedback, and engage in meaningful discussion with the students.[23,26] Along the same lines, Hmelo-Silver[27] argues that experts can initially guide novices through the learning process by scaffolding learning, modeling skills, and coaching students through the clinical decision-making process. For instance, when considering a plan of care for a patient with dementia, instructors might ask what physical and cognitive factors may impact the patient's safety when determining appropriate adaptive equipment. Instructors may then guide students' thinking via open-ended questions to provide an opportunity for students to formulate a clear rationale for their clinical decisions, (e.g., Why would one choice be more appropriate and what other factors would we need to consider?) Later, the experts' support can fade as the novice's clinical reasoning skills improve.[27] Purposeful, facilitated discourse between instructors and students is therefore a vital part of learning.[28–32]

The development of clinical reasoning in health-related fields assumes verbal interaction, particularly between instructors and students; social interaction and language use are vital in active learning processes in which students construct their knowledge with the help of more expert others.[28,30] Therefore, meaningful discussion between instructors and students that models higher-level thinking and provides feedback and guidance is critical to students' cognitive and professional development.[23] Often instructors offer the opportunity for students to engage in simulated or real-life application of content knowledge and then guide students in the decision-making process about a plan of care. These interactions, therefore, play a key role in guiding students to think independently. Hence, graduate health science training programs shoulder a great responsibility in preparing students to engage in clinical reasoning and meet the expectations of critical thinking and high-level reasoning that are among the required standards across health care disciplines.[7–12]

2. Theoretical framework

Understanding the workings of complex peer-to-peer and student–instructor interactions within health professions classes can be difficult. We have found Garrison's[33] Community of Inquiry (COI) framework helpful in addressing the teaching, social, and cognitive issues raised in such classes. Garrison[33] argues that "thinking collaboratively is an essential component of innovative thinking and learning" (p. 2) but structuring the environment for this learning is the challenge. Learning itself, as the (COI) framework indicates, is an intersection between the "interdependent elements of cognitive, social and teaching presence" (p. 9). He identifies social presence as relationships that encourage free and open communication and cognitive presence as the guidance ensuring student progress to high level thinking and application of knowledge. He argues that collaboration is critical to development of

high-level thinking and learning and proposes the teaching process as the purposeful learning transaction characterized by active engagement, proportional contribution of all participants, and distributed authority to regulate the learning. Finally, he[33] argues that although the teaching responsibility in a collaborative group initially falls on the instructor, the group members should eventually take on more responsibility for the teaching process. As a result, the role of the instructor should gradually shift toward that of a facilitator. Consequently, novice learners need coaching and practice[23] so that when instructors effectively facilitate student collaboration, active engagement, and high level problem-solving they can ensure students will meet healthcare standards. Fig. 1 depicts this study's theoretical framework.

Health Science training programs, such as OT and CD, provide coursework that includes foundational theories and content. They also provide opportunities for students to actively engage in discourse with the instructors about clinical cases as a means to develop clinical reasoning skills. In these programs, courses could include a lab session during which students engage in simulation activities to practice hands-on therapy techniques, and problem-solve clinical situations. Instructors may also present students with case study scenarios. During these active learning opportunities, instructors should engage students in high-level thinking through carefully constructed divergent questions in order to monitor their ability to construct rationales and use problem-solving skills. Simulation and case study scenarios therefore, are both strategies for preparing students to enter hands-on fieldwork placements and eventually the work force.

We wanted to better understand how the interactions in two non-medical health professions classes might be studied using such a framework. Using a constructivist perspective, our research questions included: 1) How is learning in two graduate health sciences classrooms structured? and 2) How do the classroom structures contribute to students' demonstration of clinical reasoning?

3. Methods

3.1. Overview and objectives

We situate this study in a constructivist framework. In this study, a grounded theory design allowed examination of data, particularly instructor–student patterns of discourse in graduate health science programs in the real-time context of the classroom in multiple disciplines at one university over time. It also allowed examination of semi-structured interviews of instructors, and detailed field notes. Institutional Review Board approval was received by Rowan University in November 2016 and the study was conducted between January and May 2018.

3.2. Context

The research for this study was conducted at a comprehensive university in the Northeastern US which offered several graduate Health Science programs. The OT and CD programs were specifically selected for several reasons. First, the programs were similar in length, credit hour requirements, numbers of students, and requirements of hands-on fieldwork.

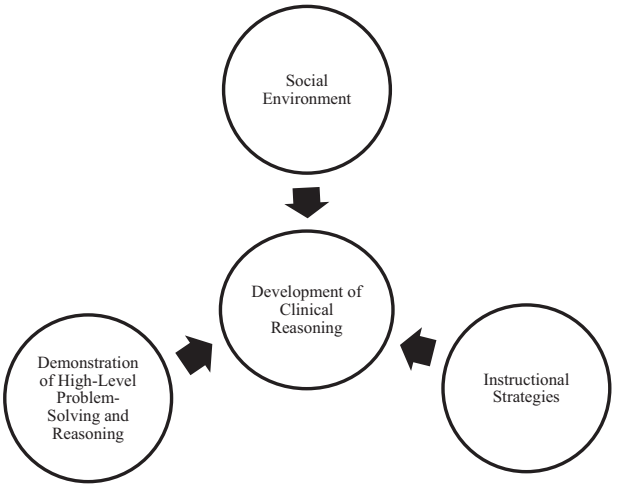

Fig. 1. Theoretical framework.

Second, the student participants followed similar prescribed sequences of coursework prior to off-campus fieldwork placements. Third, all participants were in the second year of their programs. Last, both disciplines adhere to similar standards of practice and competencies that include expectations of decision-making skills, use of judgment, and integration and application of theoretical knowledge[7,10] that require practicing clinicians to pass nationally recognized certification exams and adhere to professional standards that include the expectation for clinicians to engage in high-level problem solving and reasoning, to collaborate with other healthcare professionals, and to interpret and synthesize all information to develop appropriate treatment plans. In order to help students develop clinical reasoning skills to meet those professional standards, the instructors adopted an active learning approach to instruction that incorporated leaning through simulation of skills, clinical case studies, and hands-on skills practice.

3.3. Participants and recruitment

Participants were selected using purposeful sampling. Instructors of courses that fell in the second year of the curriculum who also used active learning strategies that encouraged instructor–student interaction and collaboration were selected to participate. Participants included two graduate instructors, one OT and one CD, and their students (n = 62). All participants self-selected pseudonyms in order to maintain confidentiality.

3.4. Data collection

Three types of data were collected. The first and primary data collection included recordings from instructor–student discourse within two graduate health science classrooms over the course of a full semester. Each course met once weekly for a total of 3 h. Data were collected over six sessions per class over a period of three months, totaling 36 h of audio recordings.

Data also included detailed field notes about the environment and instructor–student interactions. Finally, in-depth, open-ended interviews of roughly half an hour were conducted with each instructor. Interview questions focused on their intended participation frameworks, scaffolding strategies, and strategies to guide students to employ high-level thinking and problem-solving.

3.5. Data analysis

First, all audio recordings were transcribed verbatim. Data analysis was conducted in three cycles. All transcripts were reviewed and open coding, which "provides a starting point to provide the researcher with analytic leads for further exploration"[34] (p. 101) was employed in the initial iteration. Utterances for both the instructors and students were initially divided into three general categories: social interaction, demonstration or modeling of high-level thinking and problem solving, and instructional strategies.

Pattern coding was used to "identify an emergent theme, configuration, or explanation" (p. 210) during the second iteration.[34] We used Garrison's[33] COI framework, as a model to define social interactions that occurred in the classroom. Garrison's[33] COI framework and Garrison, Anderson, and Archer[35] were helpful in identifying and defining the categories of high-level problem solving that instructors modeled and students elicited during their interactions. These demonstrations of high-level thinking were labeled on a continuum from lower-to higher-level thinking as triggering event, exploration, integration, and resolution. Similarly, Shea, Li, and Pickett[36] and Garrison's[33] COI framework were useful in categorizing instructional activities that occurred in the classroom as design, facilitation, and direction.

Third, we realized the need to further subdivide the three larger categories. Social interactions were divided into three subcategories. Utterances were identified as "Group identity" when participants made references such as "we" and "us" and indicated being part of the collective group about the immediate topic. Utterances were designated as "Non-group identity" when they lacked reference to the collaborative group during a discussion about the topic. Finally, utterances without references to the collaborative group or to the topic were identified as "Non-group/non-identity".

Each of the four high-level problem-solving categories that instructors modeled or student exhibited were also further divided. The category of triggering events was subdivided into problem identification and sense of puzzlement (i.e., asking convergent questions). Exploration was divided into recall of facts, suggestions for consideration, and leaps to conclusions. Integration was divided into convergence and judgment, and resolution was subdivided into application to the real world and defending solutions.

Similarly, each of the three instructional activities was subdivided into more specific codes. For example,

design was subdivided into expectations and topic identification. Facilitation was further segmented into identifying areas of agreement/disagreement, seeking to reach a consensus/understanding, encouraging, acknowledging, or reinforcing students, prompting discussion, and assessing the efficacy of the process. Likewise, the direction of instruction was divided into presenting content, summarizing the discussion, confirmation of understanding, diagnosing misconceptions, and injecting knowledge. Thirty-one instructor–student segments of discourse were selected to be cross coded by both authors. Disagreements were resolved though discussion. Finally, following the coding and analysis of the transcripts from the instructor–student discourse during large group instruction, the data were compared and contrasted with the transcripts from the instructors' semi-structured interviews.

Last, audio recordings of classroom interactions were assigned to one of three categories: instructor utterances, student utterances, and other activities, (e.g., videos, transitions, reading silently, guest speaker, class breaks) where neither the instructor nor the students were interacting verbally in the learning environment. Sound clips were then successively stacked in respective trays using the 2017 version of Adobe Premier program to calculate total talking time for each data collection session.

4. Results

In this study we investigated how learning in graduate health science courses was structured and provided opportunities for clinical reasoning in two graduate health science courses. From the instructor–student discourse, we identified three major themes: the social environment, instructor modeling and student demonstration of high-level problem solving and reasoning, and instructional strategies employed.

4.1. Social environment

Both instructors described the social environment in their classrooms as interactive. One instructor discussed the benefits and challenges of group dynamics in the classroom and the strategies she uses to encourage collaboration and discussion.

> I think sometimes, depending on the overall dynamics of the class is how effective their collaboration is. 'Cuz sometimes they feel really comfortable with each other and they are not afraid of looking stupid when I'm asking them a question…or if they kinda keep each other on task, or if someone goes off task, they feel comfortable bringing them back in. Other times I think that they're not as comfortable with each other and then it's a lot of…like you know…I have to walk around and kinda keep prompting them…and so overall, I think they use each other a lot.

The other instructor spoke about creating an inclusive and collaborative learning environment through respect.

> I think I try to create an environment where students feel respected…where they feel that they are learning actively…and where there's an excitement about the topic and a respect for them in terms of where they are in their thought process.

When asked what student collaboration looks like in her classroom, the instructor continued,

> "…so they're talking to each other…they are trying to think through a problem when they work in their small groups".

Despite their attempts to encourage a collaborative environment during active learning opportunities, often the instructors unknowingly undercut the creation of a safe and cohesive group by overwhelmingly modeling nongroup identity, ("I" and "you") vs. group identity ("we" and "us") across all sessions. The instructors used group identity references a total of 240 times and non-group references 936 times (3.9 times as many).

4.2. Eliciting high-level problem solving and reasoning

Questions are common in all types of classrooms and are often used by instructors to actively engage students in the learning environment. Convergent questions, also referred to as closed questions, are used with the intention to elicit a specific response.[37] An example of convergent questions would be: "So, what kind of hearing loss would this be? Conductive or sensorineural?" These types of questions are often referred to as lower level questions.[37] Conversely, divergent questions, also referred to as open questions, encourage a wide variety of responses that stimulate discourse or explore varying issues surrounding a topic and are referred to as higher level questions.[37] Examples of divergent questions may be, "What else…What other takeaways?" or "What do you think?" Both instructors stated that they promoted higher level

reasoning by engaging students in discourse through the use of open-ended questions to facilitate student discussion and to provide opportunities for active learning. One instructor stated a more general approach.

> I try to use open-ended questions as much as I can so, you know, but connect to whatever we were just talking about in class…I start out I think more broad and I then I kinda let them guide me on how specific I need to be. So, if my question is too broad and they're not understanding what I'm asking, then I might start to get a little bit more specific but I like to kinda keep it open and see where their discussion leads us.

On the other hand, the other instructor incorporated a specific framework of high-level thinking that she modeled for the students.

> I think I told you I use a model of cognitional structure that…it's based on the work of Bernard Lonergan…it's a four level…His model is actually much bigger, but for teaching I use 4 levels… experience, understand, judge, decide…it's a four-level model. And in each level what I ask them to do is step out and…so experience is what you know from just…you know…sensory input, so when you see your patient, what do they look like?

The instructor continued:

> You start to make some decisions to get them to recognize, what do I know? What questions do I have?.. so, we stop…we do this kind of in parallel so I have them do a case and then at the same time, say OK…so I just experienced…now let's go out to the model…what do you know, what questions do you have? Now let's go to understand…you know, how are you going to begin to understand about them? In this task, so and then what other questions are you going to have, so I try to get them to check in with their own thought process so that they have an understanding about where they are in their clinical reasoning about this patient…are you ready to make a decision about an intervention or even an assessment tool…you may not be because you don't know enough yet to put you on a particular path.

Even though instructors identified using open-ended questions and providing models as a means to encourage student interaction and promote high-level thinking, they were not as effective as they assumed. The instructors perceived that they elicited high-level thinking by modeling the decision-making process and through the use of open-ended questions. Although the instructors often asked both convergent questions (sense of puzzlement) and divergent questions (prompting discussion) as a means to prompt classroom discussion and student engagement they did not routinely model their own thinking to guide that of the students. Although the use of convergent questions was an effective means for instructors to check the students' understanding of factual knowledge, it did not effectively advance the students' thinking. On the other hand, the use of divergent questions elicited some higher-level thinking but was not used consistently. Further, because student talk was often directed to the instructor rather than to peers there were limited opportunities for critical discourse and collaboration that demonstrated clinical reasoning. The number of convergent questions the instructors modeled initially varied but then gradually decreased over the six data collection sessions (n = 38, 74, 22, 22, 12, 7), however, the divergent questions presented also decreased over the data collection sessions (n = 100, 86, 74, 72, 63, 42).

The students' responses to the instructors' questions were divided between lower level and higher-level thinking. The frequency of low-level reasoning students demonstrated varied across data sessions. Students frequently asked their own convergent questions (sense of puzzlement) to obtain factual information (n = 17, 9, 15, 11, 48, 29). They also responded to questions by recalling and stating factual information (n = 34, 77, 1, 21, 1, 58), and more often offering suggestions for others to consider (n = 56, 39, 42, 45, 54, 42). The frequency of higher-level reasoning students demonstrated either decreased or varied but did not gradually increase across the data collection sessions (convergence n = 9, 5, 19, 9, 19, 10, application to real world n = 46, 23, 23, 18, 16, 18, and defending solutions n = 27, 33, 32, 13, 31, 30). These results are shown in Table 1 and indicated that the instructors' use of a cognitive framework and questions to elicit high level thinking during classroom discourse did not yield a steady increase and were not as effective as they perceived.

4.3. Instructional strategies

Both instructors asserted that they actively engaged students in dynamic discussions to elicit high-level reasoning and hands-on practice but acknowledged that they still incorporated lecture. Both instructors assigned readings for students to complete prior to class so they were prepared for discussions during class time. One instructor stated.

Table 1
Frequency of instructor vs. student utterance types-cognitive process.

Presence	Category	Code	Data Session					
			1	2	3	4	5	6
Instructors								
Cognitive	Triggering event	Sense of puzzlement	38	74	22	22	12	7
Students								
Cognitive	Triggering event	Sense of puzzlement	17	9	15	11	48	29
	Exploration	Recall of Facts	34	77	1	21	1	58
		Suggestions for consideration	56	39	42	45	54	42
	Integration	Convergence	9	5	19	9	19	10
	Resolution	Application to real world	46	23	23	18	16	18
		Defending solutions	27	33	32	12	31	30

I think the way I anticipate this being structured, is I would still do a lecture but hopefully not as much… or I can do voice-over recordings and they let them review that on their own prior to coming…. And then spend more time doing…like case studies… where they have to answer specific questions about cases and then we can go over the practical skills…

Similarly, the other instructor stated.

…So, the class…the way I set up every class that I teach, is that there has to be a lot of give and take during the class. So, I'm not the sage on the stage where you stand up and lecture for the whole time. That's not engaging, certainly I don't think that's the way to stimulate critical thinking students in graduate students because they are not brand new, they are experienced. At their level, they have had a lot of clinical experience and because we are talking about challenging cases, I like them to weigh in on the kinds of individuals they've interacted with out in the field and how their experiences are the same or different from the literature.

Later she added, "usually there is a lecture and it is engaging…I engage them in questions back and forth".

Both instructors perceived that they engaged students regularly and described their intent to facilitate class discussions, but both adopted roles as class director and neither overtly shifted toward a facilitative role. Audio recordings of classroom discourse indicated that even though instructors actively engaged students in some discourse, instructor talking time was consistently about two to three times as long as that of the students. These results are displayed in minutes and seconds (mm:ss) in Table 2.

Furthermore, the instructors consistently controlled the design of the instruction across all data sessions by setting the expectations within the classroom (n = 44, 29, 45, 41, 114, 55). The instructors' relied on encouraging/reinforcing students (n = 120, 101, 74, 33, 151, 57) and prompting discussion using divergent questions (n = 100, 86, 74, 72, 63, 42) to facilitate discourse with the students. To a lesser degree, instructors identified areas of agreement and disagreement (n = 13, 18, 30, 33, 16, 7). Finally, rather than gradually shifting from instructor to facilitator, the instructors directed and maintained control of instruction rather than distributing responsibility to the students over all data sessions. Both instructors relied heavily on lectures to present course content (n = 75, 56, 47, 41, 17, 46), often injected their personal knowledge and experiences before students had opportunities to offer their own (n = 60, 40, 49, 22, 43, 36), and to a lesser degree confirmed students' understanding (n = 51, 44, 34, 41, 48, 19). These results are shown in Table 3 and indicated a disconnect between that instructors' perceptions and the instructional frameworks they adopted.

Across the data collection sessions, both instructors assumed the role of class facilitator (n = 1090) only 1.41 times as often as compared to when they served as

Table 2
Speaking times vs. other activities (in minutes and seconds).

	Data Sessions					
	1	2	3	4	5	6
Instructors	156:44	177:27	169:57	148:41	161:48	144:29
Students	51:16	32:39	57:12	69:54	45:29	124:00
Other	86:20	77:38	51:44	31:57	118:12	71:32
Total time	294:44	287:44	278:59	250:32	325:59	340:01

Other activities-video presentations, guest speakers, class breaks, silent reading, small group discussions (student–student).

Table 3
Frequency of instructor utterance types-teaching presence.

Presence	Category	Code	Data Session					
			1	2	3	4	5	6
Teaching	Design	Expectations	44	29	45	41	114	55
	Facilitation	Identifying areas of agreement/disagreement	13	18	30	33	16	7
		Encouraging, acknowledging, or reinforcing student	120	101	74	33	151	57
		Prompting discussion	100	86	74	72	63	42
	Direction	Presenting content	75	56	47	41	17	46
		Confirming understanding	51	44	34	41	48	19
		Injecting knowledge	60	40	49	22	43	36

the class director (n = 769). Additionally, the frequency of instructor direction generally decreased over the data collection sessions. Similarly, the instances of instructor facilitation also decreased, with the exception of a sharp increase in student encouragement during one session (week 5). This comparison is shown below in Fig. 2.

5. Discussion

Graduate health science programs assume the responsibility for preparing their students for employment in health-related fields. Two of these responsibilities include meeting requirements set forth by professional organizations and governing bodies for

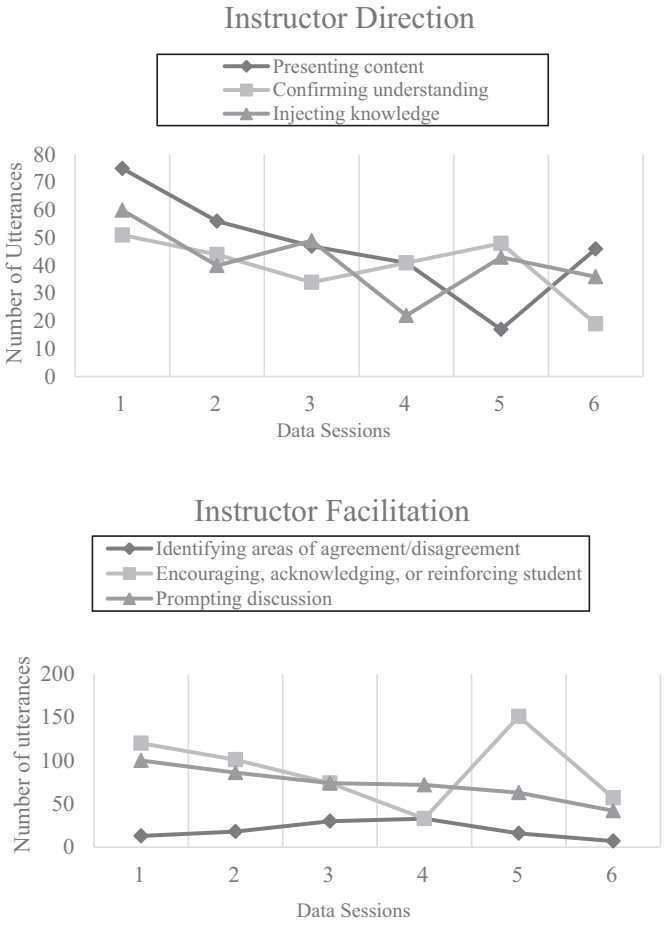

Fig. 2. Comparison of instructor direction vs. facilitation.

students to acquire clinical content knowledge and demonstrating clinical competencies and reasoning.[7–12] This study investigated how learning in two graduate health science courses was structured and provided opportunities for clinical reasoning. The findings indicated that instructor perceptions of the interactions in their classrooms may not match what actually happens. Although the instructors prompted discussions using open-ended questions, their roles were often directive. While direct instruction generally decreased, instructor facilitation did not necessarily increase. As a result, instructors taught, rather than facilitated, their classes. While they often brought valuable insights and examples to their discussions, their presence in the classroom was a teaching presence that commonly interrupted students' contributions. Students frequently did not have the space to work through problems on their own. This was important since the pedagogies instructors use, the social dynamics in the classroom, class structure and format, and instructor expectations are highly influential on the high-level problem solving required in clinical reasoning that the graduate health science students need to demonstrate.

The results have implications for instructor practice, instructional leadership, and curriculum development. Since instructors may have some control over course design and presentation of content, Garrison[33] argues that "teaching presence" not "teacher presence" is a critical component in creating a collaborative community of inquiry. The challenge is how to effectively distribute the pedagogical responsibilities among members of the community.[33] Crichton[38] similarly argues for the importance of social interactions in the learning process; it is imperative that instructors engage students in a meaningful and effective way. To overcome this challenge, Chi[39] proposes a framework that defines and categorizes students' overt behaviors in the learning process and can be useful in planning effective instruction. The ICAP Framework predicts that as students' cognitive engagement increases their learning also increases.[39] Further, the ICAP framework provides suggestions of ways to create learning tasks that encourage higher levels of student engagement. Therefore, the way instructors design learning tasks may increase or decrease student engagement which may range from *passive* to *active* to *constructive* to *interactive* engagement.[39] Simply put, passive engagement indicates the lowest level of learning in which learner is receiving information without overtly doing anything in the learning process, (e.g., listening to a lecture) and active behaviors involve some form of motoric or physical interaction with the learning materials, (e.g., highlighting text). Chi[39] defines constructive behaviors as actions that result in the students generating additional products beyond what was originally presented, (e.g., creating a concept map). Thus, when all members of the group contribute constructively, the result is interactive behaviors, the highest level of learning.[40]

Considering the ICAP Framework[39] and Garrison's[33] COI Framework as guidelines, several key factors in planning instruction should be considered. First, instructors should aim to create an open and safe environment where students feel safe sharing ideas and challenging each other, and routinely model inclusive language. Second, instructors should be mindful of how they structure class discussions that will engage students while limiting teacher-centered lectures. Though questions are an effective teaching tool and strategy to engage students,[26] instructors should carefully construct divergent, open-ended questions that will elicit high-level thinking from their students. Third, instructors should overtly expect students to justify their reasoning. Simply asking "why" provides the opportunity for instructors to evaluate the students' understanding and offers students the experience of higher-level thinking. Finally, instructors should resist the temptation to provide answers and share personal experiences too quickly.

The instructors in this study controlled the course design and facilitation of discourse with little impact from students. Osterman and Kottkamp[40] advocate the importance of reflective practice as a meaningful strategy to promote personal learning and behavioral changes. Instructors can use reflective practices to consider how best to incorporate more student-centered instruction in their classrooms. Furthermore, instructors can evaluate the effectiveness of their instructional practices and collaborate to incorporate effective active learning designs into the program curriculum.

6. Limitations

This study had certain limitations. Although the classes spanned two disciplines, it was conducted at one university and did not include Physical Therapy, another health science field. Therefore, the findings may not be representative of instructional pedagogies and class structures all graduate health instructors

adopt and may not be applicable to all health science disciplines.

7. Conclusion

Results of this study highlight how instructional practices can inadvertently undermine the clinical reasoning skills students demonstrate in the classroom environment. In addition to reflective practice, this study revealed that the pedagogies instructors adopt, particularly the structure of class time, types of questions instructors use to facilitate classroom discourse and engage students, and specific expectations to provide rationales and challenge each other, are highly influential on the clinical reasoning skills graduate health science students display in the classroom. In a broader sense, as instructional practices continue to shift toward active learning strategies to help students develop higher level thinking skills, the findings of this study were not necessarily course-specific but rather representative of a common struggle that has emerged in all of education. Moreover, these findings highlight the tensions that emerge and the challenges that all instructors encounter when creating an environment that incorporates student-centered instruction.

Declaration

Institutional Review Board (IRB) approval and Consent to Participate: Institutional Review Board approval was received by Rowan University in November 2016 and the study was conducted between January and May 2017. All participants signed a consent form, and confidentiality was assured by securely storing data.

Competing interests

The authors declare that they have no competing interests.

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