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"JÚLIO DE MESQUITA FILHO"
Instituto de Ciência e Tecnologia
Campus de São José dos Campos

SHORT COMMUNICATION

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Development of a cell phone application as an auxiliary teaching tool for the subject of complete dentures

Desenvolvimento de aplicativo de celular intitulado: "Manual de Prótese Total – Reabilitando sorrisos", como uma ferramenta didática auxiliar para a disciplina de prótese total

Michelle de Sá dos Santos GOMES[1], **Gabriel Barroco BRENO**[1], **Elisa Camargo KUKULKA**[1], **Larissa Araújo Lopes BARRETO**[1], **Tarcisio Jose de Arruda PAES JUNIOR**[1]

1 - Universidade Estadual Paulista, Instituto de Ciência e Tecnologia, Departamento de Materiais Odontológicos e Prótese, São José dos Campos, São Paulo, Brazil.

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ABSTRACT

Objective: The study aimed to develop a cell phone application entitled: "Total Prosthesis Manual – Rehabilitating smiles", as an auxiliary teaching tool for teachers and students through digital technology, with a smartphone. **Material and Methods**: The tool was structured on the "Application Factory website", which allows the creation of mobile applications in different formats, with broad and interactive features on IOS and Android platforms. The expository format of the content is in slide format, containing descriptive theory and images about the stages of making a complete prosthesis; from necessary materials, photos and descriptive guidance of the steps. **Results**: The application is a complementary teaching resource to assist undergraduate and postgraduate students and professionals working in the area of complete prosthetics. The theoretical and practical content selected for the application covered all stages of understanding, development and possible complications associated with the manufacture of a complete bimaxillary prosthesis, from planning, impressions, models, orientation plans, tooth assembly, adaptations and delivery. **Conclusion**: The application provided a low-cost, expandable and easy-to-use teaching resource for teaching complete dentures. It is essential to develop various analyzes such as user experience tests, application effectiveness, development of new technologies and improvement of techniques, so that their potential for enriching learning in complete dentures and dentistry in general can be verified.

KEYWORDS

Complete denture; Dental education; Educational technology; Learning; Mobile applications.

RESUMO

Objetivo: O estudo teve como objetivo desenvolver um aplicativo de celular intitulado: "Manual de Prótese Total – Reabilitando sorrisos", como uma ferramenta didática auxiliar para professores e alunos por meio da tecnologia digital, com smartphone. **Material e Métodos**: A ferramenta foi estruturada no "site da Fábrica de Aplicativos", que permite a criação de aplicativos móveis em diversos formatos, com recursos amplos e interativos nas plataformas IOS e Android. A modalidade expositiva do conteúdo é em formato de slides, contendo teoria descritiva e imagens sobre as etapas de confecção de uma prótese total; a partir de materiais necessários, fotos e orientação descritiva das etapas. **Resultados**: O aplicativo é um recurso didático complementar para auxiliar estudantes de graduação, pós-graduação e profissionais que atuam na área de prótese total. O conteúdo teórico e prático selecionado para a aplicação visou todas as etapas de compreensão, desenvolvimento e possíveis complicações associadas à confecção de uma prótese total bimaxilar, desde o planejamento, moldagens, maquetes, planos de orientação, montagem dos dentes, adaptações e entrega. **Conclusão**: O aplicativo trouxe um recurso didático de baixo custo, expansível e fácil de usar para o ensino de próteses totais. É fundamental desenvolver diversas análises como testes de experiência do usuário, eficácia de aplicação, desenvolvimento de novas tecnologias e aprimoramento de técnicas, de forma que possa ser verificado seu potencial de enriquecimento do aprendizado em prótese total e odontologia em geral.

PALAVRAS-CHAVE

Aplicativos móveis; Aprendizagem; Educação odontológica; Prótese total; Tecnologia educacional.

INTRODUCTION

In the complete prosthesis discipline, the students' first contact is made through theoretical classes taught by professors, followed by laboratory practices, prior to the beginning of clinical care. The professors use various methodologies and resources such as photos, practical demonstrations and slides in order to establish the theoretical and practical content for the manufacture of a complete mucous-supported prosthesis, respecting its biological, mechanical and aesthetic principles. In the discipline in question, aspects related to the treatment of toothless individuals and with the need for rehabilitation using complete dentures are addressed, a treatment determined by the patient's examination [1,2].

Theoretical teaching with master classes, presentation of schematic slides, didactically illustrated and/or photos and videos are established teaching methods and considered as the "gold standard" for teaching in the classroom. Resources that currently use technology, even though they are not yet present in the curricula of educational institutions, have become a valuable didactic attribute in the diversification of teaching methods, opening up a range of attention capitation and individual didactic faculties of each student, allowing a greater embrace of teaching in the classroom, and leveling students to the same knowledge through different didactic resources [3]. However, the way in which information is transmitted can vary the degree of absorption of the taught content and learning from student to student [4-7].

The increased use of cell phones and tablets has provided the ability, not previously realized, to move information quickly and efficiently into a readily available format [8], hence the growth of information technology, traditional teaching methods that are in implementation currently do not meet educational needs alone [3-5]. In the literature, reports prove that the use of technology as an auxiliary and complementary technique, such as the use of applications and research sites, show improvements in learning, not only in the area dentistry [6,9,10] as well as in other areas of health such as medicine and physiotherapy [11]. The use of new tools in teaching such as the use of videos, mobile applications, and software [12-14], in addition to helping in teaching, innovate teaching and allow teachers to cover a greater number of students in terms of understanding of teaching [4-6].

By means of digital technology and with the purpose of adding tools, the objective of this study was to develop an application entitled: "Manual de Prótese Total – Reabilitando sorrisos", helping to teach and learn the subject.

This study presents the idealization and development of the application to be used in complete prosthetics disciplines and validation of the method will be carried out in future work. The application was developed and after validation it will be made available to the public.

It is worth mentioning that this content is based on the sequence of laboratory and clinical technical procedures adopted didactically in treatments with total mucosal prostheses supported by most public and private educational institutions in Brazil and described in the relevant literature. The objective is not to exhaust the subject, but to facilitate learning and the assimilation of the knowledge acquired by the student.

MATERIAL AND METHODS

Development

The databases used for the research were PubMed, SciELO - ScientificElectronic Library Online, Periódicos Capes and Google Scholar. Within the research result, articles of research relevance were selected in order to understand the main difficulties of students in complete dentures and to identify the development of teaching technologies in the area of dentistry and health in general. Through the results obtained, an auxiliary didactic tool was developed through a mobile application.

The application entitled "Manual de Prótese Total – Reabilitando sorrisos" was developed with the aim of assisting students in the procedures during the daily practice of making a complete denture. All theoretical and practical content was based and respectfully on the literature recommended in the teaching plan of this institute's discipline. The expository mode of the content is in slide format in an effective way, of simple visualization and understanding, containing descriptive theory and images about the stages of making a complete denture, from necessary materials, images and descriptive guidance of the steps.

The application itself was developed through an interactive platform called "Fábrica de Applicativos" [15]. The Application Factory system allows the creation of commercial applications, for study and commercial dissemination. It allows the designer's prior planning, editing and corrections, has several aesthetic designers and auxiliary resources such as texts, images, gallery, user feedback, voice files, suggestion box and questions, among other broad and interactive contents. The system also allows the development and availability of the application for the IOS and Android platforms (two of the platforms universally used by students in the public of interest so that everyone can have access for a more effective experience. The application interface can be seen in Figure 1

Application content

- Introduction
- Anatomy of the toothless tooth
  - Maxilla
  - Mandible
- Basal areas
  - Basal area of the maxilla
  - Basal area of the mandible
  - Maxilla relief zones
  - Mandibular relief zones
- Anatomic molding
  - Materials needed
  - Individualization of the tray
  - Molding of the maxilla
  - Molding of the mandible
- Study models
  - Materials needed
  - Technique
  - Final model of the maxilla
  - Final model of the mandible

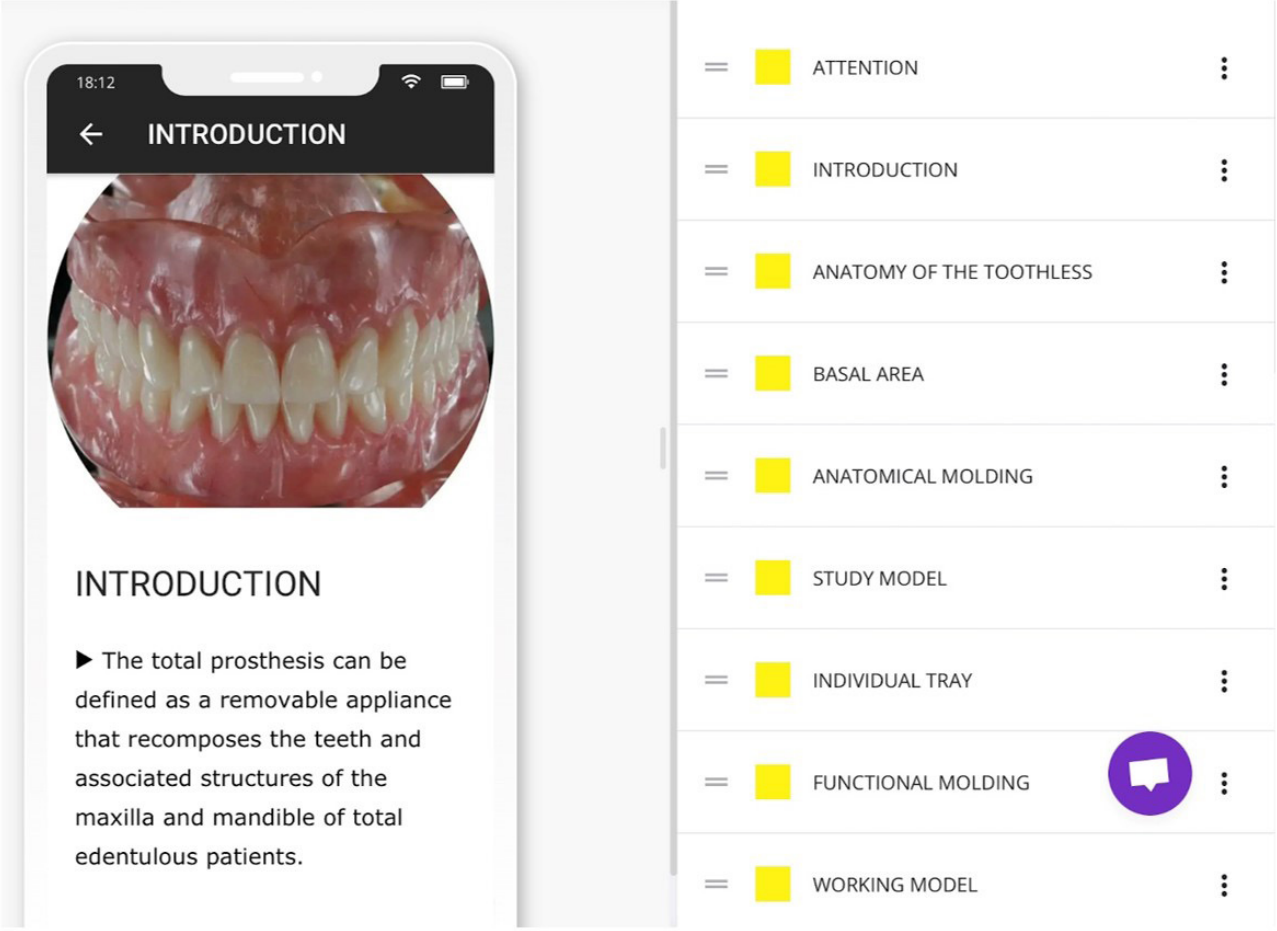

Figure 1 - Home screen and application content.

- Individual tray
  - Materials needed
  - Technique
  - Maxillary final tray
  - Mandibular final tray
- Functional impression
  - Materials needed
  - Individualization of the tray
  - Impression of the maxilla
  - Impression of the jaw
  - Final impression of the maxilla
  - Final impression of the mandible
- Work model
  - Materials needed
  - Dicing
  - Technique
  - Final model of the maxilla
  - Final model of the mandible
- Proof base
  - Materials needed
  - Technique
  - Final test base of the maxilla
  - Mandibular final proof base
- Orientation plans
  - Materials needed
  - Confection of superior orientation plan
  - Confection of inferior orientation plan
  - Superior final orientation plane (Maxilla)
  - Inferior final orientation plane (Mandible)
  - Individualization
  - Assembly of the upper plane in articulator
  - Assembly of the lower plane in articulator
- Articulators
  - Facebow
  - Vertical dimension
  - Relationship centric
  - Compensation curve
- Artificial teeth
  - Selection of teeth
  - Materials needed
  - Assembly of teeth 11-21
  - Assembly of teeth 12-22
  - Assembly of teeth 13-23
  - Assembly of teeth 14-15-24-25
  - Assembly of teeth 16-26
  - Assembly of teeth 36-46 occlusion key
  - Assembly of teeth 17-27
  - Assembly of teeth 45-35
  - Assembly of teeth 41-42-43-31-32-33
  - Assembly of teeth 43-33
  - Assembly of final teeth
- Aesthetic and functional test
- Ceroplasty
  - Materials needed
  - Sculpture
- Installation of complete dentures and subsequent care
- Rebasing
  - Technical Office
  - Laboratory Technician
- Immediate Prosthesis
  - Impression and model
  - Wax roller and teeth assembly
  - Extractions
  - Installation
- References

It is worth emphasizing that this content is based on the sequence of technical laboratory and clinical conducts adopted didactically in treatments using mucous-supported complete dentures by most public and private educational institutions in Brazil and described in the relevant literature. The objective is not to exhaust the subject, but to facilitate the learning and assimilation of the knowledge acquired by the student.

RESULTS

The application "Manual de Prótese Total – Reabilitando sorrisos" is a complementary didactic resource to assist undergraduate and graduate students and professionals working in the field of complete prosthesis. The theoretical and practical content selected for the application aimed at all stages of understanding, development and possible complications associated with the manufacture of a complete bimaxillary denture, from planning, impressions, models, orientation plans, assembly of teeth, fittings and delivery. All theoretical and practical content and manufacturing techniques were based on the teaching plan of the complete prosthesis discipline at the Institute of Science and Technology – ICT -UNESP – SJC.

DISCUSSION

In dentistry, it is of great importance the need for a good knowledge of the theoretical base, added to an efficient clinical practice so that the student develops the profession in an adequate way, with the purpose of satisfying the needs of health, function and aesthetics of their patients. We know that this practical day-to-day activity requires students to constantly renew their theoretical knowledge, in addition to manual and postural skills. One of the great challenges in teaching is to cover the diversity of students in the classroom, with the greatest amount of efficient content, that is, the amount of content learned by students, the development of teaching aid techniques that optimize teaching, facilitate learning and expand the number of didactic resources for teachers [1,2,6].

Complete denture steps include: planning, diagnosis, impressions, individual trays, preparation of orientation plans, among other basic requirements and steps for completing a rehabilitation with prostheses that can influence failures or defects in the result of complete dentures. A good complete denture is based on some fundamental principles like retention, support and stability. When some of these fabrication steps are neglected or not performed correctly, they can impair the functionality and the final result of complete dentures. When the difficulties are not resolved, as in the complete denture discipline, mainly in simpler procedures such as a functional impression, or the making of a wax roller, they can generate unwanted future results at the end of the complete denture process, and therefore, the use of auxiliary and alternative teaching methods can add and vary the information, adding knowledge to better processes, thus generating better results [1,2,6,16,17].

Nowadays, we recognize the great influence that cell phones and other software have on people's lives, especially in generation Y and Z. Studies show that these generations, because they are exposed to these technologies from an early age, acquire digital literacy as easily as walking and speak, and with that, have positive impacts on the learning process. With this, the study is developed in a cell phone application, perhaps the most common software, with greater ease of understanding and handling among students present in universities today [2,3,18]. The use of cell phones has an enormous untapped educational potential for the current generation [19].

Within the objective of the present study, a cell phone application was developed with the purpose of helping students and teachers in the discipline of complete dentures in dentistry courses. In a simple, effective and interactive way, the platform can be used as a resource for theoretical and practical study in the classroom and/or laboratory, home study, pre-exam review and even a consultation resource in clinical daily life that the future dental surgeon will take over. The mobile application platform has its content exemplified in slide shows, the theory is discursive, based on the renowned literature in the area and added to photographs, authorial images and schematic drawings elucidating and completing the theoretical content.

The research application in question comes as a new tool to assist students in all procedures for making a complete prosthesis, using explanatory texts, theoretical content based on established literature, on texts recommended and developed by the discipline complete prosthesis from ICT UNESP, São José dos Campos [6] and step-by-step images with practical and visual theoretical content.

In the literature, aid applications are found for fixed partial denture [6] and removable partial denture disciplines [13], however, regarding complete dentures, it is rare to find any technological aid tool. Technology encompasses and assists in all processes from theoretical understanding to making a complete prosthesis; from the clinical examination and diagnosis, through the clinical and laboratory stages, to the delivery of the prostheses, guidance and control.

No similar didactic tool was found in the literature within the discipline of complete dentures. Due to the diversity of student profiles in the classroom currently occupied by the accelerated generation Y, auxiliary teaching methods are necessary and useful to expand teaching in complete dentures. The development and applicability of a didactic cell phone application provides a low-cost, expandable and easy-to-use didactic resource for enriching learning in complete dentures and dentistry.

The development of new technologies, such as a cell phone application, to assist clinical practice in the complete denture discipline aims at predicting the final results in the final rehabilitation prostheses delivered to patients not only during university life, but also in the professional life of students. However, the didactic experience of the students in front of a new teaching technology does not make the method viable as an applicable and efficient didactic tool to help in the learning of the content, therefore the study has as a future challenge to prove the effectiveness of the method and the experience of the student in front of to the method, evaluating the process, the learning and the results for the confection of a complete denture with the help of the professors.

Limitations of this work

The initial proposal was to test this application with undergraduate students, having a significant number of responses to the use of the tool that could bring important inferences in conducting the best ways to use and edit this manual. Unfortunately, this stage could not be completed due to the stoppage of in-person activities at the university due to the coronavirus pandemic. It is intended to continue this study in due course.

CONCLUSION

The mobile application brings a low-cost, expandable and easy-to-use didactic resource for teaching complete dentures. It is essential to develop several analyzes such as user experience tests, application effectiveness, development of new technologies and technique improvement, in such a way that its potential for enriching learning in complete dentures and dentistry in general can be verified.

Authors' contribution

MSSG: Conceptualization, Methodology, Software, Writing – Review & Editing and Funding Acquisition. GBB: Methodology, Software and Writing – Review & Editing. ECK: Writing – Review & Editing. LALB: Writing – Review & Editing. TJAPJ: Conceptualization, Methodology, Supervision and Project Administration.

Conflict of Interest

The authors have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

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Regulatory Statement

The work carried out involves the idealization and development of an application, where no experiments have been carried out on humans or animals, it is not necessary to submit the work on an ethics committee local to the institution in which it was developed.

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Elisa Camargo Kukulka
(Corresponding address)
Universidade Estadual Paulista, Instituto de Ciência e Tecnologia, Departamento de Materiais Odontológicos e Prótese, São José dos Campos, São Paulo, Brazil.
Email: Elisa.c.kukulka@unesp.br

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