

Observation and Assessment of Faculty Development Learning Outcomes

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Abstract: Prior research has found that participation in course offerings provides a means of professional development and results in changes to faculty beliefs and instructional practices. However, as with most professional development initiatives in education, little is known about the sustainability of these training efforts. The research question that guided this study was the following: Do professional development efforts in teaching result in observed learning outcomes among faculty members? In this study, teaching observations served as the primary data source. Twelve faculty members (six in the College of Dentistry and six in the College of Health and Human Performance) who completed two six-week teaching seminars in fall 2006 and spring 2007 or spring 2008 and summer 2008 were asked to participate in a classroom observation and an interview lasting no longer than forty-five minutes. Six dental faculty members and three faculty members from the College of Health and Human Performance agreed to participate in the study. Three standardized reviewers conducted these classroom observations during fall 2008, spring 2009, and summer 2009. An active teaching rubric was used to evaluate the class transcripts. The findings revealed that participants somewhat frequently to frequently used questions that were open-ended or checked for comprehension. Seven of nine instructors made extensive efforts to engage the students interactively throughout the teaching session. Six of the participants infused the description of actual or hypothetical cases to illustrate the connections between teaching and patient care, while six utilized reflective practices. Findings from the interviews corroborated the observations. Overall, the findings showed that participants demonstrated the integration of those strategies that were taught during the seminars, which were consistent with teaching critical thinking skills and showed that the learning acquired during professional development initiatives was sustained.

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Studies of faculty development programs in the dental, medical, and nursing health sciences as well as higher education have increased over the past three decades.^{1,2} Previous research,³⁻⁸ systematic reviews,⁹ and commentaries¹⁰ emphasize that the preparation of health care professionals for teaching is essential for enhancing teaching effectiveness, faculty recruitment and retention, academic excellence, and innovation. Research also indicates that participation results in changes to instructional beliefs and practices.^{9,11-13}

While participants have reported personal value and a more positive teaching culture following their immersion in faculty development programs, there is a paucity of data about the sustainability of knowledge, skills, and practice in the health sciences professional development literature. In the systematic

best evidence in medical education (BEME) study, Steinert et al. reviewed articles (n=303) on faculty teaching; fifty-three met the inclusion criteria related to faculty development in teaching. These studies included randomized controlled trials (11 percent, n=6) and quasi-experimental (89 percent, n=47) designs. Qualitative analyses were incorporated in 21 percent (n=11). Researchers reported using end-of-workshop questionnaires, pre- and posttest measures to assess attitudinal or cognitive changes, student and resident assessment of faculty teaching, self-assessment of post-training performance, and direct observations of teaching behavior to evaluate faculty development programs. Questionnaires were utilized most frequently. All but four of the interventions used a survey or questionnaire. Twenty-nine (55 percent) of the interventions used a questionnaire only; twenty

(38 percent) used a questionnaire and another method (e.g., observation or expert opinion). Most questionnaires were designed for a particular study; however, few reported the psychometric properties of those instruments. Sixteen studies (30 percent) included direct observation (of live or videotaped teaching sessions) as part of their assessment. One study assessed student exam scores; another included patient ratings of resident behaviors. In many studies, the response rates for outcome measures were low or unspecified; statistical methods or differences were often not described. Only eight of the BEME articles reviewed scored 4 (or higher) for both study quality and strength of findings.⁹ Few studies explored the sustainability of changes beyond the study of the actual faculty development process.

Researchers who have looked at faculty development sustainability include Mahler and Benor, who evaluated the effects achieved following a four-day multidisciplinary (basic and clinical science teachers) teacher-training workshop. The goal of these sessions was to change teacher behaviors by increasing student verbalization, rather than just teacher talk, and to increase the cognitive level of verbal exchanges. Baseline performance was measured. Following the workshop, 161 lessons among sixty teachers were observed and rated by students, who initiated the activity and the kind of activity. Raters were trained and used validated methods and criteria. Postworkshop measures revealed an improvement in teacher performance on student verbalization ($d=0.50$ to 0.82), and the cognitive level of verbal changes increased ($d=0.10$ to 0.54). The observations occurred over 500 days. No significant regression occurred in the activity dimension over time. However, moderate decreases were observed in the cognitive dimension after 270 days, supporting the need for supplementary intervention.⁵

In another study, Mahler and Neumann examined the effects of the previous workshop on the cognitive dimension of instruction. Sixty faculty members were observed by trained, blinded sixth-year medical students using three videotaped lessons of each participant, taken before and after the intervention. The students rated changes in teaching behavior and cognitive versatility at Bloom's taxonomy levels of comprehension, application, and evaluation across all classroom settings.⁷

The availability and effectiveness of faculty development have been identified as predictors of the success or failure of reform initiatives in health

professions. Hendricson et al. indicate that faculty development related to teaching and assessment strategies is essential to the introduction of new curricular approaches and to modifying the dental educational environment.⁴ Developing ways to represent teachers' professional knowledge can help in transferability of skills and can therefore be both useful and valuable to others.¹⁴ One challenge that Loughran et al. acknowledge is the difficulty associated with trying to describe, articulate, and document teachers' professional knowledge in ways that show its nature in practice. Dalrymple et al. found that professional development in PBL instructional methodologies supported revision to a PBL curriculum. They used scenario-based discussions, mock group demonstrations, role-modeling, and role-play to familiarize participants with process-based assessment and feedback. Overall, the participants reported feeling satisfied with the methods and content of the workshop.¹⁵⁻¹⁷ Laberge et al. conducted a long-term outcomes study of a Genetics in Primary Care (GPC) Faculty Development Initiative. Visits were performed at nine sites while individual phone interviews were conducted at eleven sites using a standardized questionnaire four years after participating in the GPC project. One hundred primary care physicians and genetics professionals across twenty teaching medical universities in the United States participated in the training. Overall, 95 percent of the respondents reported having made changes to their formal and informal teaching practices.¹⁸ Laberge et al. reported the long-term outcomes of a primary care faculty development program at the University of Wisconsin. Their program included a year-long series of five weekend workshops that prepared preceptors to teach curricular areas relatively new to medical education. Participants included physicians in community-based practices and university-based physicians. Those surveyed included preceptors teaching medical students and residents ($n=100$ of the 105) from the seven groups graduating between 1996 and 2003. Self-reported outcomes attributed to the program included improved teaching skills and clinical skills, intrapersonal growth, increased self-confidence, increased interdisciplinary networking, and mentoring.

Still needed are studies that explore whether the sustainability of changes in instructional practices can be observed (without supplementary interventions). If so, how would those changes be described across a group of faculty members? To address

these questions, this study focused on the following question: Does professional development aimed at promoting the use of student critical thinking strategies result in observed faculty teaching outcomes one year later?

Methods

Twelve faculty members (six in the College of Dentistry and six in the College of Health and Human Performance) who completed two six-week teaching seminars during fall 2006 and spring 2007 or spring 2008 and summer 2008 were asked to participate in a classroom observation and an interview lasting no longer than forty-five minutes. Six faculty members in the College of Dentistry and three in the College of Health and Human Performance agreed to participate in the study. Each researcher was randomly assigned to observe and interview three participants. The units of analysis were the observations of participant teaching in the clinic and or classroom and interviews with each participant.

To ensure that the researchers were documenting teaching behaviors in the same way, they watched a videotape of a professor teaching oral surgery treatment planning. The researchers took running notes for five minutes and then read aloud what they had recorded. Subsequently, they took notes for three more five-minute intervals; in the interim they discussed what they recorded. This process demonstrated interrater agreement during the last three intervals in how they recorded the instructors' verbal behaviors.

Each instructor was observed during classroom or clinic instruction. Observations were used to document evidence of strategy use that supports the development of students' critical thinking skills. Running notes (documentation of teacher content, question types, time, and style, as well as student responses, comments, and questions) were used to record the instructor's behaviors. Researchers transcribed their running notes into a full text to indicate what the instructors said or did during teaching and how they responded to student learning needs.

A follow-up interview was conducted with each individual instructor. The participants were asked the following questions: 1) What changes did you make in your instructional practices (such as preparing for teaching, providing instruction, developing assessments, and engaging students in investigations

or asking questions) as a result of taking the faculty teaching seminars? 2) What changes in your instructional practices (preparing for teaching, providing instruction, developing assessments, engaging students in investigations, or asking them questions) have you wanted to make but could not? Explain why. Responses to interview question 1 were used as evidence of changes that faculty members believed they had made, while responses to interview question 2 were evidence of the type of changes faculty members hoped to make in the future.

Each line of the observation and interview transcript was numbered sequentially. Subsequently, each researcher used open coding while reading his or her transcripts. Afterwards, transcripts were coded independently by each of the researchers, and they met and discussed the codes within each transcript and searched for commonalities across the teaching dataset. Transcripts of the teaching observations served as the primary data. The two coauthors who did not observe the instructor independently analyzed the transcripts inductively. Subsequently, the authors met and discussed findings from the independent analyses. When differences in ratings were evident, the authors were asked to explain how they arrived at their reasons. The author who observed the instruction was the independent expert reviewer and helped achieve consensus. This process resulted in refining the data set. Observations were rated as discrete events of strategy use. Each author rated the actual number of times a teaching strategy was used, and the scores were totaled. Thus, a rating of 5 or 6 represents frequently (more than eight observations of teaching strategy use that can lead to promoting critical thinking), while ratings of 3 or 4 represent somewhat frequently (four to seven observations of strategy use) and 0 to 2 infrequently (zero to three observations of strategy use). Findings from the secondary dataset, the interviews, were used to corroborate or refute findings that emerged from the observations.

Triangulation of the methods occurred through multiple methods of data collection (interviews and teaching observations), data analysis (open coding and identification of themes, frequency of observations), multiple raters, and the use of different groups of raters across data analysis. Recommendations for the data analysis from Steinert⁹ used in this study included observations to understand how teachers' beliefs changed through an exploration that used qualitative methods as well the use of interviews and observations.

Results

Observations

Overall, as shown in Table 1, findings from the observations showed that all of the participants (100 percent) somewhat frequently to frequently asked questions that were open-ended or checked for comprehension. Seven of nine instructors (77 percent) made extensive efforts to engage the students interactively throughout the teaching session. Six of the participants (66 percent) infused the description of actual, hypothetical, evidence-based cases from the literature to illustrate the connections between teaching and patient care, and six (66 percent) utilized reflective practices and cooperative learning. Findings

from the interviews corroborated the observations. Overall, a majority of participants demonstrated strategy use that promoted critical thinking skills.

Use of questions. Participants' use of questions ranged from use of recitative, comprehension, and open-ended and multilayered questions. Overall, each participant used some form of questioning. Six participants used recitative questions frequently. In a graduate pediatric dental course, while showing slides of patients with craniofacial anomalies, Adrianna asked, "What is the name for bulging eyes?"

Five participants used checking for comprehension questions frequently, while one participant used these question types somewhat frequently and another used them infrequently. While teaching cardiovascular differential diagnoses in physical therapy patients, Sally told students that they must be

Table 1. Participants' (n=9) use of strategies to support students' development of critical thinking skills

	Adrianna	Lucy	Laura	Terri	Chloe	Marion	Sally	Chaim	Walter	
Category 1. Questioning										
Asking students to respond to queries when the response is Type 1, recitative (only the one correct answer is sought); Type 2, check for comprehension (checking for their understanding); Type 3, open-ended questions (allowing for responses that are not predictable); or Type 4, multilayered questions (asking a continuous set of questions one after another without pause).	Type 1. Recitative	6	6	6	6	0	6	6	0	1
	Type 2. Check for comprehension	6	5	5	6	0	2	5	3	0
	Type 3. Open-ended questions	6	6	6	4	5	5	6	3	3
	Type 4. Multilayered questions	6	0	0	4	2	5	3	1	0
Category 2. Patient Case Analysis										
Instruction that used Type 1, hypothetical case (on paper, not a patient in real time); Type 2, authentic treatment (using real-time actual patients in the clinic); or Type 3, evidence-based literature (patient-based scenarios gleaned from a research study to exemplify a principle or concept).	Type 1. Hypothetical case	3	4	0	0	1	2	0	0	0
	Type 2. Authentic treatment	6	0	0	1	0	3	0	0	2
	Type 3. Evidence-based literature	0	0	6	0	0	0	0	0	0
Category 3. Reflective Practice										
Events in which students and/or professors take time to think before they respond.		2	0	0	0	0	0	3	1	1
Category 4. Cooperative Learning										
Learning experiences in which students are expected to work in Type 1, pairs, or Type 2, small groups.	Type 1. Pairs	0	0	0	0	0	0	0	0	0
	Type 2. Small groups	3	0	0	0	1	0	0	0	0
<i>Note: 1 and 2=infrequently; 3 and 4=somewhat frequently; 5 and 6=frequently.</i>										

aware of the warning signs of cardiovascular issues among patients. She asked a series of comprehension questions aimed at assessing student understanding, such as “What are risk factors of cardio problems in general? What pain patterns?” Later she asked, “How much do you have to smoke to be at risk?”

Six participants asked open-ended questions frequently, and the remainder asked these questions somewhat frequently. While looking at images of three patients with craniofacial anomalies, Adrianna asked students to describe what they saw. As they looked at one image, she asked students to use clinical terms, thus emphasizing the importance of using appropriate pedagogical language to the discipline, and asked, “What about the tip of her nose?” Laura’s presentation was on periodontal regeneration. She told the students, “We want to go from perio[dontal] disease to healing the LJE. We want to get back to [the] normal architecture—the ideal.” Then she asked students several open-ended questions, such as “How do we do that? If repair is enough, why do you want to regenerate?” During a presentation on cardiovascular issues in physical therapy patients, Sally asked the students if any of them had ever encountered a cardio emergency and then asked, “Were they under your care? Did you have to help?” Next, she asked students to describe the ways they were required to assist in the patient’s care.

Two participants used multilayered questions at each of the following rates: frequently, somewhat frequently, and infrequently. While supervising students in the endodontics clinic, Marion listened attentively as a student presented a review of a patient’s case and responded by asking a continuous set of questions: “Is this . . . for his tooth? No, we need to know why. What was his blood pressure? What is protocol for blood pressure? At what level can you not treat?” Following the student’s reply, she asked: “What’s the chief complaint? At night? What do you think? What kinds of pains?” This set of multilayered questions was intended to help the student think through the patient’s present symptom, ensure clarity about the patient’s oral health need, and be certain that the student has considered treatment in conjunction with the patient’s underlying medical conditions.

While teaching about femoral nerve injuries, Terri pointed out that the sciatic nerve comes out of the pinitiformis. Then she continued to explore students’ understanding of how innervations affect mobility and functioning by asking the following multilayered questions: “What would I look for?

What do you look for? What if it innervated the glutus mediscus? What do I look for?”

Patient case analysis. Six of the participants used one form or another of patient case analysis including scenarios based on hypothetical or actual patients or evidence-based literature. In a periodontics clinic, Walter reviewed a patient’s treatment plan. After the student showed the plan to the professor and began to explain it, Walter checked the student’s intended plan while he conducted his own physical exam in the patient’s mouth. This type of teaching demonstrates the professor’s oversight and consideration of the student-generated proposed patient treatment plan. The professor’s assessment is based in part on his own oral examination of the actual patient in the predoctoral dental clinic.

Laura used an evidence-based patient scenario that she gleaned from the *Journal of Oral and Oropharyngeal Health* to teach students how to interpret the meaningfulness of results from a published study and how to calculate odds ratios.

Reflective practice. Three participants demonstrated the use of reflective practices infrequently, while another participant used them somewhat frequently. During a class session on legal issues in physical therapy, Chloe asked students to work in small groups to analyze cases. After the students had a chance to read the case, she asked them to think about each situation, talk it over, and then provide the class a quick synopsis of the case and an overview of the legal and ethical contradictions. She required that students think and offer responses within the context of the class session.

In a course about the physical properties of metals, Chaim was discussing corrosion. He told the students that they should be able to differentiate, familiarize, illustrate, and discuss the factors of corrosion and tarnish. After explaining the chemical reactions that lead to each condition and asking a series of open-ended and comprehension questions, as he was nearing the end of the presentation, he asked students to reflect upon the following question: “Can two gold crowns cause corrosion?” In the periodontics clinic, a student asked Walter to review a treatment with her. He replied, “Yes, give me one minute.” He read over the treatment plan, thus modeling reflection in action for this student, and then walked over to examine the patient.

Cooperative learning. Overall, the strategies including team-based or think/pair/share were used infrequently. Two participants demonstrated an infre-

quent use, while another used them somewhat frequently. None of the participants used online discussion, a strategy that can extend learning experiences outside of didactic courses. Adrianna demonstrated one exemplar of cooperative groups when she broke her students into three groups and gave each a different patient-based study. While working together, she asked them to look at the pictures of patients, discuss their clinical significance, and state aloud an appropriate treatment plan.

While assigning students to work cooperatively in small groups, Chloe instructed students to “look at the legal issues. You’ll stand up—secretary and leader. You’ll still report. Now what I want you to think about . . . [is what] if he’s not doing anything illegal, but he’s not following clinical guidelines?” While using the think, pair, and share method, Laura reviewed students’ response to an assigned worksheet. She read each question and asked students to volunteer their responses.

Changes in Instructional Practice and Observed Teaching

During the interviews, participants reported how their instructional practices had changed. In this section, we describe how those changes relate to the actual observations. In one example, Lucy reported that she now includes “more questioning in my lectures [and] poses some clinical situations after every topic.” While teaching, she asked, “What is [the difference] to the regeneration of tissues versus repair? What happens to the tissues after periodontic treatment? After S/RP, do they regenerate? Do they repair? If they do not, why not?” As shown in Table 1, Lucy frequently asked open-ended questions and those seeking comprehension. She used hypothetical case analysis somewhat frequently.

Rather than simply tell students what they need to do in the clinic, Walter commented that he now looks “a little bit more critically [at] students.” As noted while observing him in the clinic, when a student approached him and asked if he could do a procedure, he did not give the student either approval or denial. Instead, Walter told the student that first he would like to see the sequencing and that he wants to see what the student has already done. Walter asked open-ended questions somewhat frequently. He also demonstrated reflective practice; albeit infrequently, he was the only one of four participants to use it.

Marion pointed out one of the differences between clinical and classroom instruction and stated,

“The teaching is a lot easier in the clinical setting because you can evaluate students a lot better. So when I’m grading, I might just make comments on it.” To exemplify this practice, Marion asked a junior student who was working with a senior if she had completed her diagnosis. Next, she instructed the student to wait as she reviewed the patient record on the computer and checked his forms. She told the senior, “Let me check the diagnosis,” and then offered on-the-spot advice to this student. While teaching in the clinic, Marion engaged in questioning students’ treatment decisions somewhat frequently.

Adrianna explained that her “lectures are much more organized as far as setting objectives and being able to summarize those objectives at the end of each slide.” During her presentation on craniofacial anomalies, she presented images of three actual patients as well as provided an overview of her objectives for this didactic class. She shared that she tried to use variety in her presentation format: “I put more pictures and less text in my courses and that’s also even in the collection of data.” The session on craniofacial anomalies consisted of actual patient pictures and was accompanied by her asking questions to draw out what the students could visualize. During her observation, she asked students to explain, “What would you see in a profile? Orally? What condition? What about his bite?” While calling on a student she asked, “What would you expect to see? What is the biggest challenge to treatment?” Adrianna asked open-ended and multilayered questions and made references to actual patients frequently. She also referred to hypothetical cases somewhat frequently.

Laura described how she has become more precise in communicating and that she definitely asks more questions: “I feel . . . it is good to ask and challenge them you know because . . . sometimes students just prefer . . . the lecture.” While reviewing a previous assignment related to a study that predicted the odds ratio of an occurrence of oropharyngeal cancer, she asked: “What type of study is this? Choose one: retrospective cohort, case-control, retrospective cohort, clinical trial, nested case-control, cross sectional.” Then, she asked, “Was this an experimental study?” and students replied. “Was matching used?” she asked, and students replied. “What variables were used for matching?” Laura asked questions that checked for comprehension and open-ended questions frequently. She also relied on the use of evidence-based literature frequently.

Terri spoke about the importance of getting students to become critical thinkers. Instead of

just providing students with information, she was interested in “making them more accountable by asking: What can you tell me about this [and] what do you know about this?” Her curiosity extended to her course in anatomy although she acknowledged that basic science courses such as anatomy do not seem to promote the development of critical thinking among students. Later she explained, “What I have been able to do in that course is to take them at the very beginning of their entrance into the physical therapy program and start them thinking about what does this mean clinically, what will this person” with a femoral nerve injury look like. As observed, her presentation was interspersed with many questions such as those that required the synthesis of didactic information and an ability to think about clinical implications simultaneously. Terri asked open-ended and multilayered questions somewhat frequently, such as: “Could you injure the nerve and only affect the posterior thigh muscle? What if you injured a hamstring, what actions would be weakened or lost? What are the muscles that are innervated by the tibial nerve? If the nerve is injured at the inferior piriformis, then what are the clinical signs?” Throughout the fifty-minute period, she worked to keep students actively engaged by asking them about and helping them visualize the information diagrammatically, rather than telling them. She referred to authentic treatment infrequently.

The Way Forward

Many participants described additional changes they hoped to make in their instructional practices. They described issues pertaining to assessment, presentations, and a desire to compare their own teaching to their colleagues, and they spoke about the potential benefits of professional development. For example, Lucy hopes to receive formative feedback after teaching so she can identify what improvements to teaching she can make. Chaim stated that he wants to further his use of assessment by adding essay questions. He would also like to incorporate ten minutes of formative assessment during didactic courses so that he can check student comprehension. Similarly, Laura reported that she wanted to make exams more challenging. However, Laura expressed concern about doing this for fear of reprisal on the course evaluations, a concern that is commonplace among many faculty members: “The more [I] challenge them, then the worse you know the student evaluations are.” Sally also described the need to

impart information accurately. She reported, “One thing that I need to work on is . . . to use notes so I don’t forget to say certain things.”

Laura expressed her desire to calibrate her own teaching with that of her colleagues to gauge what they were doing in comparison. She said, “Well, I think what is encouraging me is that [the chair] is kind of doing the same things I feel [so perhaps he is also . . . expecting to change the students.” Terri pointed out another dimension of sharing information: “When you try and make a change in your course, it will often affect what happens in someone else’s course, and so there has to be some communication that goes on between instructors.”

Adrianna stressed the importance of having colleagues come together to discuss issues that they share about teaching: “I felt that it was important to have a forum for faculty to come together and discuss common themes of problems or successes or methods or ways that they can improve teaching.” In her opinion, the teaching philosophy of her school does not reflect critical thinking. She also pointed out, “When you don’t speak the same language, then it’s hard for the people to understand you.” She hoped that faculty members would eventually come together to understand what critical thinking is and looks like in instruction: “So I wish the whole faculty took the course so that they . . . had the same experience and therefore [would] . . . make a more concerted effort.” Terri described the dilemma of being isolated and working singularly: “Often [as] faculty . . . we don’t see each other, we pass each other in the hallway.” During the professional development teaching seminars, she pointed out, “When each person had to present a window, a little glimpse, into their course, [I began to think] wow you know all of a sudden it was like oh now I know what you were doing.”

Discussion

This study focused on whether professional development efforts designed to promote student critical thinking resulted in observable instructional practices as discovered through the experiences of nine faculty members one year later. The results showed that by looking across the four categories—questioning, patient case study, reflective practice, and cooperative learning—within and across classroom and clinical settings, observable outcomes became evident. The interviews with each faculty member provided the opportunity to hear them de-

scribe the changes they made and changes that they still wanted to make. Information gathered helped to provide support for the types of teaching observed. Types of changes that faculty members said that they would still like to make included providing support to establish professional learning communities and to facilitate further faculty development in the instruction and assessment of critical thinking skills. As discussed by other researchers, we recognize the need for performance-based measures of change to better understand faculty development initiatives designed to improve teaching effectiveness in health professions education. In this study, performance-based measures were comprised of classroom and clinical observations. Interviews with the participants enhanced the authenticity of these measures by allowing for direct questioning and probing regarding changes with the faculty who were directly observed.¹⁹⁻²¹

The majority of the observations (seven of nine) took place in a traditional classroom setting with faculty members at the front of the room and students sitting in desks or chairs opposite the faculty member. PowerPoint or some other visual was used to assist in guiding these classroom-based courses. There were two observations that took place in the predoctoral dental clinics. In that setting, teaching was individualized as faculty members demonstrated their abilities to utilize a rich representation of the categories of interest in this study. Since the intent of this study was to find evidence of observable learning outcomes, there appears to be no value in distinguishing between settings other than to suggest that the clinical setting, in addition to the classroom, is a place where observable learning outcomes can take place.^{22,23}

The findings of our study suggest that, along the continuum of question types, higher-level questioning was evident in both settings. As expected, the clinic offered opportunity for authentic treatment since the patient was present. However, faculty members did refer to patient cases while teaching in the classroom, thus providing students with authentic examples that facilitated the use of higher ordered questions.^{24,25} Reflective practice was spread relatively evenly across the population as well by faculty members during interviews and as they engaged students during observations. Further exploration in the use of genuine case study in the classroom as it relates to fostering critical thinking skills could help to inform the profession and create a closer relationship between the classroom and the clinic.^{26,27} Cooperative learning provides an opportunity for

students to learn to rely upon themselves and their peers and to make inferences rather than rely upon the faculty member to provide discrete information.²⁸ This approach allows students to think for themselves in a safe and controlled environment, whether in the classroom or the clinic. For the purpose of this study, cooperative learning was evidenced by the use of three specific methods (learning experiences) in which students are expected to work in pairs, small groups, or asynchronously with others. While evident in observations, planning for future faculty development opportunities could focus on how to use various cooperative learning techniques to foster teaching critical thinking skills.²⁹ Follow-up observations in the classroom and the clinic could gauge the relative success with teaching higher ordered thinking skills.

The findings reported here were constrained by the number of individuals who completed the professional development teaching seminar courses and who volunteered to participate in this study. Nine of twelve individuals elected to participate. No initial observation of participants was conducted prior to the professional development teaching seminar courses, so there is no baseline data, another limitation of this study.³⁰ Since there was only one observation conducted with each participant, it is important to keep in mind that the totality of observations represents only single snapshots in time of what teaching was.^{31,32} The observations should not be construed to represent the participants' teaching repertoires or other changes in instruction they have made. This study does not address the effect of these instructional practices on student outcome measures.

The goal of faculty development is to empower faculty members to excel in their role as educators and, in so doing, to create organizations that encourage and reward continual learning.³³ The findings of this study showed that observable behaviors do occur and are sustained over time, which may help qualify participation by faculty members in professional development. Peer review in classrooms and clinics followed by subsequent use of this data for evaluation and review of educational scholarship can also help evidence the value of time faculty members spend in professional development activities.^{29,34,35} When resources are spent on our faculty members for development, it may help shape the direction of teaching in the health disciplines.³⁶ To ensure that faculty development plays an essential role in professional development, dental school administrators need to embrace the notion that continual growth is central to the quality of teaching.⁹

Developing faculty is an ongoing investment, which requires resources.^{36,37} Providing opportunities for faculty members to grow invites them to remain active learners in professional health education.^{38,39} Moreover, if administrators value the benefits that accrue from participation, they must fully understand the need for change and make a commitment to provide the necessary resources to facilitate the faculty development process.⁴⁰ To encourage and maintain faculty participation, administrators may need to consider how time and growth will be reflected in academic dossiers. Subsequently, the criteria used to evaluate faculty for promotion and tenure, post-professor review, and merit may warrant changes.¹⁰ Making faculty development a priority will result in organizational habits that model, encourage, and reward lifelong learning. Additionally, when faculty members think about their field of expertise as well as their teaching, students benefit.^{41,42} Patients ultimately benefit from health professionals who think critically and from students who provide expert health care under the tutelage and guidance of the academic health faculty.

Observing faculty teaching outcomes was used in this study to gauge the sustainability of professional development after one year. Previous studies have not used this approach to gauge the sustainability of professional development. To assess a faculty member's collective use of higher ordered questioning, this appears to be a valuable approach. The method used in this study provided accountability and direct observable support for professional development that is critical when funding and time to focus on teaching are quite scarce.

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