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ORIGINAL

Teaching media system for the Pediatric Dentistry course in the Stomatology career

Sistema de medios de enseñanza para la asignatura Odontopediatría en la Carrera de Estomatología

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ABSTRACT

Introduction: the teaching-learning process in the Dentistry Career is established according to the demands of comprehensive Cuban dental care. Due to its high potential on a cognitive and educational level, its improvement is necessary.
Objective: design a system of teaching aids for learning the subject Pediatric Dentistry in the fourth year of the Stomatology degree.
Method: a descriptive, analytical study was carried out with a qualitative approach through the design of direct perception teaching media and the use of virtual teaching-learning environments for topic IV: endodontic treatments in young temporary and permanent teeth affected by dental caries. the population under 19 years of age. Scientific methods such as document review, analysis and synthesis, induction-deduction were used.
Results: the teaching aids of direct perception, prepared by the teacher, promoted the theoretical-practical link, with the observation of images of the healthy molar, different pathologies to present according to the progression of the lesion and the different treatments and indications for them. The audiovisual media and tasks indicated through a teaching guide enabled on the Moddle platform allow the student a better understanding of the content.
Conclusions: the designed teaching aids system contributes to the improvement of the teaching-learning process of the subject.

Keywords: Medical Education; Teaching; Media; Methods; Students; Educational Environment; Educational Innovation; Educational Model.

RESUMEN

Introducción: el proceso de enseñanza aprendizaje, en la Carrera de Estomatología se establece según exigencias de la atención estomatológica integral cubana. Por sus elevadas potencialidades en el plano cognitivo y educativo, se hace necesario su perfeccionamiento.
Objetivo: diseñar un sistema de medios de enseñanza para el aprendizaje de la asignatura Odontopediatría en el cuarto año de la carrera de Estomatología.
Método: se realizó un estudio descriptivo, analítico, con enfoque cualitativo mediante el diseño de medios

de enseñanza de percepción directa y la utilización de entornos virtuales de enseñanza aprendizaje para el tema IV: tratamientos endodónticos en dientes temporales y permanentes jóvenes afectados por caries dental a la población menor de 19 años. Se emplearon métodos científicos como la revisión de documentos, análisis y síntesis, inducción-deducción.
Resultados: los medios de enseñanza de percepción directa, elaborados por el profesor, propiciaron la vinculación teórico-práctica, con la observación de imágenes del molar sano, diferentes patologías a presentarse según avance de la lesión y los diferentes tratamientos e indicaciones para las mismas. Los medios audiovisuales y tareas indicadas a través de una guía didáctica habilitada en la plataforma Moddle, permiten al estudiante una mejor comprensión del contenido.
Conclusiones: el sistema de medios de enseñanza diseñado contribuye al perfeccionamiento del proceso de enseñanza aprendizaje de la asignatura.

Palabras clave: Educación Médica; Enseñanza; Medios; Métodos; Estudiantes; Entorno Educativo; Innovación Educativa; Modelo Educativo.

INTRODUCTION

The teaching and learning process in the Dentistry degree program is organized based on the needs and obligations established in Cuba for comprehensive dental care that is social, state-run, free, and accessible from a community perspective, as established in the National Comprehensive Dental Care Program for the Population.[1]

Due to the high potential offered by the development of the teaching-learning process in pediatric dentistry at the cognitive and educational levels, it is necessary to improve it since its system of concepts, laws, theories, methods, and procedures encourages research and thus generates new knowledge.[2]

Higher education has the mission of training and graduating professionals with high competence and social commitment. Today's society needs to train professionals with the ability to solve problems in professional practice with ethical and responsible performance.[3]

Work-based education is the teaching space where theory and practice are linked, whose developing principle prioritizes attention to the health services provided to the community, with teachers and basic work teams monitoring.[4]

The formation of student groups from the first year of the degree program also benefits their distribution into teams of two or more members for education in the workplace. Once they graduate, this organization facilitates interactive work in comprehensive health teams involving stomatologists, licensed professionals, technicians, residents, and students.[1]

In the health system, decisions are constantly made during the teaching-learning process, most of which are taken by teachers in a multifactorial pedagogical context. Authors such as Enríquez Clavero et al.[1] citing Salas and Salas, refer to this process as a "didactic situation in health," whose main objective is to solve community health problems.

Within the teaching-learning process, psycho-pedagogical requirements include the search for knowledge and student self-management, considering as a skill the extent to which students can self-manage understanding through mixed teaching methods, including information and communication technologies (ICT). Depending on the selected work modality, virtual or face-to-face, each teaching component takes on particular dimensions.[5]

In the Pediatric Dentistry course, information and communication technologies are used to develop a scientific methodology based on problem situations that allow students to interpret and resolve real or simulated situations with a systemic approach. This subject provides students with the scientific foundations that enable them to understand the conditions that arise in the population and to establish logical reasoning in prevention, treatment, and emergency procedures in patients under 19.[5,6]

The content related to endodontic treatments in primary and young permanent teeth has insufficient literature and resources to make it accessible to students. Specifically, in topic IV (Endodontic treatments in primary and young permanent teeth), inconsistencies and inadequacies have been reported in the introductory textbook (Manual de Odontopediatría), hindering students' knowledge acquisition.[6]

The above aspects allowed us to identify the following problematic situations:

- The strategy for self-directed learning among students is insufficient.
- Students have difficulty linking theory to practice due to the inconsistency of the content. This is fragmented and insufficient, leading to difficulties in managing clinical cases.
- Students do not have the means to understand topic IV: endodontic treatments in primary and young permanent teeth.

This led to the present study, which aims to design a system of teaching resources for pediatric dentistry in the fourth year of the dentistry degree program during the 2023-2024 academic year.

METHOD

A descriptive, analytical study with a qualitative approach was conducted by designing a teaching aid system to reinforce topic IV of the Pediatric Dentistry course in the fourth year of the Dentistry degree program during the 2023-2024 academic year.

Direct perception teaching aids were designed, including three-dimensional direct perception aids; graphic elements (photographs); projection of still images (slides); projection of moving images (educational videos); and a teaching guide designed for this purpose, using the Moodle platform as a virtual teaching and learning environment.

Empirical scientific methods such as document review and observation were used. Theoretical methods included historical logic, analysis and synthesis, and induction-deduction.

RESULTS

Educational media and learning resources serve as communication and methodological support to achieve the objectives of the teaching-learning process. Cognitive development must be stimulated and accelerated by promoting the acquisition and integration of knowledge. Therefore, it is highly applicable in classroom and workplace education.[7]

The teaching-learning process is systematic, integrative, and developmental, so modern academic disciplines use methods to motivate learning and activate and develop students' intellectual faculties to acquire knowledge and skills.[7]

Using virtual health classrooms as collaborative learning tools enhances cooperation among students, requires greater empathy and creativity on the part of teachers, and makes communication technologies an increasingly integral and essential part of the teaching-learning process.[8]

In the context of educational settings, teaching media are enriched and grouped into still images, moving images, sound, direct perception media, real situations, simulation, and those supported by the use of ICT: computers, educational software, telematic networks such as Informed, which provide new methods and ways of transmitting knowledge.[9]

The Regulations on Teaching and Methodology in Higher Education establish that teachers must use teaching methods and media that guarantee the active participation of students, ensuring that they are structured coherently to achieve the proposed objectives in all forms of teaching work. The role of the teacher as a guide to lead students to autonomous learning is a priority.[10]

A system of teaching methods is proposed to improve students' learning of Pediatric Dentistry, which is taught in the fourth year of the Dentistry degree program. This subject is related to the content of Topic IV: endodontic treatments in primary and young permanent teeth affected by dental caries in the population under 19 years of age.

Structure of the teaching media system for the subject of Pediatric Dentistry

The course begins with a lecture on Topic IV, which covers content related to:

- Endodontic treatments in primary teeth.
- Endodontic treatments in young permanent teeth.
- Treatment of teeth with incomplete apical development.

The teaching and learning system proposed for this course consists of:

Direct perception media (face-to-face mode)

- Three-dimensional medium showing a healthy molar and the different pathologies that can occur as the lesion progresses (figure 1).
- Treatment plans and indications (figures 2, 3, 4).

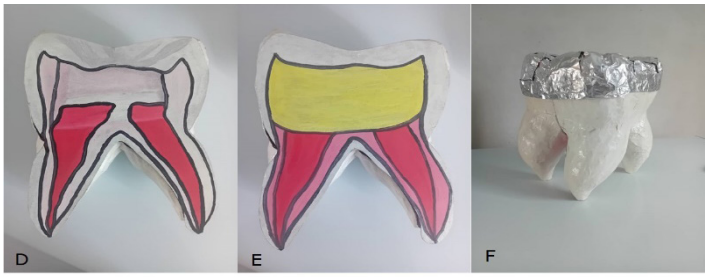

Figure 1. The three-dimensional model shows a healthy permanent molar and some pathologies that may occur as the lesion progresses. A: Healthy molar. B: Internal view of a healthy molar. C: Molar affected by dental caries. D: Molar with vital pulpotomy with calcium hydroxide. (This image explains the functions of the medication, the surgical technique used, and the indications and contraindications. E: Molar filled after treatment. F: Molar with stainless steel crown for permanent restoration

TRATAMIENTOS DE LAS ENFERMEDADES PULPARES EN LOS DIENTES TEMPORALES Y PERMANENTES JÓVENES

El tratamiento de las caries profundas y el endodonto de los dientes temporales y permanentes jóvenes, representan los problemas más comunes en Odontopediatría. El diagnóstico del daño pulpar es uno de los elementos más difíciles.

RECUBRIMIENTO PULPAR	DESCRIPCIÓN	INDICACIONES	REQUISITOS	CONTRAINDICACIONES	OBJETIVOS
RECUBRIMIENTO PULPAR INDIRECTO	Tratamiento de forma preventiva donde aún la pulpa se encuentra sana.	En molares temporales. En dientes permanentes jóvenes.	Caries profundas que se aproximan al tejido pulpar, pero no lo afectan. Sensibilidad al ingerir alimentos o líquidos fríos. Ausencia de dolor espontáneo. Apariencia normal de la gingiva.	Caries profundas con exposición pulpar. Dolor agudo a los cambios térmicos que no cesan al retirar el estímulo. Dolor espontáneo prolongado particularmente en la noche. Diente decolorado. Movilidad excesiva. Fístula. Radiolucidez periapical o de la bifurcación.	Eliminar la capa de dentina infectada, aplicar (CaOH en dientes permanentes jóvenes y óxido de Zinc en dientes temporales) Sellar la cavidad para estimular la esclerosis y formación de dentina reparativa en los dientes permanentes. En dientes temporales, prevenir la inflamación pulpar y lograr la sedación.
RECUBRIMIENTO PULPAR DIRECTO	Protección directa de una herida pulpar con el fin de lograr la formación de dentina reparativa conservando la vitalidad pulpar. Indicaciones: Dientes permanentes jóvenes con ápices abiertos o incompleta formación apical con exposición: Mecánica o por trauma y no contaminada. Reciente. En punta de alfiler, superficial y no hemorrágica.			Dientes temporales. En exposiciones por caries. En casos de pulpitis. Rarefacción periapical o de la bifurcación. Reabsorción interna.	Estimular la formación de un puente de dentina en el sitio de exposición que permita la conservación de la vitalidad pulpar.

Figure 2. Treatment plan and indications for pulp capping

TRATAMIENTOS DE LAS ENFERMEDADES PULPARES EN LOS DIENTES TEMPORALES Y PERMANENTES JÓVENES

PULPOTOMÍA VITAL	Consiste en realizar el acceso a la cámara pulpar, la remosión de la pulpa coronaria y la colocación de un medicamento adecuado sobre los muñones radiculares que permitan preservar la vitalidad de la pulpa permanente.			
	DESCRIPCIÓN	**INDICACIONES**	**CONTRAINDICACIONES**	**OBJETIVO**
PULPOTOMÍA VITAL CON FORMOCRESOL DILUIDO AL 1/5 %	Tratamiento de forma preventiva donde aún la pulpa se encuentra sana.	Caries profundas proximales de temporales maduros con menos de 2/3 de reabsorción radicular. Exposición pulpar en dientes temporales maduros. Molares permanentes con formación completa de la raíz.	Reabsorción interna. Reabsorción externa avanzada en dientes temporales. Hemorragia no controlable después de la amputación de la pulpa coronal. Pulpitis irreversible.	Fijar la superficie de los muñones pulpares y conservar la vitalidad de la porción apical restante.
PULPOTOMÍA VITAL CON HIDRÓXIDO DE CALCIO	Tratamiento de forma preventiva donde aún la pulpa se encuentra sana.	Exposición pulpar por caries en dientes permanentes jóvenes con ápices abiertos.	Dientes con pulpitis irreversible. Dientes permanentes no vitales. Dientes con rarefacción ósea periapical. Dientes temporales	Estimular la formación de tejido duro y dentina reparativa conservando la vitalidad de los muñones radiculares que permite la continuación de la formación radicular.
PULPOTOMÍA PARCIAL O AMPUTACIÓN PULPAR	Consiste en la remoción de una parte de la pulpa coronaria vital y colocación del medicamento adecuado que permita la conservación de la vitalidad en el tejido pulpar remanente.	Exposición pulpar mayor de 1mm por trauma en incisivos permanentes. Cuernos pulpares de morales permanentes. Exposiciones pulpares mayores de 1 mm en molares temporales	Pulpitis. Dientes no vitales. Reabsorción radicular de 2/3 o más en molares temporales.	Preservar la vitalidad pulpar del diente, de modo que se mantenga su fisiologismo normal.

Figure 3. Treatment plan and indications for vital pulpotomy

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TRATAMIENTOS DE LAS ENFERMEDADES PULPARES EN LOS DIENTES TEMPORALES Y PERMANENTES JÓVENES				
	DESCRIPCIÓN	**INDICACIONES**	**CONTRAINDICACIONES**	**OBJETIVO**
PULPOTOMÍA NO VITAL CON FORMOCRESOL DILUIDO AL 1/5 %	Consiste en la remoción de la pulpa coronaria no vital, limpieza superficial de los conductos radiculares y colocación del medicamento adecuado que permita la conservación del diente hasta su exfoliación.	Necrosis pulpar sin rarefacción ósea periapical o de la bifurcación con molares temporales.	Reabsorción radicular de 2/3 o más en molares temporales. Reabsorción interna. Fístula.	Mantener los molares temporales en el arco hasta su exfoliación.
PULPECTOMÍA	Consiste en la remoción del tejido pulpar vital o no vital del diente, seguido de la preparación biomecánica, esterilización y obturación del o los conductos radiculares con el material adecuado.	Dientes anteriores temporales maduros. Caries profundas o traumas que ocasionan alteraciones pulpares irreversibles, necrosis, rarefacción o tumefacción.	Dientes anteriores temporales con 1/3 o más de reabsorción radicular. Coronas muy destruidas. Rarefacción apical extensa que se relaciona con el folículo permanente.	Conservar los dientes temporales que según su padecimiento estarían destinados a la extracción.
APEXIFICACIÓN	**DESCRIPCIÓN** Técnica de inducción de la formación apical o apexificación que radica en la aplicación de pastas alcalinas en contacto con el tejido conectivo periapical. Se busca con ello la formación de cemento por parte de los cementoblastos presentes en el tejido conectivo periapical (ligamento periodontal). El cemento neoformado obtura el ápice radicular produciendo una modelación y algunas veces un alargamiento de raíz.		**INDICACIONES** **Técnica de formación apical de Frank** Cierre continuado del conducto y del ápice hasta una apariencia normal. Cierre apical en forma de cúpula conservando el conducto un aspecto de trabuco. Falta aparente de cambios radiográficos, pero con existencia de topes positivos en el área apical. Tope positivo y evidencia radiográfica de una barrera en el ápice anatómico del diente.	

Figure 4. Treatment plan and indications for non-vital pulpotomy, pulpectomy, and apexification

Audiovisual resources available in the Virtual Health Classroom (AVS)

- Graphic elements (photographs): image gallery.
- Projection of still images (slides): Endodontics Conference.pptx.
- Moving image projection (videos): "Pulp coverings"; "Complete endodontic treatment 1" and "Complete endodontic treatment 2". Teaching guide for Topic IV (document).
- Supplementary bibliography.
- Forum resource for clarification of doubts.
- Assignment for Endodontic Procedures.
- Endodontic Treatment Questionnaire.

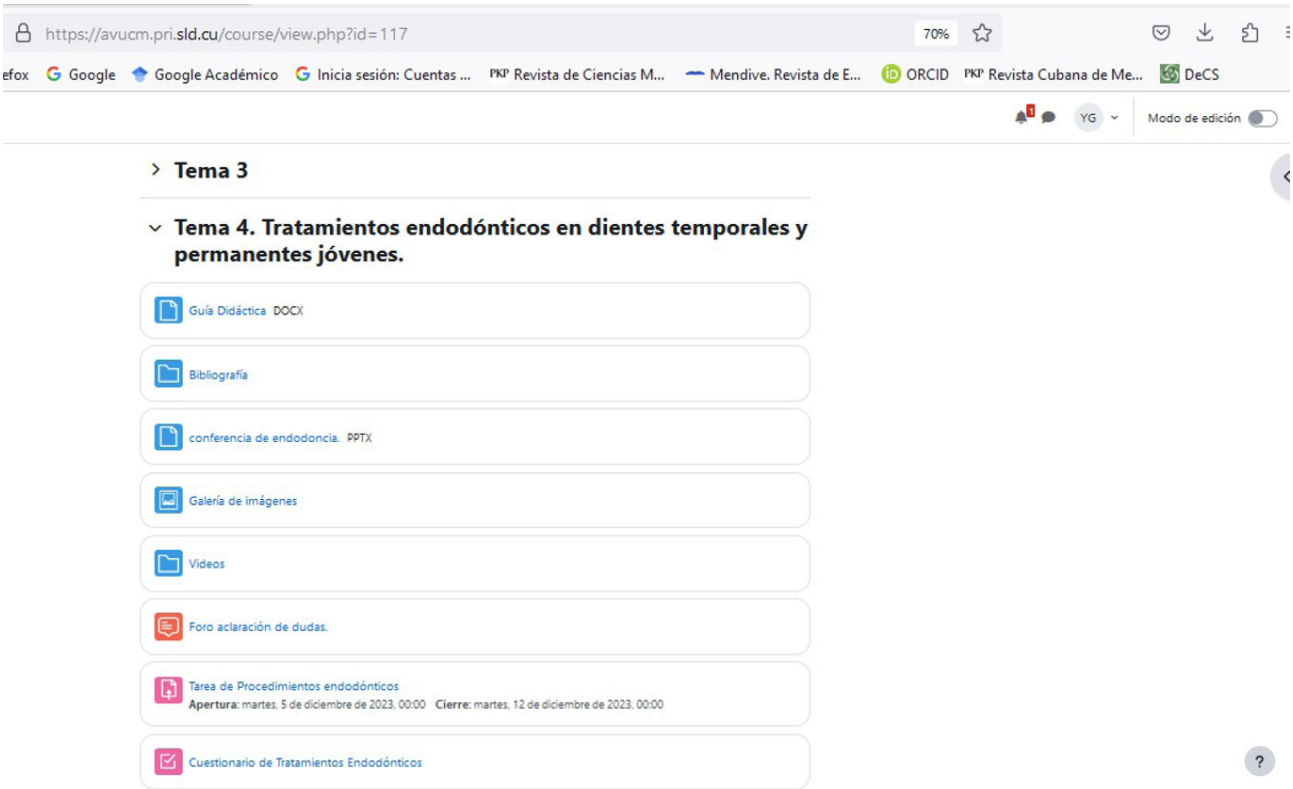

Figure 5. Audiovisual teaching resources available in the AVS

The teaching guide developed to deepen knowledge on Topic IV taught in the classroom contains the following instructions:

- Conduct a systematic review of endodontic treatments for primary and young permanent teeth.
- Use the technological resources available in the AVS. To do this, study the presentation "Endodontics Conference.pptx."
- Visit the Image Gallery after studying each section of the summary by the Conference and its Bibliography.
- Access the available Videos, which show the practical application of the theoretical content taught with models and real cases.
- Access the Discussion Forum for group exchange and clarifying doubts on the topic, where students and teachers interact. The Forum has a predetermined time for teacher consultation (non-evaluative).
- Complete the individual assignment indicated. It must be uploaded to the platform within the established deadline.
- Answer the questionnaire as a form of individual assessment consisting of two questions, column links, and completing certain situations. It must be completed and uploaded within the established deadline. The teacher will report the individual grade in the AVS.

The use of the teaching media system helped improve the quality of the teaching process for students, as it increased their motivation to learn and assimilate the content. This contributed to better preparation for their performance as future graduates.

DISCUSSION

Improving teaching methods has advantages for teachers, such as better communication with students and colleagues through virtual teaching and learning environments; it provides unified criteria for the treatment of different pulp and periapical diseases in young permanent and deciduous teeth; better control and monitoring of student activities and tasks; ease of implementing active and collaborative learning; savings in material and financial resources; and a greater variety of learning resources.

An essential reference for this study is the work carried out by Albert Díaz[11] in Pinar del Río, Cuba, who developed an integrated teaching media system for the subject of dental anatomy to help dentistry students solve integrative teaching tasks, which contribute to the progress of cognitive autonomy through a b-learning environment.

The integrated teaching media system proposed by Albet Díaz[11] began with the use of natural teeth and casein, combining them with other virtual teaching media, such as digital mind maps of tooth groups, using mobile and computer applications such as Mindomo and Dental-Lite. This facilitated the study of teeth with three-dimensional images. A teaching guide was developed for independent activity and self-preparation by students, which was included in the institutional Virtual Health Classroom.

Hernández et al.[12] noted students and teachers need an integrated teaching system for learning medical bacteriology in second-year medical students in Pinar del Río, Cuba. This system was developed and evaluated by specialists as valuable and relevant.

The research in Pinar del Río by González Crespo et al.[13] shows a methodology for developing clinical-radiographic teaching activities perfected based on the teacher's initiatives. This methodology contributed to better preparation of the primary teachers involved, standardization of the teaching-learning process, and the acquisition of professional skills in education at work, particularly in the importance of the clinical method for achieving comprehensive patient care.

In Santa Clara, Cuba, Santos Prieto et al.[14] designed a guide to assess the craniofacial and general physical growth of patients requiring dental care. This guide provided a feasible teaching tool for undergraduate and postgraduate orthodontics courses.

Other similar studies in the international context support the importance of teaching aids in improving different subjects or meeting specific needs, such as the global experience of distance education during the COVID-19 pandemic.

In this regard, in Argentina, Carletto Körber et al.[15] proposed using virtual resources to continue teaching pediatric dentistry, thereby strengthening skills such as creativity, innovation, and adaptation in both students and teachers.

Also, in Argentina, the teaching resources available to the Faculty of Dentistry of La Plata were analyzed, where the existence of a diversity of face-to-face and virtual learning resources was confirmed, which developed the acquisition of knowledge, competencies, skills, and psychomotor abilities. This facilitated the promotion of the use of many of the tools available due to the restrictions on face-to-face teaching caused by the pandemic, especially the most technological ones and those belonging to ICT.[16]

CONCLUSIONS

The teaching media system designed contributes to improving the teaching-learning process of the subject. Using the Virtual Health Classroom as a collaborative learning tool reinforced student cooperation, required greater creativity and empathy from the teacher, and demonstrated that communication technologies are increasingly essential and mandatory knowledge for the educational teaching process.

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Authors declare that there is no conflict of interest.

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