Development of an application for oral health education in childhood and adolescence: experience report

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Abstract The aim of the present study was to report the experience of the development of a smartphone application (app) on the oral health of children and adolescents for parents and caregivers. This experience report was developed as part of an extension project of the Federal University of Paraná, Brazil, between June and December of the year 2020 amidst the COVID-19 pandemic. The topics addressed on the app were tooth decay, oral hygiene, healthy eating, other oral diseases, premature birth and infectious diseases. The development of the app took place wholly on an online platform free of charge in seven steps: Step 1 – choice of name of app; Step 2 – definition of color palette; Step 3 – creation of logo for app, defined as "EducaBucal"; Steps 4 and 5 – definition of objectives and topics/subtopics, respectively; Steps 6 and 7 – bibliographic survey, creation of material and finalization of app. The bibliographic survey involved consulting recent articles in high-impact journals indexed in Google Scholar, SciELO and PubMed as theoretical support for the creation of the material. This innovative, dynamic experience enabled the continuity of educational actions even amidst the COVID-19 pandemic and enabled expanding the comprehensiveness and reach of oral health counseling. Virtual environments can and should be increasingly explored as scenarios for extension projects.
Descriptors: Oral Health. Health Education. Dental. Information Technology.

Desarrollo de una aplicación para la educación en salud bucal en la infancia y la adolescencia: relato de experiencia
Resumen El objetivo de este estudio fue relatar experiencias a partir del desarrollo de una aplicación (app) para teléfonos inteligentes sobre la salud bucal de niños y adolescentes, dirigida a padres y/o cuidadores. Este relato de experiencia se desarrolló en un proyecto de extensión de la Universidad Federal de Paraná, entre junio y diciembre de 2020, en medio de la pandemia de COVID-19. Los temas tratados en la aplicación fueron caries, higiene bucal, alimentación saludable, otras enfermedades bucales, prematuridad y salud bucal y enfermedades infecciosas. El desarrollo de la aplicación se realizó íntegramente en una plataforma online gratuita, en siete etapas: Etapa 1 - elección del nombre de la aplicación; Paso 2: definir la paleta de colores; Paso 3 - creación del logo de la aplicación, definido como "EducaBucal"; Pasos 4 y 5 - definición de objetivos y temas y subtemas, respectivamente; Pasos 6 y 7: levantamiento bibliográfico, preparación del material y finalización de la aplicación. La etapa de levantamiento bibliográfico incluyó la consulta de artículos recientes en revistas de alto impacto indexadas en Google Scholar, SciELO y PubMed para apoyo teórico en la elaboración del material de la aplicación. Se concluye que esta experiencia innovadora y dinámica permitió la continuidad de las acciones educativas incluso en medio de la pandemia COVID-19 y permitió ampliar el alcance y alcance de las directrices de salud bucal. Los entornos virtuales pueden y deben explorarse cada vez más como escenarios para proyectos de extensión.
Descriptores: Salud Bucal. Educación en Salud Dental. Tecnología de la Información.

Desenvolvimento de um aplicativo para educação em saúde bucal na infância e adolescência: relato de experiência
Resumo O objetivo deste estudo foi relatar experiências vivenciadas a partir do desenvolvimento de um aplicativo para *smartphone* (app) sobre saúde bucal de

crianças e adolescentes, destinado a pais e/ou cuidadores. Este relato de experiência foi desenvolvido em um projeto de extensão da Universidade Federal do Paraná, entre junho e dezembro de 2020, em meio a pandemia do COVID-19. Os temas abordados no aplicativo foram doença cárie, higiene bucal, alimentação saudável, outras doenças bucais, prematuridade e saúde bucal e doenças infecciosas. O desenvolvimento do app aconteceu integralmente em plataforma online e gratuita, em sete etapas: Etapa 1 - escolha do nome do app; Etapa 2 - definição da paleta de cores; Etapa 3 - elaboração do logo para o app, definido como "EducaBucal"; Etapas 4 e 5 - definição dos objetivos e dos tópicos e subtópicos, respectivamente; Etapas 6 e 7 - levantamento bibliográfico, elaboração do material e finalização do app. A etapa de levantamento bibliográfico incluiu a consulta a artigos recentes em revistas de alto impacto indexadas no Google Acadêmico, SciELO e PubMed para suporte teórico à elaboração do material do app. Conclui-se que esta experiência inovadora e dinâmica permitiu a continuidade de ações educativas mesmo em meio a pandemia do COVID-19 e permitiu ampliar a abrangência e o alcance das orientações em saúde bucal. Os ambientes virtuais podem e devem ser cada vez mais explorados como cenários de projetos de extensão.

Descritores: Saúde Bucal. Educação em Saúde Bucal. Tecnologia da Informação.

INTRODUCTION

Promoting oral health in childhood is an important strategy for children to grow and become healthy adults. However, the prevention of diseases that affect the oral cavity, especially in childhood, continues to pose a public health challenge[1]. The most recent epidemiological survey conducted in Brazil in 2010 demonstrated that the prevalence of dental caries was 53.4% among five-year-old children, 56.5% among 12-year-olds and 76.1% among adolescents 15 to 19 years of age, demonstrating progression in the prevalence with the increase in age. Moreover, data from the same survey on gingival status in different age groups revealed gingival problems in 37.1% of 12-year-olds and 49.1% among individuals in the 15-to-19-year-old age range[2].

Such data underscore the importance of health education for children and adolescents. Due to the characteristics of their stage of development, children depend on the care and support of their parents and caregivers for the adequate performance of numerous functions related to general and oral health[3]. Therefore, oral health education strategies should be directed at the entire family to improve oral health outcomes and quality of life in childhood[2].

Technologies have been strong allies in oral health promotion and disease prevention in individuals, including children, enabling the development and strengthening of health education actions[4]. Among the diverse technological possibilities, applications for mobile devices (apps) can assist in the development and dissemination of information on health promotion in an enjoyable and, at the same time, serious manner and applicable to oral health education[5,6].

Approximately 3.85 billion individuals in the world and 234 million individuals in Brazil use mobile devices (cell phones) with access to the internet, known as "smartphones"[7,8]. Enabling fast, easy access to information with greater mobility in day-to-day living, these devices have been replacing desktop and laptop computers[9]. Moreover, the COVID-19 pandemic led to numerous changes in daily living due to health measures and social distancing[10], with the delay of collective activities related to oral health to avoid crowds and actions that could contribute to the propagation of the virus, as stipulated in Technical Note N° 16/2020 of the Brazilian Health Ministry[11]. This situation further reinforces the use of information technologies for the transmission of oral health information during this period of social distancing. Hence, the immense potential of smartphone apps in the prevention of diseases and promotion of oral health is evident, as such programs can provide the large-scale orientation of the lay population[5,6].

Understanding that the production of apps can favor the dissemination of information on oral health, the aim of the

present study was to report the experience of the development of a smartphone app to offer information and provide knowledge to parents and caregivers with regards to the oral health of children and adolescents.

EXPERIENCE REPORT

The app was developed as an activity of the extension project entitled "Demystifying the body through health education" of the *Universidade Federal do Paraná* (UFPR) from June 1st to December 31st in the year 2020. The project was conducted *in loco* through oral health education actions at the Preventive Pediatrics clinic of the UFPR hospital. The actions were directed at parents and caregivers of children with conditions detected in the pre-, peri- and postnatal periods. The most frequent conditions were acquired immunodeficiency syndrome, syphilis, toxoplasmosis and premature birth.

In 2020, in-person activities of the extension project were suspended due to the COVID-19 pandemic and activities shifted to the completely online format following approval of the project in the Extraordinary Public Notice issued by UFPR Dean's Office of Extension and Culture. Among other proposed activities, this public notice envisaged the creation of a smartphone app containing information and advice for oral health care in children, including dietary and oral hygiene habits. For such, a permanent app development team was formed and held weekly meetings online through the *Microsoft Teams* platform for the production of content and decision making. This team was composed of an undergraduate student, two doctoral students and a professor. The workload constituted 120 hours of activity between June 1st and December 31st, 2020. All tasks were performed remotely (online).

The app was developed entirely on the free-of-charge online platform (basic plan) *Fábrica de Aplicativos* (wich translates to App Factory) (https://painel.fabricadeaplicativos.com.br/), which enabled the development of a simple, intuitive, functional app without the need for previous computational programming knowledge. The steps of the creation of the app are displayed in Figure 1.
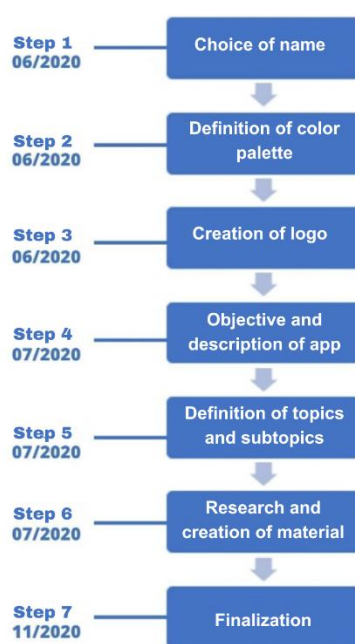

Step 1 06/2020	Choice of name
Step 2 06/2020	Definition of color palette
Step 3 06/2020	Creation of logo
Step 4 07/2020	Objective and description of app
Step 5 07/2020	Definition of topics and subtopics
Step 6 07/2020	Research and creation of material
Step 7 11/2020	Finalization

Figure 1. Flowchart of app development process.

The first step consisted of the creation of a name for the app. The name chosen was EducaBucal, resulting from the combination of the words "education" and "bucal" ["oral" in Portuguese]. The choice of the name occurred through a discussion among the members of the team. Steps 2 and 3 consisted of the establishment of the visual identity of the app. These steps are extremely important, enabling, along with the name, the characterization and identification of the tool. For the creation of the logo and layout, a palette of blue tones was selected. The logo was created from the idea

that, besides the initials of the name, the logo should have visual elements that characterize the essence of the app. Thus, the images of a tooth brush and tooth were placed in the letter "B", as seen in Figure 2.

Step 4 consisted of the definition of the objective and purpose of the app so that the subsequent step could be performed adequately. Moreover, a brief description was created for the description field of the app on the platform.

The creation of the content of the app was planned in the form of topics (main icons) considered relevant and necessary for the target public and aligned with the objective of the tool (Step 5), such as the most frequent oral diseases in children and conditions that were observed during the in-person execution of the extension project at the clinic of the UFPR hospital. The topics defined were "tooth decay", "oral hygiene", "healthy eating", "other oral diseases", "premature birth and oral health", "infectious diseases", "frequently asked questions", "tips", "useful links" and "about us" (Figure 3). Within the topic, subtopics were created for division and better organization of the content according to the needs of each subject (Figure 4). During the execution of Step 6, however, some subtopics were added or altered in accordance with the need for extra information and changes to improve the organization of the app. Additional information was identified through the reports of parents during the execution of the extension project prior to the pandemic.

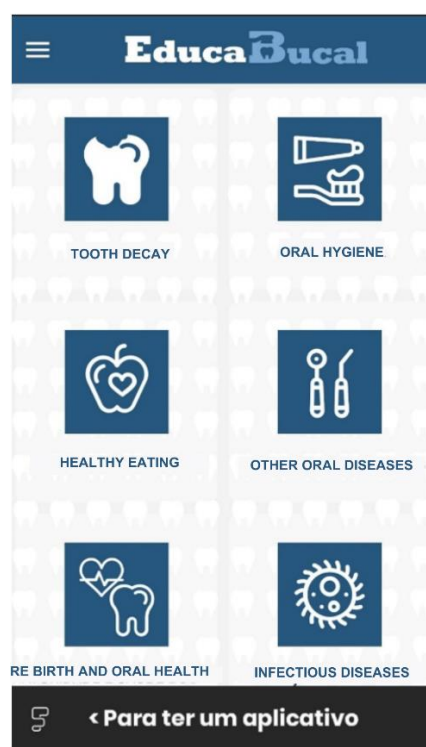Figure 2. EducaBucal logo.

Figure 3. Initial page of app with examples of main icons.
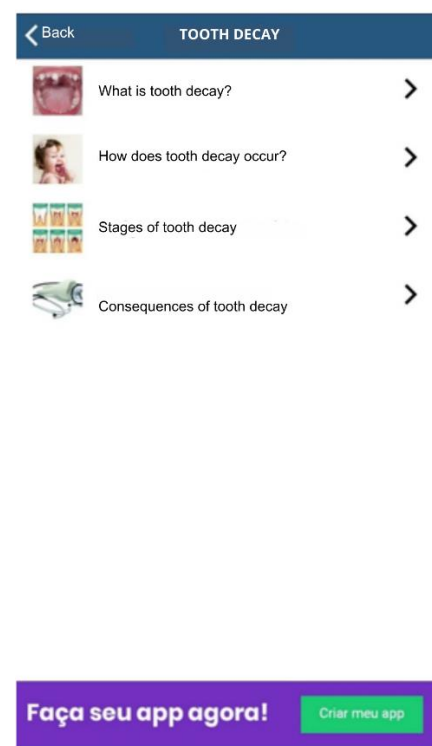

Figure 4. Subtopics of "Tooth decay" icon.

Theoretical support of the information contained in the app came from articles found on the most commonly used research platforms, such as Google Scholar, SciELO and Pubmed, including articles published by the team that created the app (Step 6). For each topic addressed, an individual reading was performed of the articles encountered, followed by the creation of a text to be placed on the app in simple, understandable language so that the target public (parents and caregivers of children) could assimilate the content. The format and writing of the materials were similar for all topics. With each text ready, corrections were made during meetings, enabling all members of the team to discuss the best way to address the content. Besides the written content, photos and illustrations were used and original videos were produced for EducaBucal, such as demonstrating how to clean a child's tongue. The images were available in the articles used, pertained to the private collection of the UFPR pediatric dentistry specialty or were original and made especially for the app. To upload onto the platform, it was necessary for the videos to be available on the YouTube

platform. Hence, the videos were also available on the UFPR pediatric dentistry channel. The app also had an area to send questions directly to a dentist through a form as well as suggestions for videos, games and other apps that also address child oral health. Extra information was also available, such as the address and contact information of places that offer dental care.

During Step 7, the entire content of the app was revised and corrected by specialists in each field addressed: three professors with a doctoral degree in dentistry, a professor with a doctoral degree in nutrition and a professor with a doctoral degree in medicine. The suggested changes were made and the complete app was revised for publication. It should be pointed out that the purpose of this app is not to substitute a medical or dental consultation.

The signing of the Essential Plan in the AppFactory was necessary for publication in the Android system. EducaBucal is available free of charge on the Google PlayStore platform. To obtain the information contained on the app, access to the internet is needed to download the app and its tools. However, if parents and caregivers do not have access to the internet at a given time, access to the information is possible in the offline system.

FINAL CONSIDERATIONS

The use of smartphone applications for health education is an irreversible occurrence, as technological progress has enabled greater access on the part of the population to information in a fast manner and often free of charge. The use of technologies has been increasingly frequent and is even crucial for situations in which social interaction is not possible, such as the COVID-19 pandemic. To the best of our knowledge, there are no smartphone apps that have content and objectives similar to those proposed in the present report. There are numerous health apps on the market, but most are directed at specific functions, such as the nutritional or physical follow-up of patients, pharmacological counseling and advice with regards to particular medical specializations.

The EducaBucal app employs a simple interface that any individual – irrespective of knowledge regarding digital platforms – can use adequately, with detailed content pertinent to the target public. All information on the app – systematically divided into topics and subtopics – was based on recent articles available in the main academic and scientific databases and posted in simple, accessible language so that parents and caregivers can learn and acquire knowledge on the oral health of their children, thus stimulating participation and the democratization of knowledge. Moreover, parents and caregivers can send questions on the oral health of children to a dentist through the app, who will answer directly. Users can also send comments and experiences, making the learning process easier and constant. It is important to point out that the app needs to be evaluated by users to determine the possible need for improvements.

Moreover, the app seeks to overcome the oral health/tooth dichotomy by combining knowledge from other health fields, such as medicine and nutrition, through a holistic approach of the topics, given the complexity of individuals and the various factors that can affect a child's health. The supposition is that the combination of specializations/fields of knowledge can offer a more complete true vision of health, as oral health exerts an influence on general health and vice-versa.

The creation of the smartphone app as an extension activity enables enriching the student experience in theoretical and methodological terms while also blazing a trail for the reaffirmation and materialization of ethical, solidary commitments of Brazilian public universities to the population, as university extension makes a decisive contribution to the education of both undergraduate and graduate students through the expansion of the universe of knowledge and direct contact with major contemporary social issues.

This innovative, dynamic experience enabled the continuity of educational actions even amidst the COVID-19 pandemic and enabled expanding the comprehensiveness and reach of oral health counseling. Virtual environments can and should be increasingly explored as scenarios for extension projects. It should also be stated that access to information is highly facilitated by digital platforms and recognition is necessary of the immense potential of these channels of communication as methods for the transmission of oral health knowledge.

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