

Removable Partial Denture Education in Portugal Following the Bologna Process

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Abstract - *The aim of this study was to investigate the current guidelines used for the undergraduate course subject Removable Partial Denture in Portuguese Dental Schools following the Bologna Process. All Dental Schools were sent a questionnaire, divided into the following areas: (I) organization and syllabus; (II) teaching methods; (III) materials and techniques; Answers about organization and syllabus of course subjects showed the most variability; teaching methods were identical regarding principal textbook and live demonstrations of laboratory/ clinical procedures; the same techniques and materials are used in all the schools' dental clinics. The majority of Dental Schools present similar guidelines for removable partial dentures.*

KEY WORDS: removable partial denture, dental education, teaching, curriculum, Portugal

INTRODUCTION

In the second half of the twentieth century, oral health became a concern to a great part of the population, especially in developed countries^{1,2}. Although there has been a reduction in tooth loss, the increase in average life expectancy has led to a rise in the need for prosthetic treatment^{1,3}, particularly with regard to removable partial dentures and/or fixed prosthesis over teeth and implants⁴. This pattern is very likely to continue in the years to come. Older people have a growing perception of treatment needs and demand more aesthetic results¹.

However, for varying reasons, several Dental Schools have reduced the number of hours allocated to the teaching of removable prosthodontics, especially the laboratory procedures for prosthetic treatment. This reduction in teaching hours in recent years is largely due to the fact that degree courses have been shortened by one academic year since adoption of the Bologna Process (which was instigated to create a European Higher Education Area and thus ensure comparability in the standards and quality of higher education qualifications)⁵⁻¹².

In Portugal there are seven institutions of higher education in Dental Medicine (three public and four private) teaching removable prosthodontics that have revised their curricula in accordance with the Bologna Process.

The aim of this study was investigate the current guidelines being used for undergraduate courses in removable prosthodontics (RPDs) at Portuguese Schools of Dental Medicine, following their adoption of the Bologna Process, considering the subjects, materials and techniques discussed below.

MATERIALS AND METHODS

The questionnaire consisted of twenty-four multiple-choice questions regarding RPD, divided into three major groups: (I) organization and program of the course subject; (II) teaching methods; (III) materials and techniques used. Respondents were asked to indicate the hypothesis that best described the situation of RPD teaching in their schools. If no answer fitted, the respondent could write his/her own answer in a designated space.

Professors at the Faculty of Dental Medicine of the University of Porto tested the face validity of the questionnaire before it was sent to other Institutions.

The questionnaire (see appendix) was sent to the 'Removable Partial Denture' Department Heads of the seven institutions of higher education that confer the degree of Dental Medicine in Portugal (Table I). The response rate was 100%.

RESULTS

The results obtained from the questionnaire study are presented according to the groups of questions defined above.

Group I – Organization and syllabus of the Removable Partial Denture course subject

All the schools surveyed (n=7) have adapted their curriculum to the Bologna Process. In four schools (57,1%), RPD appears as an independent course subject. In three schools (42,9%), RPD is included in a *Removable Prosthodontics* course subject.

There are differences in the teaching of RPD in terms of the school year when it is taught (Table II), the student/teacher ratio (Table III), the teaching hours for each type of class (Table IV and V) and the amount of assessment with regard to theoretical and practical classes (Table VI).

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Table 1. Higher education institutions that confer the degree of Dental Medicine

Faculty of Dental Medicine of the University of Porto
Faculty of Medicine of the University of Coimbra
Faculty of Dental Medicine of the University of Lisboa
Advanced Institute of Health Sciences – North
University Fernando Pessoa
Advanced Institute of Health Sciences Egas Moniz
Health Sciences Institute of the Portuguese Catholic University

Table 2. Year/ Semester in which RPD is taught in each School of Dental Medicine

Year/Semestre	SDM 1	SDM 2	SDM 3	SDM 4	SDM 5	SDM 6	SDM 7
3 rd year/1 st semester	X	X	X	X	X	X	
3 rd year/2 nd semester	X			X	X		
4 th year/1 st semester	X	X		X	X	X	X
4 th year/2 nd semester	X	X			X		X
5 th year/1 st semester	X	X			X	X	X
5 th year/2 nd semester		X			X	X	X

SDM: School of Dental Medicine

Table 3. Student/professor ratio in pre-clinical and clinical classes

Ratio	Pre-clinical classes	Clinical classes
	SDM (n)	SDM (n)
6:1 to 10:1	1	5
11:1 to 15:1	4	2
16:1 to 20:1	1	0
>20:1	1	0

SDM: School of Dental Medicine

Table 4. Teaching hours for theoretical classes

Theoretical classes (h)	SDM (n)
10-15h	1
16-25h	2
26-35h	1
36-45h	1
Other	2

h: hours ; SDM: School of Dental Medicine

Table 6. Number of evaluations concerning theoretical and practical classes

Evaluations (n)	Theoretical classes	Practical classes
	SDM (n)	SDM (n)
1	1	0
2	0	1
3	1	1
4	1	0
5	0	0
>5	4	5

SDM: School of Dental Medicine

Table 5. Teaching hours for laboratory and clinical practices

Hours	Laboratory Practices	Clinical Practices
	SDM (n)	SDM (n)
≤30h	2	0
From 31 to 50h	4	2
From 51 to 70h	1	2
From 71 to 90h	0	1
From 91 to 110h	0	0
From 111 to 140h	0	2

SDM: School of Dental Medicine

Group II – Teaching methods for Removable Partial Denture (Questions 10 to 13)

Six schools (85,7%) recommend “*McCracken’s Removable Partial Prosthodontics*” by McGivney and Carr, as a main textbook, while one school chose the “other” possibilities citing “*Atlas of Removable Partial Prosthesis*”.

All teachers involved in the teaching of RPD made live demonstrations of laboratory as well as clinical procedures. Video was the format selected by some schools to demonstrate laboratory procedures (n=5; 71,4%) and clinical procedures (n=3; 42,9%). Only one School (14,3%) had the lessons available on the Internet.

Table 7. *Laboratory procedures required of the students*

<i>Laboratory Procedures</i>	<i>SDM (n)</i>	<i>%</i>
Making of individual trays	7	100
Obtaining of study casts	6	85.7
Making of intermaxillary registration plates	5	71.4
Mounting and studying of the casts in articulator	6	85.7
Analysis of the models in surveyor	6	85.7
Planning and drawing of RPD	6	85.7
Mounting the teeth and waxing	2	28.6
Flasking, processing and finishing the RPD	2	28.6
Making of the metallic framework (waxing, casting and finishing)	0	0
Others	0	0

SDM: School of Dental Medicine

Group III - Materials and techniques taught in RPD (Questions 14 to 24)

Material used for the border moulding

- The materials used in the border moulding varied between each school. Five schools use an impression compound (71,4%), two schools a polyvinilsiloxane (28,6%) and two schools a wax (28,6%).

Material used for the Final Impression

- For the final impression, one school uses a polyether (14,3%), two schools a polyvinilsiloxane (28,6%) and three schools an irreversible hydrocolloid (42,9%). The other one uses a polyvinilsiloxane and/or an irreversible hydrocolloid.

Use of Individual Tray

- The use of an individual tray for the final impression was advocated by all schools.

Articulator type

- Four schools use only a semi-adjustable articulator (57,1%), one school only a hinge type articulator (14,3%) and two schools use both options (28,6%).

Number of teaching hours on drawing the RPD

- Four schools dedicate 10 hours or less (57,1%), two 11-20h (28,6%) and one 21-30h (14,3%), to the teaching of RPD design.

In-house laboratory of denture metallic frameworks

- In only two schools (28,6%) the framework of a RPD is manufactured in an internal dental laboratory.

Laboratory Procedures undertaken by students

- Table VII presents the laboratory procedures that are undertaken by students at each school.

Use of the Altered Cast Technique

- In 5 schools (71,4%), the use of the altered cast technique for bilateral and unilateral distal extension clinical situations is required.

Patient treatment using prostheses with attachments

- In four schools (57,1%) students are allowed to treat patients with removable partial dentures with attachments.

Post-insertion Protocol for RPD

- Only in one school (14,3%) did not have a protocol for post-insertion visits.

Presence of a required minimum number of RPD for students

- In three schools (42,9%) it is mandatory for the student to make a minimum number of RPD units.

DISCUSSION

The results obtained show that there is a general agreement between most of the Portuguese dental schools on the majority of issues. The issues that reveal the widest range of different answers relate to Group I: "Organization and course program for the RPD course subject". This may be justified by the fact that RPD is an independent subject in only four of the schools surveyed (57%). This value is smaller than that obtained by Rashedi and Petropoulos¹³, who state that RPD is an independent curricular unit in 86% of cases. It is our belief that the situation regarding whether or not RPD is an independent subject is a determining factor in some of the other answers as well. In reality, when RPD is taught as part of a wider prosthodontic course subject (such as *Removable Prosthodontics*, *Dental Prosthesis and Occlusion*, or *Oral Rehabilitation*), it becomes more difficult to determine in which semester it is taught, the student/teacher ratio, the number of theoretical classes, laboratory practice and clinical practice, as well as the amount of theoretical and practical assessment. In our opinion, there is no problem in subdividing a larger group of Oral Rehabilitation into smaller independent course subjects, provided that there is good overall coordination of all the parts involved.

The fact that RPD may, or may not be, an independent course subject, and the use of different terminology to designate it, may justify the results ranging from 1 to 6 semesters teaching time found among the various schools. Likewise, we can understand the variation in the number of teaching hours: theoretical (from 12 to 35 hours), practical and laboratory (from 10 to 70 hours) and clinical (from 48 to 140 hours). Despite this diversity of answers, all schools taught the program of RPD in the 3rd and/or 4th and/or 5th years of the course, which is perfectly adapted to the characteristics of a course subject from the clinical cycle

(4th and 5th years) whose teaching can be initiated in the final part of the basic cycle (3rd year).

For practical assessment, almost all schools chose continuous evaluation. The number of theoretical evaluations varied between 1 and 8. However, there were still two schools that chose continuous theoretical evaluation. We think that these results can be explained by the different methods of teaching RPD in the seven schools surveyed.

The respondents confirmed that in the theoretical classes the teaching ratio was "all students:1 teacher" and subdivided the student/professor ratio in practical classes in two ways: clinical classes and laboratory classes. The ratio given for clinical classes varied between 5:1 and 12:1 while for the laboratory classes it was between 12:1 and 20:1. These results are similar to those found in the USA¹³ and in the UK¹⁴, and below expectations. We know that, particularly in the clinical practice classes, it is necessary for the teacher to closely monitor the students' work. Due to economic limitations it is not possible, in most cases, to reach the ideal ratio (4:1) proposed for the clinical teaching in accordance with the Bologna Principles.

The answers in "Group II - Methods of teaching RPD" showed a larger uniformity in the answers. The same main textbook is recommended by almost all Schools (n=6; 85,7%). Curiously, it is also the most recommended by the schools in the United States¹³.

All teachers performed live demonstrations of laboratory and clinical procedures. A majority of the respondents (71%) present videos of laboratory procedures and only 43% of clinical procedures. Only one school had its teaching sessions available via the Internet in order for the students to review the contents. The results regarding this group of subjects do not differ considerably from those presented in 2003 by Rashedi and Petropoulos¹³.

Concerning "Group III - Materials and techniques used in RPD", there were no major differences among the schools and only small variations were observed. In most of the Portuguese schools (71%) the modelling impression compound is the material selected to make the border moulding. Use of the same material was indicated in a survey carried out in schools of dental medicine in the United States¹⁰.

The greatest diversity of answers relates to the material used for a final impression of a partially edentulous arch. Three schools chose the irreversible hydrocolloid, two the polyvinylsiloxane, one the irreversible hydrocolloid and the polyvinylsiloxane, and another one the polyether. In the United States, the first choice is also the irreversible hydrocolloid (25%), followed by the polysulfide (16%) and the polyvinylsiloxane (7%)¹⁰. Nowadays, with the development of impression materials in the last few years, we have a good chance of reaching the same goal without loss of quality in the work using a variety of materials.

All the respondents indicated the use of an individual tray for final impression of partially edentulous arches. The results reported by Lynch and Allen¹⁴ in the UK are similar but contrast with the percentage (48%) achieved by Petropoulos and Rashedi¹⁰ in the USA.

Semi-adjustable articulators are used in six of the schools surveyed (85,7%), and three schools also refer to the use

of the hinge-type articulator. The preference for teaching with a semi-adjustable articulator has been presented in some previous studies^{10,13,15}. However, according to Taylor *et al*¹⁶, a survey of dental prosthesis technicians showed that only 15% of dentists use semi-adjustable articulators in clinical practice.

Designing the prosthesis is part of the course in all schools, although they dedicate different numbers of teaching hours to it: fewer than 10 hours in 57% of the cases, from 11 to 20 hours in 29% and from 21 to 30 hours in 14%. An article by Taylor *et al*¹⁶ regarding a questionnaire about the *Removable Prosthesis* curriculum shows unanimity among all the Prosthodontics teachers regarding the issue of RPD design, namely that it should be a dentist's responsibility. In contrast, Taylor *et al*¹⁶ presented the answers to a questionnaire to dental technicians in the USA, stating that 77,9% of the respondents reported that they designed all, or almost all, of the RPDs manufactured at their laboratories. The difficulty felt by dentists in the designing of the RPD is also referred to in other articles^{7,17-19}. We believe that the Portuguese reality is close to the statements made by Taylor *et al*¹⁶. Therefore, RPD designing being a dentist's responsibility, we suppose that the teaching in RPD has not been successful in the preparation of dentists for that task.

Only two out of seven schools had their own laboratory making metallic framework for RPDs. According to Petropoulos and Rashedi¹⁰ the current tendency of American schools (66%) is also to engage external laboratories.

In all schools it is mandatory for the students to make individual trays. The majority of them (n=6; 85,7%) also have to obtain the study casts, mount them in an articulator, analyse in a surveyor and plan and draw the RPD. In 71% of the cases it is necessary to make the intermaxillary registration plates. In only two schools (28,6%) do students carry out the mounting of the teeth and waxing, as well as the flasking, processing and finishing of the RPD. In every school the manufacture of the metallic framework (waxing, casting and finishing) is undertaken in a dental lab. These results indicate a growing tendency in enhancing clinical procedures in detriment of laboratory procedures. This is in agreement with the conclusions of other studies^{5,9-11,13,20}.

In most cases (71%), but not in all, the students are required to use the "Altered Cast Technique" for bilateral or unilateral distal extension RPDs. In other studies⁹⁻¹⁰, this percentage ranges from 59 to 96%. Although these percentages are high, according to Taylor¹⁶, the dental laboratories only use this technique in 6,2% of RPDs with distal extensions.

In four schools (57%) students treat patients whose RPDs have attachments. This does not mean that these cases are not dealt within the other three schools, but possibly they are forwarded to postgraduate courses. A very similar value of 61% is referred to by Petropoulos and Rashedi¹⁰.

Only in one school is there no defined protocol for post-insertion visits, which corresponds with the results in the USA¹⁰. In 57% of the schools, students are not expected to obtain a minimum number of RPD units before successfully completing their course. This option, which contradicts the results obtained in other surveys^{9,10,14,21}, is partly explained by the assumption that it is not possible to find enough patients to reach the minimum required.

The agreement in the answers on many issues can be at-

tributed to the relative uniformity of prosthodontic training of the teachers responsible for teaching Prosthodontics in Portugal, as most of them achieved their degrees in the three public dental schools, the first ones to exist in Portugal.

The number of schools that confer the degree of Dental Medicine in Portugal might have imposed a limitation on this study.

CONCLUSIONS

The majority of the Portuguese dental schools agree on most of the issues in question. The most wide-ranging answers relate to "Group I – Organization and program of the RPD course subject" and may be explained by the fact that this subject is a self-contained course unit in only four, out of seven, Portuguese schools of dental medicine.

ADDRESS FOR CORRESPONDENCE

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APPENDIX

Questionnaire on Removable Partial Denture Education sent to the Portuguese Schools of Dental Medicine

Instructions: Please, mark all the answers that best apply to the curriculum of Removable Partial Denture at your teaching institution. More than one answer can be chosen. If a question does not fit the situation of your school, please correct it, making any appropriate alterations. All data collected will be kept strictly confidential and the results from different institutions will not be identified in future publications or presentations. Thank you for your collaboration.

Group I - Organization and program of Removable Partial Denture

1. Does your teaching institution have an independent *Removable Partial Denture* course subject in its Dental Medicine Degree Course?
 - a. Yes
 - b. No
2. Is the subject *Removable Partial Denture* already adapted to the Bologna Process?
 - a. Yes
 - b. No
3. In which year of the course is the subject *Removable Partial Denture* taught? Please indicate the semesters in which it occurs.
 - a. 1st year; number of semester _____
 - b. 2nd year; number of semester _____
 - c. 3rd year; number of semester _____
 - d. 4th year; number of semester _____
 - e. 5th year; number of semester _____
 - f. 6th year; number of semester _____
4. What is the student/teacher ratio?
 - a. $\leq 5:1$ (please specify) _____
 - b. Between 6:1 and 10:1 (please specify) _____
 - c. Between 11:1 and 15:1 (please specify) _____
 - d. Between 16:1 and 20:1 (please specify) _____
 - e. $> 20:1$ (please specify) _____
5. How many hours of theoretical classes does the subject *Removable Partial Denture* have?
 - a. 10-15
 - b. 16-25
 - c. 26-35
 - d. 36-45
 - e. Other (please specify) _____
6. How many hours of laboratory practice does the *Removable Partial Denture* subject have?
 - a. ≤ 30 (please specify) _____
 - b. 31-50
 - c. 51-70
 - d. 71-90
 - e. 91-110
 - f. 111-140
 - g. >140 (please specify) _____
7. How many hours of clinical practice does the *Removable Partial Denture* subject have?
 - a. ≤ 30 (please specify) _____
 - b. 31-50
 - c. 51-70
 - d. 71-90
 - e. 91-110
 - f. 111-140
 - g. >140 (please specify) _____

8. How many practical evaluations does the *Removable Partial Denture* subject have?
- 0
 - 1
 - 2
 - 3
 - 4
 - >5 (please specify)_____
9. How many theoretical evaluations does the *Removable Partial Denture* subject have?
- 0
 - 1
 - 2
 - 3
 - 4
 - 5
 - >5 (please specify)_____

Group II - Teaching methods for Removable Partial Denture

10. What is the main textbook recommended for the study of *Removable Partial Denture*?
- McCracken's Removable Partial Prosthodontics (McGivney and Carr)
 - Clinical Removable Partial Denture (Stewart, Rudd, Kuebker)
 - Removable Partial Denture (Renner et Boucher)
 - Stewart's Clinical Removable Partial Prosthodontics (Phoenix, Cagna, DeFreest)
 - Other (please specify)_____
11. Do teachers carry out live demonstrations of laboratory procedures?
- Yes
 - No
- And of clinical procedures?
- Yes
 - No
12. Do teachers present videos to demonstrate laboratory procedures?
- Yes
 - No
- And to demonstrate clinical procedures?
- Yes
 - No
13. Do teachers provide classes on the Internet for the students to review?
- Yes
 - No

Group III - Materials and techniques taught in Removable Partial Denture

14. What material is usually taught to be used for the border molding in a definitive impression for the patient partially edentulous?
- Modelling impression compound
 - Polyvinylsiloxane
 - Polyether
 - Polysulfide
 - Wax
 - Other (please specify)_____
15. What material is usually taught to be used for the final impression of the partially edentulous arch?
- Polysulfide
 - Polyether
 - Polyvinylsiloxane
 - Irreversible Hydrocolloid
 - Other (please specify)_____

16. Do teachers usually teach their students to use an individual tray for the definitive impressions of the partially edentulous arch?
- Yes
 - No
 - Sometimes
17. Which is the articulator used by the students?
- None
 - Semi-adjustable
 - Hinge-type
 - Other (please specify)_____
18. How many hours of teaching are specifically allocated to the designing of Removable Partial Denture?
- ≤10 (please specify)_____
 - 11-20
 - 21-30
 - 31-40
 - 41-50
 - 51-60
 - >60 (please specify)_____
19. Is there an in-house laboratory that manufactures denture metallic frameworks?
- Yes
 - No
20. Which laboratory procedures are required of the students of *Removable Partial Denture*?
- Making of individual trays
 - Obtaining of study casts
 - Making of intermaxillary registration plates
 - Mounting and studying of the casts in articulator
 - Analysis of the models in surveyor
 - Planning and drawing of the removable partial denture
 - Mounting of teeth and waxing
 - Flasking, processing and finishing of the removable partial denture
 - Making of the metallic framework (waxing, casting and finishing)
 - Others (please specify)_____
21. Are students required to use the altered cast technique for bilateral or unilateral distal extension situations?
- Yes
 - Not
 - Other (please specify)_____
22. Are students allowed to treat patients with removable partial denture with attachments?
- Yes (please specify)_____
 - No
23. Is there a protocol for removable partial denture post-insertion visits?
- Yes
 - No
24. Is there a minimum number of removable partial dentures (1 unit=1arch) that the student should make to successfully complete the course?
- Yes
 - No
- If yes, which is the number? _____
25. We are grateful for your comments, or suggestions:

*If you need any explanation, please don't hesitate in contacting us.
Thank you very much for your collaboration.*