Evaluation of Dental Students as Instructors in Preclinical Prosthodontics and Occlusion Courses

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Purpose: **While facing a shortage of faculty members, dental schools need to be innovative in their educational methodologies. One approach to augment student learning would be to mentor dental students as participating faculty in current courses. A study was undertaken to evaluate dental students as instructors in preclinical prosthodontics and occlusion courses.**

Materials and Methods: **In spring term 2003, three senior dental students (4DN) and four full-time faculty were assigned as faculty for each of two preclinical courses: fixed prosthodontics and complete denture prosthodontics. In the summer term 2003, two junior dental students (3DN) and five full-time faculty were assigned to teach in the occlusion preclinical course. Each course had previously been conducted with a total of seven full-time faculty. Three types of outcome assessment were accomplished: (1) evaluation by the 2DN students of full-time faculty and student instructors at the end of the course using a standardized university scale of 1 (poor) to 5 (excellent); (2) a survey of student instructors about their experience; and (3) a course debriefing with selected 2DN students.**

Results: **The overall mean instructor-quality score assigned to the student instructors, 4.5 (SD, 0.7), was slightly higher than that of faculty instructors, 4.2 (SD, 0.9). Student instructors were rated higher than or equal to full-time faculty based on the mean response scores for all ten evaluation questions. The greatest difference between faculty and student ratings was in the category of "respect and concern for the students" in all courses. In addition, information gathered from eight student instructors indicated that the experience was a very positive one overall with an increased interest in an academic career noted. Comments from the 2DN students in the debriefing sessions were positive about having student instructors.**

Conclusions: **This study demonstrated that from the perspective of second year dental students, senior and junior dental students were accepted as preclinical instructors in prosthodontics and occlusion preclinical courses. Additionally, senior and junior students who participated in student teaching had a positive experience. The use of dental students as preclinical faculty in prosthodontics and occlusion appears to be a viable approach for mentoring students in careers in academics, providing student instructors with higher learning experiences, and supplementing the efforts of full-time faculty.**

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CURRENT and emerging faculty shortages in dental education have been well documented in recent literature.[1-8] The main factors contributing to this shortage are the growing number of faculty separating due to retirement or leaving dental education to pursue private practice. In addition to the shortage of faculty, state funding for dental education has decreased, leading to the elimination of some vacant faculty positions. As a result of these factors, dental schools face the challenge of providing a high-quality preclinical and clinical education with diminished resources. Mentoring dental students as student instructors is one approach that could reinforce learning experiences, as well as enhance beginning learner experiences of first and second year students in preclinical courses.

Nuckles et al[9] looked at the participation of dental students as faculty in the teaching of preclinical operative dentistry with favorable results in 1974. Bibb et al[10] reported on a program to mentor senior dental students to teach dental anatomy in 2002. Several recent American Dental Education Association (ADEA) abstracts have suggested using dental students as instructors in the preclinic to partially address the shortage of full-time dental faculty.[11-13]

The purpose of this study was to evaluate the use of dental students as instructors in preclinical prosthodontics and occlusion courses from both the student instructor and early student learner perspectives.

Materials and Methods

In the spring term of 2003, three senior student instructors (4DN) and four full-time faculty members were assigned as faculty to each of two prosthodontic preclinical courses: DEN 6415 Fixed Prosthodontics III, which met two half-days per week, and DEN 6460 Treatment of the Edentulous Patient, which met one half-day per week. In the summer term of 2003, two junior dental students (3DN) and five full-time faculty members were assigned as faculty for the occlusion preclinical course, DEN 5213 Fundamentals of Occlusion, which met two half-days per week (Table 1). Student instructors were selected based on their progress toward graduation requirements in prosthodontics, efficient patient care, and positive rapport with faculty. They attended lecture and laboratory sessions and served as instructors in the preclinical simulation laboratory. Student instructors provided one-on-one instruction and evaluation of daily work for the 2DN students; however, they were not involved in the grading of projects. Student instructors were paid hourly for their teaching commitment. Each of the courses in this study had previously been conducted with a total of seven full-time faculty members for a second year class (2DN) of 80 students.

At the end of each course, the 2DN students completed teaching evaluation forms for the full-time faculty and student instructors they had worked with during the course. The evaluation form consisted of ten items each on a 5-point scale, (1) poor, (2) below average, (3) average, (4) above average, and (5) excellent. Responses were tabulated using scanning technology. This evaluation form is used for all courses in all colleges at the University of Florida.

The dependent variable of interest in this study was the overall rating of instructor quality (called instructor-quality score hereafter). An instructor-quality score was obtained for each evaluation form by averaging across the responses to the ten items, so the score also ranged from 1 to 5. The reliability and validity of the obtained instructor-quality scores were assessed by: (1) computing coefficient alpha as an index of reliability, and (2) examining the item-total correlation as an index of discrimination, and thus the level of unidimensionality of the ten-item scale. The extent to which the ten-item scale is unidimensional (all items measure the same construct) provides evidence that the obtained instructor-quality scores are valid.

A statistical analysis was performed on the overall instructor-quality scores calculated from each evaluation form. A 2-way analysis of variance (ANOVA) model was fit to evaluate the effects of instructor type (student vs. faculty) and course (6415 vs. 6460 vs. 5313), as well as their interaction effect. Because the evaluation forms were de-identified, the evaluations completed by the same student for a particular course were considered independent. All calculated p-values were two-sided, and $p < 0.05$ was considered statistically significant.

Table 1. Sequence of Courses, Student Instructors, and Faculty

Semester	*Course*	*Student Instructors*	*Full-time Faculty*
Summer 2003	DEN 5213 Fundamentals of occlusion	Two juniors	Five
Spring 2003	DEN 6415 Fixed Prosthodontics III	Three seniors	Four
Spring 2003	DEN 6460 Treatment of the edentulous patient	Three seniors	Four

Table 2. Mean Responses to Evaluation Questions for DEN 6415 Fixed Prosthodontics III and DEN 6460 Treatment of the Edentulous Patient (N = 160)

Evaluation Item	*Student*	*SD*	*Faculty*	*SD*	*Difference*
Description of course objectives and assignments	4.4	0.8	4.4	0.8	0.0
Communication of ideas and information	4.5	0.8	4.3	0.9	0.2
Expression of expectations for performance in the class	4.5	0.8	4.4	0.8	0.1
Availability to assist students in and out of class	4.5	0.8	4.5	0.8	0.0
Respect and concern for students	4.7	0.7	4.4	1.0	0.3
Stimulation of interest in course	4.5	0.8	4.3	0.9	0.2
Facilitation of learning	4.5	0.8	4.4	0.9	0.1
Enthusiasm for the subject	4.6	0.7	4.4	0.8	0.2
Encouragement of independent, creative, critical thinking	4.5	0.8	4.4	0.8	0.1
Overall rating of instructor	4.5	0.8	4.4	0.8	0.1

In addition to the student evaluation forms described above, two additional outcome assessments were accomplished: (1) A survey was completed by the eight student instructors (six senior students and two junior students) using a scale of 1 (most negative) to 5 (most positive), and (2) A course debriefing with a random sample of six 2DN students was conducted. This research was approved by the University of Florida Institutional Review Board (IRB 100-2003 and IRB 258-2003).

Results

Evaluation by the 2DN Students of Full-time Faculty and Student Instructors

The responses to each of the ten items on the evaluation form are summarized in Tables 2 and 3. Student instructors were rated as higher than or equal to full-time faculty based on the mean response scores for all ten evaluation questions. The greatest difference between faculty and student ratings was in the category of "respect and concern for the students" in all courses.

The resulting reliability of the instructor-quality scores obtained from the ten-item scale was very high (0.98), suggesting that the instructor-quality scores contain little measurement error. In addition, the item-total correlation values for each of the ten items was also very high (ranging from 0.87 to 0.96), indicating very strong discrimination, and thus construct validity of the instructor-quality scores. Therefore, the overall instructor-quality score was used as a summary measure for the 10 items.

The mean and standard deviation of the overall instructor-quality scores provided by 2DN students of student instructors and faculty instructors were 4.5 (SD, 0.7) for the student instructors and 4.2 (SD, 0.9) for the full-time faculty in the pooled data. Thus, the mean instructor-quality score was higher for student instructors than for faculty instructors, providing evidence that not only is the perceived instructor quality of student instructors not lower than that of faculty instructors, it may actually be higher.

Although the sample means of student and faculty instructors (4.5 vs. 4.2) were slightly

Table 3. Mean Responses to Evaluation Questions for DEN 5213 Fundamentals of Occlusion (N = 80)

Evaluation Item	*Student*	*SD*	*Faculty*	*SD*	*Difference*
Description of course objectives and assignments	4.5	0.7	4.2	0.9	0.3
Communication of ideas and information	4.5	0.7	4.1	1.0	0.4
Expression of expectations for performance in the class	4.5	0.7	4.2	1.0	0.3
Availability to assist students in and out of class	4.5	0.7	4.2	0.9	0.3
Respect and concern for students	4.6	0.7	4.2	1.0	0.4
Stimulation of interest in course	4.5	0.7	4.2	1.0	0.3
Facilitation of learning	4.5	0.7	4.1	1.0	0.4
Enthusiasm for the subject	4.6	0.7	4.3	0.9	0.3
Encouragement of independent, creative, critical thinking	4.5	0.7	4.2	0.9	0.3
Overall rating of instructor	4.6	0.7	4.2	1.0	0.4

different, it is of interest to determine whether this difference depends on the class the student is enrolled in (6415 vs. 6460 vs. 5213). To accomplish this, a 2-way ANOVA was conducted. Based on the ANOVA model, there was not a statistically significant interaction effect ($p = 0.05$); the difference in the mean instructor-quality score between student and faculty instructors was not different for the three courses. In addition, the main effect of course type (6415 vs. 6460 vs. 5313) did not reach statistical significance ($p = 0.05$); however, the main effect of instructor type (student vs. faculty) was statistically significant ($p = 0.005$).

Survey of Student Instructors

A survey was administered to each of the student instructors (a total of six seniors and two juniors) at the completion of each course to measure their impression of the experience of being an instructor. Three questions asked student instructors to rate (on a scale of 1 to 5, with 1 being most negative and 5 being most positive): (a) their overall experience of teaching, (b) whether they felt accepted by the students in the course, and (c) whether they felt accepted by the faculty. Two yes/no questions were asked: (a) whether the student instructors had ever considered an academic career previously, and (b) whether the student instructors were now considering an academic career. In addition, an open-ended question asked student instructors to comment on their experience. The level of acceptance by the students and faculty, based on the response frequencies for the first three questions pertaining to the attitude of the experience, was very high (Table 4).

With respect to the questions asking whether the student instructors had previously considered an academic career, and whether they would consider an academic career now, the results showed that five of the eight student instructors (63%) had previously considered an academic career, and seven of the eight student instructors stated that they would now consider an academic career (88%). Each student who had previously considered an academic career stated that he/she would now still consider an academic career, and two students who had not previously considered an academic career stated that he/she would now consider an academic career.

Five of the eight student instructors provided a response to the open-ended question asking them to comment on their experience. The three responses centered on two common themes:

1. The experience was very intellectually rewarding, helping them better understand the material and study for the state board exam.
2. The 2DN students in the class felt more comfortable asking the student instructor questions, and thus it was a positive experience for the 2DN students.

These responses indicated only positive consequences of serving as a student instructor.

In summary, although the data regarding the attitudes and experiences of the student instructors correspond to a sample size of eight, the experiences appeared to be very positive for all student instructors involved.

Table 4. Responses to Survey of Student Instructors (DN 4) (N = 8)

Item	*5*	*4*	*3*	*2*	*1*	*Mean*
Overall experience	6	1	1	0	0	4.6
Accepted by students	7	1	0	0	0	4.9
Accepted by faculty	3	4	1	0	0	4.3

This survey used a scale of 1–5 with 5 being most positive and 1 being most negative.

Course Debriefing

Routine course debriefings were conducted for each course following a standardized agenda in a 1-hour meeting with lunch provided. A group of six randomly chosen 2DN students was selected for each debriefing. The course directors were invited to attend, and the sessions were facilitated by a faculty member from the College of Education.

The agenda items included discussion about the course syllabus, course content, laboratory exercises, teaching methods, texts, and comparison with other preclinical courses. Comments from the 2DN students in the debriefing sessions were positive about having student instructors. Student learners expressed "there was ample assistance provided to students in the laboratory by student faculty and regular faculty." Students generally felt that faculty provided more depth, however, student instructors were more approachable. There was a desire to have student instructors in more preclinical courses.

Discussion

Analysis of the evaluation mean scores indicates there is no evidence to suggest that the mean instructor-quality scores of student instructors are lower than that of full-time faculty instructors, and there is weak evidence to suggest that the mean instructor-quality scores of student instructors is actually higher than that of the faculty. The reason for this slight increase may be related to the fact that the student instructors provided instruction and formative evaluation (i.e., instruction and non-graded evaluation of daily work), but did not provide summative evaluation (i.e., grading) of the student's work. In addition, due to the lack of normality of the instructor-quality scores and significant differences in the variances of the instructor-quality scores across the instructor types, the results of the 2-way ANOVA should be interpreted with caution.

For the eight student instructors in this analysis, five had previously considered an academic career. Through this experience, an additional two students indicated a future interest in a teaching career.

One student instructor commented, "I think this was a great opportunity; great practice before boards. I also think the students felt more comfortable asking questions and getting advice from other students; it was easier to relate." Another commented, "I thought the experience was very rewarding. I look forward to teaching again in the near future. I learned so much in helping the other students understand the basics of prosthodontics. I think the student's aren't 'intimidated' by us as much and could ask questions without feeling dumb."

One difficulty with the use of dental students as instructors was a scheduling conflict with established rotations. For example, if the student instructor was scheduled to teach in the preclinic, but was assigned to hospital dentistry rotation that week, the rotation took precedence over teaching. This led to some discontinuity in the teaching effort. The rotation schedule also created problems in recruiting students for the occlusion course, since junior students are assigned to more rotations than senior students.

Despite the emphasis on the recruitment of dental students who were the most productive in the discipline of prosthodontics, some prospective student instructors expressed concern that the loss of one or two half-days per week from the clinic would adversely affect their progress towards graduation requirements.

There was a distinct financial administrative advantage in using student instructors. Each student instructor replaced a full-time faculty member in the preclinic at the cost of a teaching assistant salary. The use of student instructors in the preclinic created the opportunity to reassign additional full-time faculty (who were previously assigned to the preclinic) to clinical teaching for that period, increasing the number of clinical chairs available in prosthodontics for junior and senior dental students. The use of student instructors made it possible to maintain a student-to-faculty ratio of 11:1 in the preclinical courses. The 11:1 preclinical teaching ratio is similar to the national mean ratio reported by Petropoulos et al in a curricular survey.[14]

The focus of this study was to assess the quality and practicality of using dental students as instructors in preclinical prosthodontic courses. This is one approach of several models, including educational electives that incorporate teaching instruction and peer teaching in small group problem-based learning. While each model has the potential to partially address current faculty vacancies, the challenge is to integrate independent educational experiences within the global curriculum and provide active faculty mentors who can longitudinally guide scholarship development in teaching, research, and service in an academic environment.

Conclusions

This study demonstrated that from the perspective of the second year dental student, senior and junior dental students appear to be accepted as effective preclinical instructors in prosthodontics and occlusion. Additionally, senior and junior students who have participated in student teaching have had a positive experience and express a future interest in dental education.

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