

# **Students' Perceptions of Prosthodontics in a PBL Hybrid** Curriculum

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#### Keywords

Dental education; problem-based learning; prosthodontics preclinical curriculum; student perception; clock hours; graduate prosthodontics specialization.

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### Abstract

Purpose: A survey was distributed to the Harvard School of Dental Medicine (HSDM) predoctoral student classes of 2005 and 2006 to assess their perceptions regarding preclinical prosthodontics laboratory exercises. Prosthodontics curriculum clock hours, prosthodontics teaching participation, and plans for specialization were also analyzed. We hypothesized that reduced hours and perceived stress in the prosthodontics curriculum might impact students' choice of specialty at HSDM

Materials and Methods: HSDM preclinical prosthodontics clock hours were compared with national means from published data. A survey was distributed to the HSDM classes of 2005 and 2006 (n = 70) at the end of their preclinical prosthodontics laboratory exercises, prior to students seeing their first patient in the clinics.

Results: A 100% response rate was achieved. Results from this study show that HSDM preclinical prosthodontics clock hours are on average shorter than other schools. The majority of the students felt stressed during the laboratory exercises, and they felt they did not gain adequate knowledge from the lectures, resulting in low self-esteem (confidence) in treating patients in the clinic. Despite this perception, HSDM students do just as well, if not better, than other students, as judged by external and internal outcome measures. Graduate prosthodontics specialization is still a specialty of choice among the graduates when compared to national data.

Conclusions: The shortened preclinical didactic and laboratory exercises in prosthodontics at HSDM affect student anxiety, but not their didactic and clinical performances or their decisions in choosing their graduate program. Problem-based learning (PBL) tutorials help the students to integrate preclinical and clinical knowledge and skills in prosthodontics.

A recent report showed that there will be a high demand for prosthodontics treatment in the future.<sup>1</sup> Prosthodontics training will continue to be a large component of the DMD/DDS curriculum, and therefore, dental education programs must continually evaluate their prosthodontics components to ensure that the curriculum always meets the current technical and therapeutic advances and the changing needs of the dental public. Advanced graduate prosthodontics programs must continue to recruit and retain students and faculty for the profession. Perception of prosthodontics as a dental specialty is influenced by the DMD/DDS curriculum and clinical experiences.

A report from the Institute of Medicine in the early 1990s recommended several changes in dental education curricula

including: (a) making it more relevant to clinical practice; (b) shifting more curriculum hours from lectures to guided seminars; and (c) decreasing the hours spent in low priority technique exercises.<sup>2</sup> The Harvard School of Dental Medicine (HSDM) problem-based learning (PBL) curriculum was introduced in 1994 and sought to comply with these recommendations by shortening preclinical didactic and laboratory exercises.

We recently reported that preclinical hours for didactic and laboratory exercises at HSDM in preclinical endodontics, operative, and prosthodontics curriculums were significantly lower when compared to the national mean.<sup>3</sup> In this study, we investigated the effects of PBL and shortened instruction hours on students' perceptions of the prosthodontics curriculum and their decision of choosing prosthodontics as their postgraduate specialty. Most educational surveys of prosthodontics have been oriented toward clinical materials and techniques,<sup>4-8</sup> clinical skills,<sup>9</sup> and curriculum, $^{10-14}$  but there has been no mention of students' perception of the prosthodontics curriculum. The aims of this study were (a) to compare HSDM preclinical clock hours in fixed prosthodontics (FPs), complete dentures (CDs), and removable partial dentures (RPDs) with the national mean; (b) to assess HSDM student perceptions regarding FP, CD, and RPD preclinical didactic and laboratory exercises in preparing them to enter the clinic and treat prosthodontics patients at HSDM; (c) to investigate the future plan of the graduates, especially in prosthodontics; (d) to look at prosthodontics faculty coverage in laboratories and clinics; and (e) to compare the external and internal outcome measures with national data.

## **Materials and methods**

Information regarding the didactic and preclinical hours in FP, CD, and RPD were obtained in previous published studies.<sup>15–17</sup> Clock hours of instruction in FP, CD, and RPD both in didactic instruction and laboratory instruction from HSDM and the national mean were compared and analyzed.

A survey regarding student perceptions was created and approved by the Harvard Medical School Office for Research Subject Protection. The survey was distributed to the HSDM classes of 2005 and 2006 (N = 70) at the end of their preclinical prosthodontics laboratory exercises, prior to students seeing their first patients in the clinic. The survey contained eight questions and asked the respondents to circle responses that applied to their perceptions (see Appendix). The responses were pooled, and a 100% response rate was achieved.

Data regarding the number of full-time, part-time, general practice, and prosthodontics faculty, and prosthodontics residents/International Team for Implantology (ITI) fellows were obtained from the Restorative Dentistry Department's office at HSDM.

External and internal outcome measures such as National Board Dental Examination (NBDE) Part I and II scores, the number of units of fixed prostheses, CDs, and RPDs completed for the classes of 2005/2006 were obtained from the Office of Dental Education at HSDM.

Finally, data regarding dental students' postgraduate plans were obtained from the registrar's office at HSDM.

### Results

The clock hours devoted to preclinical didactic (D) and laboratory (L) exercises in FP, CD, and RPD at HSDM were obtained from HSDM's curriculum and published articles.<sup>15–17</sup> Figure 1 shows the comparison of didactic and preclinical laboratory clock hours in FP, CD, and RPD between Harvard and the national mean. Overall, HSDM clock hours are much shorter compared to the national mean, with the exception of RPD preclinical laboratory clock hours.

A survey to evaluate the perception of stress levels, duration of the laboratory exercises, getting feedback from the instructor, and preparedness in treating patients was created and distributed to the HSDM classes of 2005 and 2006 prior to the conclusion of their preclinical prosthodontics curriculum. Figure 2A shows the comparison of students' perception on level of stress during the FP, CD, and RPD laboratory exercises. The majority of students (56-60%) felt stressed during the FP and CD laboratory exercises but not in the RPD exercises. In response to Question 2 (What do you think about the duration of the laboratory exercise?), the majority thought that the duration of the laboratory exercises in all preclinical exercises was just right (Fig 2B). Figure 2C shows that 56% of students felt that they have enough input/feedback from their instructor in FP and CD but not in RPD. The majority of the students (53-70%) also felt that the knowledge they gained from the lecture was not adequate for the laboratory exercises (Fig 2D). When asked about whether the knowledge students obtained from the lecture was helpful in preparing for clinical practice (Question 5), 33-43% of students replied yes, and 34-47% replied not certain in all disciplines (Fig 2E). Figure 2F shows the students' perceptions on their self-confidence level in treating patients in the clinic. In general, students felt unprepared or had low self-esteem in treating prosthodontics patients. The majority of students also felt either they did not have enough (50-54%) or had just the right amount of (39-43%) clinical hand-skill to treat patients in the clinic (Fig 2G). A majority of students (63-66%) found that PBL tutorials were helpful in allowing the students to understand preclinical and clinical knowledge and skills (Fig 2H).

### Plans after graduation (Fig 3)

Following graduation, 9.2%, 7.6%, 15.3%, 7.6%, 18.4%, 13.8%, 20%, and 7% of the students were planning to continue their education in graduate prosthodontics, oral surgery, endodontics, periodontics, orthodontics, pedodontics, GPR/AEGD programs, and private practice/research/teaching, respectively. Prosthodontics ranked fifth as a specialty of choice among the graduates.



**Figure 1** Comparison of preclinical didactic and laboratory hours in fixed prosthodontics (FPs), complete denture (CD), and removable partial denture (RPD) curriculum at HSDM and national mean.



Figure 2 Students' perceptions regarding fixed prosthodontics (FPs), complete denture (CD), and removable partial denture (RPD) preclinical exercises.



Figure 3 HSDM classes of 2005 and 2006 career after graduation.

#### **Prosthodontics faculty as mentors**

There are 6 (15%) full-time prosthodontists, 4 (10%) full-time general dentists, 6 (15%) part-time prosthodontists, 23 (59%) part-time general dentists, 12 prosthodontic residents, and 2 ITI fellows involved in the predoctoral restorative curriculum at HSDM. The faculty: student ratio both in the preclinic and clinic is 1:10.

#### **External/internal outcome measurements**

Both the classes of 2005 and 2006 ranked first in the nation on NBDE Part I (average = 93.4) and third in the nation on NBDE Part II (average = 84.9). The graduates also graduated with an average of 12.7 units of fixed prostheses per student, 2.6 units of CD per student, and 2.6 units of RPD per student, and all passed the Northeast Regional Board Examination.

## Discussion

In 1994, HSDM implemented an innovative PBL hybrid curriculum. This resulted in a shifting of curriculum hours from lectures to guided seminars (tutorial), consolidating departments, reduction of repetition and redundancy in the curriculum, and teaching in an interdisciplinary fashion rather than in a discipline-based approach. As a result, students are expected to become "critical thinkers" rather than "information consumers."

At HSDM, dental students take classes at Harvard Medical School with medical students during their first and second years. Starting in the third year, the dental students start learning about clinical dentistry. During this learning period, students must participate in different block rotations, which include lectures, tutorial, and preclinical laboratory exercises. The prosthodontics curriculum is taught mainly during the restorative block for approximately 6 months at the beginning of the third year. During this block, students learn about FPs, RPDs, CDs, dental materials, and implant dentistry. Lectures are usually given in the morning followed by tutorials (to discuss multidisciplinary cases), seminars, and preclinical laboratory exercises in the afternoon. Competency tests are given several times and must be passed for students to progress academically. The majority (54%) of the full-time clinical instructors (6) at HSDM are prosthodontists, and the faculty:student ratio both in the preclinic and clinic is 10:1, which does not differ from the national mean.15

The curriculum reorganization at HSDM resulted in a significant reduction in lecture and preclinical clock hours in the prosthodontics preclinical curriculum as compared to the national mean, with the exception of laboratory exercises for RPDs. These shortened preclinical exercises could have resulted in some effect not only in students' self-confidence, but also in their clinical and didactic performance. In this study, we distributed a questionnaire containing eight questions to the classes of 2005 and 2006, surveying their perceptions and their preparation prior to treating patients in the clinic. Although the majority of students felt that the duration of the laboratory exercises was adequate, the finding showed that the majority of students felt stressed during FPs and CDs but not in the RPD exercises. One possible explanation of this result may be due to the fact that FPs and CD curriculums were the longest and shortest in clock hours, respectively. Despite the fact that the restorative block is the longest in our curriculum, the majority of students felt they did not have an adequate knowledge gained from lectures, and a majority did not feel confident in treating prosthodontics patients in the clinic. This might be a national phenomena and not specific to HSDM. Examinations, grades, requirements, and inconsistency of professors' feedback have been suggested as the major factor causing stress among dental students.<sup>18</sup> Surprisingly, we also found that the tutorial sections may help students understand preclinical and clinical knowledge and skills. During the tutorial sections, students have opportunities to discuss their clinical problems, and they work as a group to understand the multidisciplinary cases presented by the tutors who are all prosthodontists or residents in the postgraduate prosthodontics program. By understanding the problem, the student is expected to become an independent learner and problem solver, not an information consumer.

The National Board Scores Part I and II for the classes of 2005 and 2006 remain the highest in the country (Part I ranks #1 and Part II ranks #3 in the nation).<sup>19</sup> HSDM students also completed an average of 2.6 units per student of RPDs, which does not differ substantially from the then national average (3 units per student),<sup>4</sup> 2.6 units of CDs per student, and 12.7 units of fixed prostheses per student. There is no data available regarding the national average of units of completed CDs or fixed prostheses per student. This information is taken from the clinical evaluation system, and all procedures were completed and done at HSDM clinic, excluding the work completed at externship sites. Despite a shortened curriculum and the students' perceptions about the prosthodontics curriculum, HSDM's external and internal outcomes measurements remain very strong, as measured by National Board Scores, number of units finished, and licensure pass rates.

Waldman in 1998 indicated that there was a marked national decrease in numbers of prosthodontists during the first half of the 1990s.<sup>20</sup> Specifically, between 1991 and 1995, there was a 6.3% decrease in male prosthodontists (138) and an increase of 26.1% in female prosthodontists (40). The number of prosthodontic graduate programs increased irregularly from 1987-1995; however, the number of graduates with US citizenship decreased over that time. Recruiting of qualified graduates into prosthodontics graduate programs continues to be a challenge that demands attention. There are probably several reasons deterring many qualified and interested candidates from pursuing a career in prosthodontics. Financial and academic burdens, a lack of guidance by full-time prosthodontists in the clinic, and not enough exposure to treatment performed by prosthodontists may influence the graduating students' choice of specialty. At HSDM, due to the small class size, a strong mentoring relationship has been developed beginning in the third year. Students interested in becoming prosthodontists also have an opportunity to get a broader exposure to prosthodontics by assisting the prosthodontics residents, ITI fellows, or their mentors/instructors in the faculty group practice in the evening. Students also have an opportunity to discuss their clinical cases with prosthodontics residents and full-time

prosthodontics faculty, building on relationships started in the tutorials. The Prosthodontics Study Club was also established recently to recruit interested and qualified students. A recent report shows that mentors who serve as role models have a positive impact on students' specialty choices;<sup>21</sup> therefore, we believe that the role of tutor in the PBL curriculum is critical in influencing students' choice of their residency program. Approximately, 4400 students graduate from US dental school yearly, and around 140 students enroll in first year prosthodontics programs every year, resulting in an average of 3% graduated students from US dental schools entering a prosthodontics graduate program.<sup>22</sup> At HSDM, approximately 8-10% of the graduating students choose prosthodontics as their career every year. Therefore, despite the perceived stress at HSDM, prosthodontics is still considered a good specialty choice by HSDM students compared to the national average.

In summary, we have shown that the HSDM prosthodontics preclinical curriculum time is shorter when compared to other schools. Despite the shortened curriculum, HSDM students outperform other schools' students on selected external/internal outcome measures. The shortened clock hours do affect student perceptions of stress, but not their didactic and clinical performances. This new curriculum may also positively influence students' decisions in choosing their graduate programs. This study does not have a control group, so it is difficult to gauge whether the stress/anxiety students feel is the same at all schools. Although these results are specific to HSDM, students nationwide may experience major stress in prosthodontics, because prosthodontics makes up most of the clinical requirements in the curriculum.<sup>23</sup> To increase students' interest in prosthodontic graduate programs, prosthodontics faculty should consider:

- 1. Introducing small-group, case-based tutorials and seminars,
- 2. Monitoring students' anxiety/stress levels as they transition into clinics,
- Providing positive feedback as students transition into clinics,
- 4. Providing more prosthodontists teaching predoctoral student as mentors,
- 5. Giving more exposure to prosthodontics by inviting predoctoral students to attend prosthodontics meetings,
- 6. Providing an opportunity for predoctoral students to assist prosthodontics graduate students/faculty, and
- 7. Establishing prosthodontics study clubs.

# Conclusions

A survey was conducted to assess HSDM predoctoral student perception regarding prosthodontics preclinical curricula. One hundred percent responded. The results showed that despite student perception of preparedness, anxiety, and stress of prosthodontics preclinical curriculum, HSDM's students continue to perform well when measured by external outcomes (NBDE Part I and II, National Licensure Examination), internal outcomes (competency examination, number of units completed), and by choice of specialty. The PBL portion of the curriculum helps students with preparedness and may help in regards to mentorship and to guide them to choose prosthodontics as their future career.

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# Harvard School of

# **Dental Medicine**

Please rate the following subjects by marking X in the appropriate box for each question.

No.	Question	Fixed Prosthodontics (FPS)	Complete Denture (CD)	Removable Partial Denture (RPD)
1	How would you rate your level of stress during the laboratory exercises?			
	a. Not stressful			
	b. Stressful			
	c. Very stressful			
2	What do you think about the duration			
	of the laboratory exercises?			
	a. Too short			
	b. Just right			
	c. Too long			
3	Do you think you have enough input/feedback on your laboratory work from your instructors during laboratory exercises?			
	a. Not enough			
	b. Just right			
	c. More than enough			
4	Do you feel the knowledge you have gained from the lecture is adequate for laboratory exercise?			
	a. Not adequate			
	b. Just right			
	c. More than adequate			
5	Do you think the knowledge you obtained from the lectures is helpful in preparing for clinical practice?			
	a. Yes			
	b. No			
	c. Not certain			
6	How prepared (from your pre-clinical experiences) do you feel about treating patients in the clinic? (Self-confidence)			
	a. Unprepared			
	b. Just right			
	c. Well prepared			

Continued.

No.	Question	Fixed Prosthodontics (FPS)	Complete Denture (CD)	Removable Partial Denture (RPD)
7	Do you think you have enough clinical- skill (hand-skill) training to treat patients in the clinic?			
	a. Not enough			
	b. Just right			
	c. More than enough			
8	How helpful are tutorials or PBL in helping you understand pre-clinical and clinical knowledge and skills?			
	a. Not helpful			
	b. Helpful			
	c. Very helpful			

Please provide us your input to improve the training (both pre-laboratory/ laboratory) in order to maximize learning opportunities in preparation for patient care.

Appendix Survey distributed to HSDM classes of 2005 and 2006.

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