

Students' Perceptions of Materials and Techniques Used at European Dental Schools in the Education of Fixed Prosthodontics

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Abstract: The aim of this study was to explore the materials and procedures used by students in dental schools across Europe for teaching fixed prosthodontics. An online questionnaire, containing twenty-eight dichotomous, multiple-choice, and Likert scale rating questions, was sent to students in forty dental schools. After excluding dental schools in which less than 10 percent of the students responded, 775 questionnaires from ten schools remained for statistical analysis. Among these respondents, acrylic resin teeth were said to be the most commonly used material during preclinical practice (46-96 percent), and use of extracted teeth varied from 8 to 65 percent. At nine of the ten institutions, metal-ceramic was reported to be most commonly used for fixed dental prostheses. There was large variation in the type of finish line for a metal-ceramic fixed dental prosthesis: students at five institutions reported using a shoulder finish line, three a chamfer finish line, and two a shoulder-bevel finish line. A similar variation was observed with regard to the final cementation of metal-ceramic fixed dental prostheses: students at four institutions reporting most frequently using glass ionomer cement, with three using zinc phosphate cement and three using carboxylate cement. The responding European dental students varied considerably in their opinions about whether they were preclinically properly trained for the first preparation on a patient and in their overall rating of their education in fixed prosthodontics. Responding students in the United Kingdom, Sweden, and Nijmegen, The Netherlands, rated their fixed prosthodontics training overall the highest. Overall, this study found a wide variation amongst dental schools with regard to their education in fixed prosthodontics and their rating of this teaching.

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Most dentists place a substantial number of fixed dental prostheses each year.¹ Therefore, preclinical and clinical education in fixed prosthodontics techniques is an essential component of the dental curriculum. This is clearly stated in the current profile for the European dentist, which states that “a dentist must be competent at designing effective indirect restorations, anterior and posterior crowns, bridges, complete and partial dentures, including a combination of fixed and removable dentures, and occlusal splints and undertaking some

of these procedures as is relevant to the country of practice” (competence 6.45).²

Recent publications have reported wide variations in local anesthesia teaching programs and tooth color determination programs in dental curricula as well as variations in dental students' rating of their education in this area.^{3,4} However, little is known about variation in prosthodontic training at dental schools. In the United Kingdom, for instance, dental schools vary with regard to the teaching and clinical use of impression materials and techniques in fixed

prosthodontics.⁵ Therefore, the primary aim of this study was to explore the types of materials used by students in dental schools across Europe for preclinical practice in their fixed prosthodontics programs and the types of materials, crown, and preparation margin designs employed by students in fixed dental prostheses when treating patients. In addition, we explored students' perceptions of the adequacy of their preclinical training program in preparing them for clinical training and the number of fixed dental prostheses that students have to prepare to fulfill their schools' requirements.

Methods

This study was performed in accordance with the guidelines of the Medical Ethical Committee of the Free University in Amsterdam, and permission was obtained from the director of education of the Academic Centre for Dentistry Amsterdam. An online questionnaire that sought information about students' perceptions of the teaching of fixed prosthodontics was developed. All fifty-two local representatives of the European Dental Student Association (EDSA) were approached by e-mail for assistance in distribution of the questionnaire. EDSA delegates in forty dental schools responded positively. After we pre-tested the questionnaire amongst participating EDSA delegates, the final version consisted of two parts. The first part collected general information about dental school, gender, and study year of the student. In the

second part, the fixed prosthodontics education of the student was explored with twenty-five questions (dichotomous, multiple choice, or rating scale).

After entering all questions in the Internet-based survey program eXamine 2.0,^{3,6} we distributed a web link by e-mail to the participating EDSA representatives. The EDSA representatives received the instruction to distribute the web link amongst their fellow students. At most dental schools, the web link was distributed by e-mail, and the questionnaire could be activated by clicking on it. At some schools the web link had to be distributed via a forum on the Internet or on paper. Participation was on a voluntary base, and all responses were anonymous. The questionnaire was distributed in November 2009. The dental students had six weeks to answer the questionnaire and received a reminder after three weeks.

A total of 1,205 individuals returned the questionnaire. Less than 10 percent of the students from Ghent (Belgium), Sarajevo (Bosnia & Herzegovina), Sofia and Varna (Bulgaria), Zagreb (Croatia), Auvergne, Bordeaux, Lille, Lyon, Marseille, Montpellier, Nancy, Nantes, Nice, Paris, Reims, Rennes, and Strasbourg (France), Leipzig (Germany), Athens and Thessaloniki (Greece), Parma (Italy), Katowice (Poland), Bucharest and Iasi (Romania), Belgrade (Serbia), Malmö (Sweden), and Birmingham, London, and Manchester (United Kingdom) returned the questionnaire. After exclusion of those dental schools, 775 questionnaires from ten European dental schools remained for analysis (Table 1). Questionnaires were analyzed when a student had completed at least the

Table 1. Number of students in ten European dental schools participating in study

Country	City	Total Number of Students	Number of Respondents ^a	Number with Preclinical Training ^b	Number with Preclinical and Clinical Training ^c
Finland	Helsinki	220	28	23	11
France	Brest	100	41	37	24
France	Toulouse	360	41	38	23
Netherlands	Amsterdam	884	203	170	35
Netherlands	Groningen	330	78	50	21
Netherlands	Nijmegen	410	148	139	42
Slovenia	Ljubljana	350	65	49	22
Sweden	Stockholm	550	58	41	20
U.K.	Cardiff	325	46	25	23
U.K.	Leeds	460	67	52	25
Total			775	624	246

^aTotal number of respondents from each dental school (including those who reported that they had not had education in fixed prosthodontics yet).

^bNumber of respondents who had had at least preclinical education in fixed prosthodontics.

^cNumber of respondents who had had preclinical and clinical education in fixed prosthodontics.

questions about preclinical education. This selection resulted in 624 useful questionnaires. Of these, 378 had received preclinical education, and 246 had received both preclinical and clinical education.

The rating scales questions were analyzed with PASW Statistics 18.0.2 for Windows (IBM SPSS, Chicago, IL, USA). First, a Kruskal-Wallis test was used for overall analysis, followed by subsequent Mann-Whitney tests for post hoc pairwise comparisons. A value of $p < 0.05$ was considered statistically significant.

Results

General information about the respondents is shown in Table 2. The percentage of female students was usually higher than 50 percent, and the mean study year of the respondents was 4 or 5. Most dental schools begin initial teaching in fixed prosthodontics

in study year 3 or 4, with two exceptions: in Nijmegen, The Netherlands, the initial teaching started in year 2, and in Helsinki, Finland, in year 5.

According to the respondents, acrylic resin teeth are the most commonly used material during preclinical practice of fixed dental prostheses at all surveyed dental schools (46-96 percent), and model teeth of plaster are much less frequently used (8-34 percent). A large variation amongst dental schools was observed with regard to the use of extracted human teeth during preclinical practical courses, which varied from 8 percent to 65 percent (Table 3). During the preclinical teaching, most respondents said they practice on each of the maxillary teeth and each of the mandibular teeth (Table 4). However, at the three Dutch dental schools (Amsterdam, Groningen, Nijmegen) students said they seldom practice on incisors and canines in the mandibular arch. Dental students in Amsterdam and Groningen also said they do not practice preclinically on maxillary canines.

Table 2. Characteristics of participating students with regard to gender, current study year, and year in which they received initial teaching in fixed prosthodontics

Country	City	Female (%)	Study Year (mean)	Initial Teaching (mean)
Finland	Helsinki	70%	5.6	5.0
France	Brest	57%	5.5	3.2
France	Toulouse	39%	5.7	3.3
Netherlands	Amsterdam	66%	4.8	3.0
Netherlands	Groningen	78%	5.3	4.0
Netherlands	Nijmegen	65%	4.5	2.1
Slovenia	Ljubljana	71%	5.8	3.4
Sweden	Stockholm	73%	4.7	4.0
U.K.	Cardiff	68%	5.5	4.0
U.K.	Leeds	50%	5.1	4.0

Table 3. Material used in preclinical practice of fixed dental prostheses at ten European dental schools (data expressed as percentages of total students reporting preclinical training)

Country	City	Acrylic Resin Teeth	Model Teeth of Plaster	Extracted Human Teeth	Animal Teeth
Finland	Helsinki	91%	35%	35%	0
France	Brest	78%	19%	51%	0
France	Toulouse	71%	21%	53%	3%
Netherlands	Amsterdam	82%	14%	11%	0
Netherlands	Groningen	82%	22%	8%	0
Netherlands	Nijmegen	86%	18%	48%	1%
Slovenia	Ljubljana	96%	16%	45%	0
Sweden	Stockholm	46%	34%	10%	0
U.K.	Cardiff	96%	8%	16%	0
U.K.	Leeds	81%	31%	65%	0

Note: As students were allowed to choose more than one option, the total of the different materials may exceed 100%.

At nine of the ten surveyed dental schools, the most commonly used material for fixed dental prostheses was reported to be metal-ceramic (Table 5). In Amsterdam, all-ceramic is most frequently used as material for fixed dental prostheses. The students who reported the use of full metal crowns use a chamfer finish line in Leeds and a knife-edge finish line in Brest. According to these students' responses, there is a wide disparity amongst European dental schools with regard to the type of finish line for a metal-ceramic crown: at five institutions, a shoulder finish line is the most commonly used type of finish line for a metal-ceramic crown, at three dental schools a chamfer finish line, and at two dental schools a shoulder-bevel finish line (Table 6). In Amsterdam, a chamfer finish line is always used as finish line for an all-ceramic crown.

Zinc phosphate cement was reported by these respondents to be most used for final cementation of full metal crowns. A wide variation was observed with

regard to the type of cement most commonly used for the final cementation of metal-ceramic crowns: at four institutions, glass ionomer cement was reported to be the most frequently used, at three dental schools zinc phosphate cement, and at three institutions carboxylate cement (Table 7). In Amsterdam, the all-ceramic crowns are usually finally cemented with resin cement (63 percent). The reported numbers of clinical fixed dental prostheses the students are required to complete before graduation show a wide variation from zero to twenty, even within the same institution. A considerable number of students reported that they did not know the required number of clinical fixed dental prostheses (0-38 percent).

These European dental students reported a considerable variation in their opinion as to whether they were preclinically properly trained for their first fixed dental prosthesis on a patient and their overall rating of their education in fixed prosthodontics (Table 8). The dental schools in the United Kingdom and

Table 4. Maxillary and mandibular teeth used for preclinical practice of fixed dental prostheses at ten European dental schools (data expressed as percentage of students reporting preclinical training)

Country	City	Maxilla				Mandibula			
		Inc	Can	Pre	Mol	Inc	Can	Pre	Mol
Finland	Helsinki	91%	87%	48%	44%	35%	30%	44%	83%
France	Brest	87%	68%	87%	87%	46%	38%	81%	89%
France	Toulouse	82%	84%	84%	82%	63%	68%	82%	84%
Netherlands	Amsterdam	78%	1%	17%	88%	7%	1%	73%	89%
Netherlands	Groningen	70%	4%	48%	76%	2%	2%	38%	88%
Netherlands	Nijmegen	79%	53%	61%	74%	19%	19%	50%	86%
Slovenia	Ljubljana	92%	90%	92%	94%	84%	88%	90%	94%
Sweden	Stockholm	68%	66%	71%	68%	66%	63%	71%	66%
U.K.	Cardiff	88%	56%	80%	76%	52%	44%	68%	92%
U.K.	Leeds	87%	65%	83%	83%	60%	48%	81%	87%

Inc=Incisor, Can=Canine, Pre=Premolar, Mol=Molar

Table 5. Most commonly used material for fixed dental prostheses at ten European dental schools (data expressed as percentage of students who had made fixed dental prostheses on patients)

Country	City	Full Metal	Metal-Ceramic	All-Ceramic	Other	Unknown
Finland	Helsinki	0	91%	0	0	9%
France	Brest	29%	71%	0	0	0
France	Toulouse	17%	83%	0	0	0
Netherlands	Amsterdam	0	34%	66%	0	0
Netherlands	Groningen	0	100%	0	0	0
Netherlands	Nijmegen	0	91%	2%	5%	2%
Slovenia	Ljubljana	0	86%	0	14%	0
Sweden	Stockholm	0	95%	5%	0	0
U.K.	Cardiff	0	86%	0	5%	10%
U.K.	Leeds	24%	56%	0	0	20%

Table 6. Most commonly used type of finish line for metal-ceramic fixed dental prostheses at ten European dental schools (data expressed as percentage of students who reported metal-ceramic was most commonly used crown material)

Country	City	Knife Edge	Shoulder	Chamfer	Shoulder-Bevel	Other	Unknown
Finland	Helsinki	0	20%	0	50%	0	30%
France	Brest	6%	29%	12%	0	6%	47%
France	Toulouse	6%	41%	0	18%	6%	29%
Netherlands	Amsterdam	0	0	0	100%	0	0
Netherlands	Groningen	0	0	62%	29%	9%	0
Netherlands	Nijmegen	0	0	66%	32%	2%	0
Slovenia	Ljubljana	0	61%	33%	6%	0	0
Sweden	Stockholm	0	0	100%	0	0	0
U.K.	Cardiff	0	45%	22%	11%	22%	0
U.K.	Leeds	0	86%	7%	0	7%	0

Table 7. Most commonly used cement for final cementation of metal-ceramic fixed dental prostheses at ten European dental schools (data expressed as percentage of students who reported metal-ceramic was most commonly used crown material)

Country	City	Composite	Carboxylate	Glass Ionomer	Zinc Phosphate	Other	Unknown
Finland	Helsinki	0	0	0	100%	0	0
France	Brest	0	35%	12%	29%	6%	18%
France	Toulouse	0	6	41%	35%	0	18%
Netherlands	Amsterdam	25%	0	50%	0	8%	17%
Netherlands	Groningen	5%	0	91%	0	0	5%
Netherlands	Nijmegen	18%	0	79%	0	0	3%
Slovenia	Ljubljana	6%	0	39%	50%	0	5%
Sweden	Stockholm	0	0	0	100%	0	0
U.K.	Cardiff	0	61%	6%	11%	5%	17%
U.K.	Leeds	7%	37%	21%	14%	7%	14%

Table 8. Students' opinions on their preclinical preparation and fixed prosthodontics education overall

Country	City	Preparation for Real Patient (range 1-5)	Overall Rating (range 1-10)
Finland	Helsinki	3.5±0.7	6.6±1.8
France	Brest	3.5±0.9	6.8±1.7
France	Toulouse	3.7±0.9	6.9±1.7
Netherlands	Amsterdam	3.6±0.9	6.6±1.5
Netherlands	Groningen	3.4±0.9	6.4±1.5 ^c
Netherlands	Nijmegen	3.9±0.9 ^{abde}	8.0±1.1 ^{abcde}
Slovenia	Ljubljana	3.1±1.0 ^{bcd}	5.6±2.2 ^{bcd}
Sweden	Stockholm	4.1±1.0 ^{abdeg}	7.8±1.5 ^{abcdeg}
U.K.	Cardiff	4.0±0.6 ^{abdeg}	7.4±1.1 ^{adefg}
U.K.	Leeds	4.0±0.8 ^{abdeg}	7.9±1.4 ^{abcdeg}
Kruskal-Wallis test		p<0.0005	p<0.0005

Mann-Whitney tests for post hoc pairwise comparisons: ^ap<0.05 vs. Helsinki, ^bp<0.05 vs. Brest, ^cp<0.05 vs. Toulouse, ^dp<0.05 vs. Amsterdam, ^ep<0.05 vs. Groningen, ^fp<0.05 vs. Nijmegen, ^gp<0.05 vs. Ljubljana, ^hp<0.05 vs. Cardiff.

Note: Questions asked whether students felt their preclinical training had sufficiently prepared them for a fixed dental prosthesis on a real patient and for the students' overall rating of their fixed prosthodontics education. Data are expressed as mean score±SD and based on students who had made fixed dental prostheses on patients.

Sweden and the one in Nijmegen, The Netherlands, received the highest overall ratings (mean score >7).

Discussion

This study of dental students' perceptions discovered considerable variation amongst European dental schools in the teaching of fixed prosthodontics and the rating of this teaching by students. This finding is comparable to previously reported results with regard to local anesthesia teaching programs and tooth color determination programs.^{3,4} Dental curricula vary in fixed prosthodontics training with regard to study year when the initial teaching begins (from year 2 to 5) and in materials and techniques used for fixed prosthodontics.

Teaching of all-ceramic fixed dental prostheses was already incorporated into the curriculum of many dental schools in the United States, United Kingdom, and Scandinavia fifteen years ago.⁷⁻⁹ Nevertheless, with the exception of Amsterdam, in our study, metal-ceramic was reported to be the most commonly used material for fixed dental prostheses in the responding European dental schools. According to the responding students, these European dental schools are also not uniform with regard to the type of finish line and the material used for the final cementation of metal-ceramic fixed dental prostheses (Table 6 and 7). Therefore, it would seem interesting to explore, in a subsequent study, which criteria dental schools use when selecting fixed prosthodontics techniques for inclusion in their curricula.

According to the respondents in our study, European dental schools have a wide variation in the compulsory number of fixed dental prostheses students must complete before graduation. Such variation was previously also reported for dental schools in the United States and the United Kingdom.¹⁰⁻¹² In those studies, several institutions reported that they do not have a minimum number of fixed dental prostheses the students have to complete because their program is competency-based. The considerable number of students reporting in our study that they do not know the required number of fixed dental prostheses and the large variations in numbers of fixed dental prostheses reported by students within the same institution indicate that communication with students regarding to requirements in fixed prosthodontics could be improved.

In other studies, the majority of recently graduated dentists in the United Kingdom, Australia,

Norway, and The Netherlands have reported an adequate preclinical practical experience in crown preparations, with lower scores for more extensive fixed dental prostheses.¹³⁻¹⁷ However, in one study, 32 percent of the final-year dental students in a UK dental school said they did not feel adequately prepared to undertake their assessment in fixed dental prostheses.¹⁸ Final-year dental students in the UK and Ireland ranked placement of stainless steel crowns among the areas in which they had the least confidence in another study.¹⁹ Exposure to supplementary teaching aids such as an instructional video might improve preparation of fixed dental prostheses by dental students and decrease the associated stress of the students to some extent.²⁰

According to the results of our study, most of the responding dental schools in Europe begin the initial teaching in fixed prosthodontics in study year 3 or 4. One institution begins in year 2, while another starts in year 5 (Table 2). It has been suggested that a relatively early beginning of the course in fixed prosthodontics will allow greater clinical exposure in treating patients and subsequently a higher confidence level.²¹ Although the students' rating of the education in fixed prosthodontics education at Nijmegen, The Netherlands—the dental school that begins in year 2—ranked among the highest in our study, the ratings of preclinical preparation of surveyed dental schools and overall ratings were not related to students' year in school.

The type of web-based survey used in our study has certain limitations.^{3,4} First, the questionnaire was in English only. As English is not the native language of most European dental students, this may have resulted in misinterpretation of certain questions. Second, the questionnaire was distributed through EDSA representatives. As EDSA representatives are likely to be more interested in education in general,²² this could have introduced some selection bias. Also, a considerable time may have passed between the time that students received their preclinical training and the time they completed the questionnaire, which could affect the accuracy of their responses. The students who did not know what type of finish line is taught at their school or what type of cement is used were probably students who are still early in their clinical training. Another limitation of this study is that only a small number of students responded and those were from only ten out of forty European dental schools; thus, our findings cannot be said to represent European dental education as a whole. Finally, we sought to determine students' perceptions of

their prosthodontic education, and we acknowledge that the findings may have differed had we surveyed faculty members or dental school administrators.

Our study of students' perceptions found that the responding dental schools across Europe show a considerable variation in the fixed prosthodontics program with regard to materials and procedures for their preclinical training program and procedures employed by students when treating a patient. This may result in differences in the competence of recently graduated dentists between countries. Considering the increasing international mobility of contemporary dentists, a drive towards more convergence in dental education seems warranted.²³

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REFERENCES

1. Levine RS. Experience, skill, and knowledge gained by newly qualified dentists during their first year of general practice. *Br Dent J* 1992;172:97-102.
2. Cowpe J, Plasschaert A, Harzer W, Vinkka-Puhakka H, Walmsley AD. Profile and competences for the graduating European dentist: update 2009. *Eur J Dent Educ* 2010;14:193-202.
3. Brand HS, Tan LLS, van der Spek SJ, Baart JA. European dental students' opinion on their local anesthesia education. *Eur J Dent Educ* 2011;15:47-52.
4. Dozic A, Kharbanda AK, Kamell H, Brand HS. European dental students' opinions about visual and digital tooth color determination systems. *J Dent* 2011;39S:e23-e28.
5. Randall RC, Wilson MA, Setcos JC, Wilson NH. Impression materials and techniques for crown and bridgework: a survey of undergraduate teaching in the UK. *Eur J Prosthodont Restor Dent* 1998;6:75-8.
6. Poorterman JHG, Dikkes BT, Brand HS. Dental students' part-time jobs in dental practices in the Netherlands. *Eur J Dent Educ* 2010;14:151-4.
7. Frazier KB, Mjör IA. The teaching of all-ceramic restorations in North American dental schools: curricular requirements and indications. *J Esthet Dent* 1996;8:234-40.
8. Jokstad A, Mjör IA, Frazier KB. The teaching of all-ceramic restorations in Scandinavian dental schools: a survey. *Acta Odontol Scand* 1996;54:200-4.
9. Wilson NH, Qualtrough AJ, Mjör IA. All-ceramic restorations: teaching in UK and Irish dental schools. *Eur J Prosthodont Restor Dent* 1996;4:15-9.
10. Petropoulos VC, Weintraub A, Weintraub GS. The dental student as a technician: preclinical and clinical laboratory programs in fixed prosthodontics. *J Prosthodont* 2001;10:164-9.
11. Youngson CC, Molyneux LE, Fox K, Boyle EL, Preston AJ. Undergraduate requirements in restorative dentistry in the UK and Ireland. *Br Dent J* 2007;203(Suppl):9-14.
12. Lynch CD, Singhrao H, Addy LD, Gilmour ASM. The teaching of fixed partial dentures in undergraduate dental schools in Ireland and the United Kingdom. *J Oral Rehab* 2010;37:908-15.
13. MeerumTerwogt M, Hoogstraten J. Tandartsen over hun opleiding aan ACTA van 1990 tot 1997. *Ned Tijdschr Tandheelkd* 1998;105:247-9.
14. Murray FJ, Blinkhorn AS, Bulman J. An assessment of the views held by recent graduates on their undergraduate course. *Eur J Dent Educ* 1999;3:3-9.
15. Verrijt AHM, van der Plaats RE, Plasschaert AJM. Tandartsen over hun opleiding aan de Universiteit Nijmegen van 1990 tot en met 1997. *Ned Tijdschr Tandheelkd* 2000;107:3-7.
16. Arena G, Kruger E, Holley D, Millar S, Tennant M. Western Australian dental graduates' perception of preparedness to practice: a five-year follow-up. *J Dent Educ* 2007;71(11):1217-22.
17. Ingebrigtsen J, Røynstrand E, Berge ME. An evaluation of the preclinical prosthodontic training at the Faculty of Dentistry, University of Bergen, Norway. *Eur J Dent Educ* 2008;12:80-4.
18. Rolland S, Hobson R, Hanwell S. Clinical competency exercises: some student perceptions. *Eur J Dent Educ* 2007;11:184-91.
19. Honey J, Lynch CD, Burke FM, Gilmour ASM. Ready for practice? A study of confidence levels of final year dental students at Cardiff University and University College Cork. *Eur J Dent Educ* 2011;15:98-103.
20. Nikzad S, Azari A, Mahgoli H, Akhoundi N. Effect of a procedural video CD and study guide on the practical fixed prosthodontic performance of Iranian dental students. *J Dent Educ* 2012;76(3):354-9.
21. Rafeek RN, Marchan SM, Naidu RS, Carrotte PV. Perceived competence at graduation among dental alumni of the University of the West Indies. *J Dent Educ* 2004;68(1):81-8.
22. Divaris K, Barlow PJ, Chendea SA. The academic environment: the student's perspective. *Eur J Dent Educ* 2008;12(Suppl 1):120-30.
23. Scott J. Dental education in Europe: the challenges of variety. *J Dent Educ* 2003;67(1):69-78.