

Effect of Dental Students as Instructors on Preclinical Performance in Prosthodontics

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Abstract: Dental schools continue to have difficulty recruiting and retaining faculty. One approach to augment student learning would be to train and utilize senior dental students as instructors in preclinical courses. This study was undertaken to evaluate the effect of using senior dental students as instructors on the performance of second-year students in two preclinical prosthodontic courses. In the spring term of 2007, four senior dental students and four or five full-time faculty were assigned as instructors for the fixed prosthodontics and complete denture prosthodontics preclinical courses. Each course has previously been conducted with a total of seven to nine faculty instructors. The performance of two groups of second-year students on preclinical projects was compared based upon their source of instruction for the project. The scores for the two groups were compared using the Wilcoxon rank sum tests and the corresponding 95 percent confidence intervals for the median difference in scores for the two instructor types. This study found no significant difference in performance between sophomore students instructed by full-time faculty or those instructed by senior dental students in either the fixed or removable prosthodontics preclinical courses ($p > .05$). The use of senior dental students as instructors in the preclinical prosthodontics courses may be one option to partially address the shortage of full-time dental faculty.

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Recruitment and retention of dental faculty continue to be major concerns in dental education.¹⁻⁶ The main factors contributing to this situation are the increasing number of faculty members who are leaving dental education to enter private practice or retiring,^{2,3} combined with the minimal number of new dental graduates pursuing a career in dental education.^{7,8} The vast majority of faculty members leaving for private practice are junior faculty. In addition to the shortage of faculty, state funding for dental education has diminished, leading to the elimination of some open faculty lines. Bailit et al.⁹ expressed concern that this trend may threaten the accreditation status of some schools within ten years if it is not addressed. The shortage of full-time dental faculty has not gone unnoticed by dental students. Henzi et al.^{10,11} reported concern by dental students about the shortage of clinical and

preclinical faculty, student/faculty ratios, and the impact on their education and daily lives.

As a result of these factors, dental schools face the challenge of continuing to provide a high-quality preclinical and clinical education with diminished resources. Using dental students as student instructors is one approach that could enhance and reinforce learning experiences of sophomore students in preclinical courses.

Nuckles et al.¹² examined the participation of dental students as faculty in the teaching of preclinical operative dentistry and reported favorable results in 1974. Bibb and Lefever¹³ described a program to prepare senior dental students to teach dental anatomy in 2002. Tran et al.¹⁴ described a program in which dental students were mentored in lecture techniques to prepare them to make classroom presentations to preclinical students. Park et al.¹⁵ suggested the use of

postgraduate residents to serve as small-group tutors in problem-based learning (PBL) curricula and other teaching roles to ease faculty shortages.

There have been several presentations at American Dental Education Association (ADEA) annual sessions that have proposed utilizing dental students as instructors in the preclinic to partially address the shortage of full-time dental faculty.¹⁶⁻¹⁸ Additionally, Nimmo et al.¹⁹ reported that first- and second-year dental students readily accepted instruction from junior and senior dental students in prosthodontics and occlusion preclinical courses. Haj-Ali et al.²⁰ reported that there was no statistical difference in performance with first-year dental students in a two-semester morphology and occlusion course.

The purpose of this study was to evaluate the use of senior dental students as instructors in preclinical prosthodontics courses for second-year dental students from the perspective of preclinical performance on graded exercises. The hypothesis of the study was that the type of instruction would not have an effect on the performance of graded procedures in the preclinical prosthodontic courses.

Materials and Methods

In the spring term of 2007, four senior student instructors and five full-time faculty members were assigned as faculty to DEN 6415, Fixed Prosthodontics III, which met two half-days per week. During the same term, four senior student instructors and four full-time faculty members were assigned as faculty to DEN 6460, Treatment of the Edentulous Patient, which met one half-day per week. These two courses are part of the prosthodontic curriculum for second-year students.

The student instructors were selected based on their progress towards graduation requirements in prosthodontics, their efficient patient care, and their positive rapport with faculty and peers. The selected students attended lecture and laboratory sessions and served as instructors in the preclinical simulation laboratory. The student instructors provided one-on-one instruction and evaluation of daily work for the sophomore students; however, they were not involved in the grading of projects. The student instructors were paid hourly for their teaching commitment. The course director met with the full-time faculty and student instructors at the beginning of each laboratory session to coordinate teaching goals for the session. The courses in this

study have previously been conducted with a total of seven to nine faculty members for a second-year class of eighty-two students.

To assess the effect of type of instructor on preclinical performance, the preclinical simulation lab was divided down the middle of the room. This invisible line created two distinct portions of the class, with thirty-four students on the east side of the lab and forty-eight students on the west side. For each project, the full-time faculty members were assigned to teach in the rows on one side, and the student instructors were assigned to teach in the rows in the other side of the lab. Upon completion of a graded exercise, the faculty members were reassigned, as a group, to the opposite side of the lab. This method of faculty assignment was used with the intention of isolating the type of instruction for each graded project and still providing all students with both student and faculty instruction throughout the semester. For DEN 6415, the two student groups participated in three independently scored sections, two of which were combined (averaged) because they were taught by the same instructors. The skills that were assessed were tooth preparation and fabrication of provisional restorations for porcelain fused to metal restorations and all ceramic restorations.

For DEN 6460, there were two independently scored sections. The skills that were assessed were the preparation of record bases and occlusal rims and tooth arrangement with wax contour for a lingualized occlusion. The grading of the projects was done in a blinded manner (projects were identified by non-sequential student numbers) by full-time faculty members using criterion-referenced evaluation forms.²¹ Calibration of the full-time faculty members was accomplished at the beginning of each grading session.

A statistical analysis was performed on the graded projects for the two courses, comparing the effect of type of instructor. Data were analyzed using SAS statistical software (v. 9.1.3, SAS Institute Inc., Cary, NC). The scores for the student instructor and full-time faculty groups were compared using the Wilcoxon rank sum tests and the corresponding 95 percent confidence intervals for the median difference in scores for the two instructor types. The Wilcoxon rank sum test makes minimal assumptions about the test score distributions. All tests were conducted with $\alpha=0.05$.

This research was approved by the University of Florida Institutional Review Board (IRB02 Protocol #2006-U-856).

Results

Descriptive statistics on student performance are presented in Table 1 for both courses and by both instructor types. Table 2 shows the estimated median differences in scores and the corresponding 95 percent confidence intervals for the faculty and student instructors. The results indicate nonsignificance for all groups (confidence intervals bracket zero). The median difference in the exam score between the faculty-taught and student-taught treatment groups was 1.0 for all sections. The 95 percent confidence interval around each estimate is (-1.0, 4.0).

The purpose of this study was to determine whether instruction by full-time faculty differed from that of instruction by senior dental students, either positively or negatively, on graded performance criteria. All confidence intervals bracketed zero (if the 95 percent confidence interval contains 0, the p-value is greater than .05). Therefore, it can be concluded that no statistically significant difference existed between the two instructor types in regard to performance in preclinical prosthodontics courses.

Discussion

There is a shortage of qualified dental faculty, due in part to the very low percentage of recent graduates (in the first ten years after graduation) who

pursue academic positions, the high percentage of faculty in the thirty-five to forty-five age range who leave academia to join private practice, and the fact that existing faculty are getting older and retiring.^{1,3,6} The lack of qualified dental faculty impacts dental education, a situation that is being noticed by dental students, who are affected by multiple unfilled faculty positions at multiple schools.¹¹ The problem is further compounded because of the progressive decline in state funding to dental schools, which often results in a freeze in the hiring of new faculty or the downsizing of formerly full-time (100 percent) positions to part-time status (e.g., 50 percent positions). Having fewer faculty members in dental schools undermines the quality of dental education necessary to maintain the high standards of the dental profession.

One short-term response to the lack of full-time faculty is the use of dental specialty residents and senior dental students as student instructors. Dental students can serve to compensate for faculty shortages, thereby improving the student-instructor ratio and the quality of education provided.

When utilizing dental students as instructors, there are two issues to consider: 1) how well will second-year students accept instruction from senior students, and 2) does the utilization of student instructors affect performance in preclinical prosthodontic courses? Two recent studies have evaluated student acceptance. Nimmo et al.^{16,17,19} compared standardized teaching evaluations for full-time faculty and

Table 1. Descriptive statistics for students taught by faculty and student instructors

Instructor	DEN 6415 Section	N	Mean	SD	DEN 6460 Section	N	Mean	SD
Full-Time Faculty	1 & 3	96	96.2	3.5	1	34	92.1	6.0
Student Instructor	1 & 3	68	94.7	3.9	1	48	91.3	4.9
Full-Time Faculty	2	34	87.5	8.2	2	48	91.3	4.5
Student Instructor	2	48	91.0	6.9	2	34	90.1	4.4

Table 2. Median difference (faculty-student) and corresponding 95% confidence intervals

Instructor	DEN 6415 Section	Estimated Median Difference	95% Confidence Interval		DEN 6460 Section	Estimated Median Difference	95% Confidence Interval	
			Lower Bound	Upper Bound			Lower Bound	Upper Bound
Full-Time Faculty	1 & 3	1.0	-1.0	4.0	1	1.0	-1.0	4.0
Student Instructor	1 & 3				1			
Full-Time Faculty	2	1.0	-1.0	4.0	2	1.0	-1.0	4.0
Student Instructor	2				2			

student instructors, finding no statistical difference in students' ratings of faculty members and student instructors for preclinical prosthodontics and occlusion courses. Similar findings were reported by Steven et al.¹⁸ and Haj-Ali et al.²⁰ in a two-semester dental morphology course.

This study examined the influence of student instructors on the graded performance of laboratory projects of second-year students. Senior students are in the process of acquiring and refining patient care skills themselves in the clinical environment and generally have little or no formal teaching experience. One might expect to see a higher level of performance in a group of dental students who worked with full-time faculty who have far more experience than seniors and who have honed their procedural skills over years of practice. However, in this study, there was no significant difference in the specified measures of performance between the student-guided and faculty-guided groups in the fixed and removable prosthodontics preclinical courses. Haj-Ali et al.²⁰ reported a similar outcome for a dental morphology preclinical course in which dental students functioned as instructors.

For courses that require laboratory instruction, senior dental students are able to apply their new knowledge in verbalizing technical skills and techniques to other students. Their learning experiences are fresh in their memory; hence, they can better empathize with the dental students they are educating and can communicate essential information, suggestions, and feedback at a student's level. The senior dental students who served as instructors in this study were reliable and motivated to help in all activities throughout the course. While this study focused on graded student performance, further research could explore whether this type of educational experience could imprint student instructors with the identity of being an educator and enhance the recruitment of new faculty.²²

Research in the educational environment can be challenging due to the lack of control of all variables. Limitations of this study include the fact that there was no monitoring of instruction or interaction outside of the scheduled laboratory sessions, where additional peer or faculty instruction may occur. Additionally, grade inflation, common to all academic institutions, may have obscured some grading variables. However, graded laboratory scores from this year did not differ from previous years. It should be noted that the findings and conclusions are based upon the evaluation of preclinical performance dur-

ing a single semester for specific fixed and removable prosthodontic procedures and may not apply directly to other preclinical courses or disciplines.

Conclusion

Sophomore dental students at one U.S. dental school who were supervised and taught by seniors performed as well on graded laboratory projects as their classmates who received instruction from faculty members. The findings of this study indicate that the performance of second-year dental students was not affected by the use of senior dental students as student instructors in fixed and removable preclinical prosthodontic courses.

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