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Interactive digital models combined, using radiological images in the teaching of Human Anatomy to Medical Imaging and Radiotherapy students

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Radiology education is critical for health students' anatomical competence and clinical readiness.

However, it remains insufficiently integrated in curricula as health profession program directors describe graduated students'

OBJECTIVE

- This project aims to create an innovative and digital-based matrix for the teaching of the syllabus of Anatomy, which considers the aspects above expressed, stimulate new practices and promote a broad discussion among health students.



BUILDING

COMMUNICATION SKILLS
NEW METHODS
INNOVATIVE RESOURCES
MIXED METHODOLOGIES














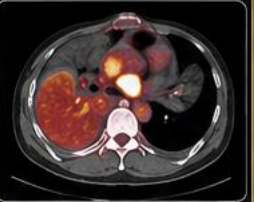

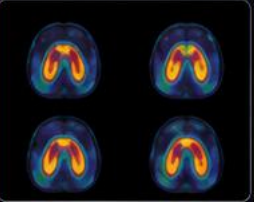

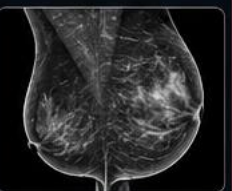

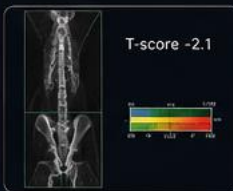



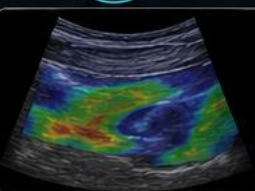






BLOOM'S TAXONOMY

BLOOM'S TAXONOMY and COLLABORATIVE LEARNING

With this method we think that the student will develop skills in socialization and collaborative learning, in increasing complexity about anatomical concepts.

IMAGING MODALITIES

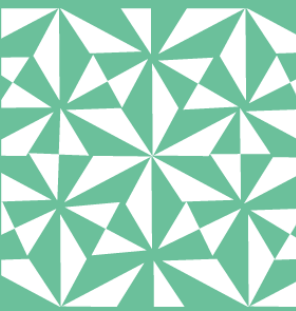
Simbologia Iconográfica

RADIOGRAFIA CONVENCIONAL   Imagem por projeção com raios X	FLUOROSCOPIA   Imagem dinâmica em tempo real com raios X	TOMOGRAFIA COMPUTORIZADA (TC)   Imagem por cortes axiais com raios X	RESSONÂNCIA MAGNÉTICA (RM)   Imagem por ressonância magnética (campos magnéticos e ondas de rádio)	MEDICINA NUCLEAR – CINTILOGRAFIA   Imagem funcional por radiofármacos – captar emissão gama	PET (TOMOGRAFIA POR EMISSÃO DE POSITRÕES)   Imagem funcional por emissão de positrões (metabolismo)	SPECT (TOMOGRAFIA POR EMISSÃO DE FÓTONS ÚNICOS)   Imagem funcional por emissão de fótons gama únicos
MAMOGRAFIA   Imagem por projeção com raios X de baixa dose	DENSITOMETRIA ÓSSEA (DEXA)   Imagem por raios X de baixa dose para avaliação da densidade óssea	ULTRASSONOGRAFIA (US)   Imagem por ondas sonoras de alta frequência	ELASTOGRAFIA (US)   Imagem por avaliação da elasticidade dos tecidos	ANGIOGRAFIA POR SUBTRAÇÃO DIGITAL (DSA)   Imagem vascular com contraste e subtração digital	INTERVENÇÃO GUIADA POR IMAGEM   Procedimentos realizados com orientação por imagem	RADIOLOGIA DENTÁRIA   Imagem por raios X intraoral ou panorâmica

X RAIOS X Radiação ionizante **☼** RADIOFÁRMACOS Radiação ionizante **∩** CAMPOS MAGNÉTICOS Não ionizante **📶** ONDAS SONORAS Não ionizante **🎯** ORIENTAÇÃO POR IMAGEM

“According to a socio-constructivist model and connectivism logic, an innovative plan based on digital teaching was developed to be applied in the Anatomy course, through Learning by doing coherence to promote networked, technologically and digitally mediated learning, in which the teacher is a mediator of learning.”

Radiologic imaging has transformed clinical practice and, increasingly, preclinical teaching, cross-sectional modalities such as computed tomography and magnetic resonance, real-time ultrasound, and even conventional radiography give students three-dimensional, living views of structures that cadaveric dissection cannot fully convey.



THE RADIOLOGY AS A RESOURCE TO LEARN ANATOMY

RADIOLOGY TECHNOLOGY HAS EVOLVED GREATLY IN THE LAST DECADES BECOMING THE MODALITY THAT, THROUGH VOLUMETRIC IMAGING METHODS IN 3D, 4D, VRT AND FINALLY THE INTRODUCTION OF KINEMATICS, CONVERTS IMAGES INTO PHOTOREALISTIC MODELS THAT SO WELL REPRESENT THE ANATOMICAL STRUCTURES.

ALMOST 100 YEARS OF ARTICLES HIGHLIGHT THE EVOLUTION OF THE ROLE OF RADIOLOGY IN TEACHING MEDICAL STUDENTS



THE SPECIFICITY OF RADIOLOGICAL MODALITIES

Ultrasound modality seems effective for education, particularly its role as an **active learning tool**. Ultrasound provides **dynamic, real-time images**, allowing learners to directly **correlate findings** with live anatomy, thereby enhancing their understanding of anatomical relationships.

During hands-on sessions, students **actively participate by manipulation**, adjusting settings, and **identifying landmarks independently**.



Learning theory framework

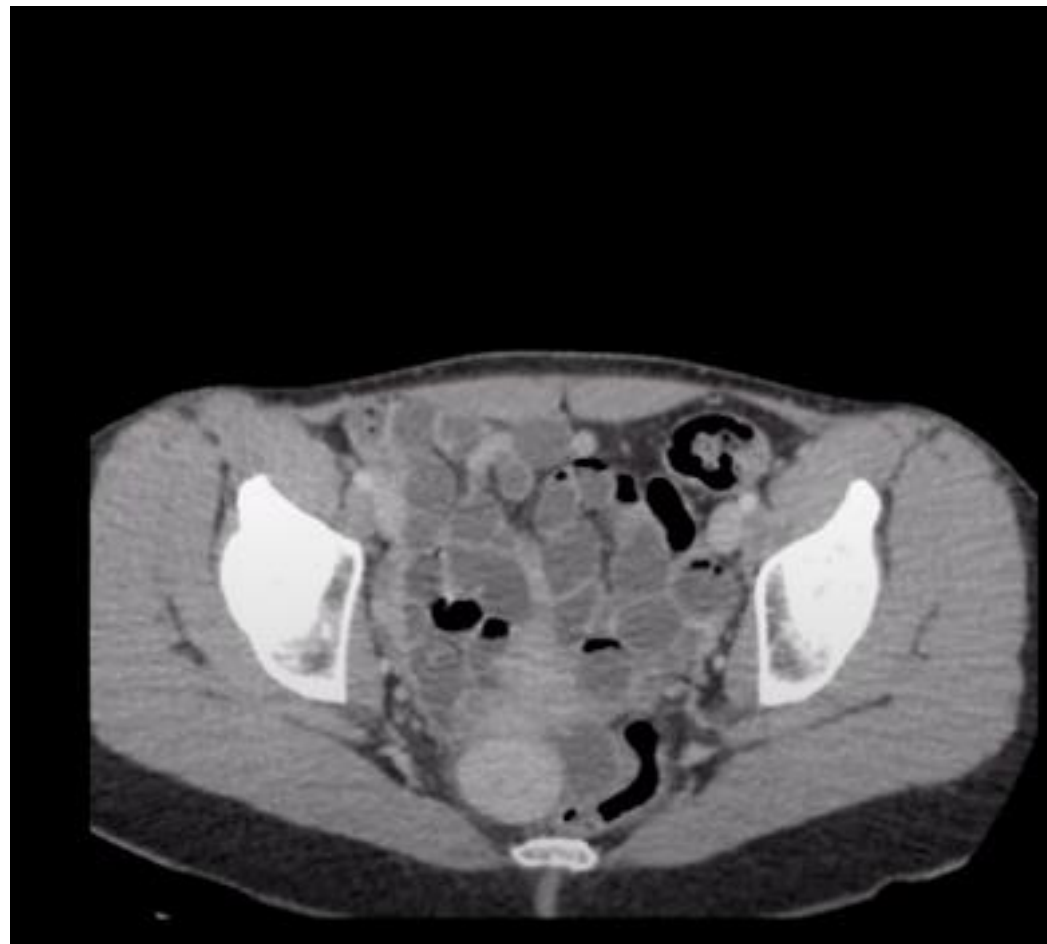
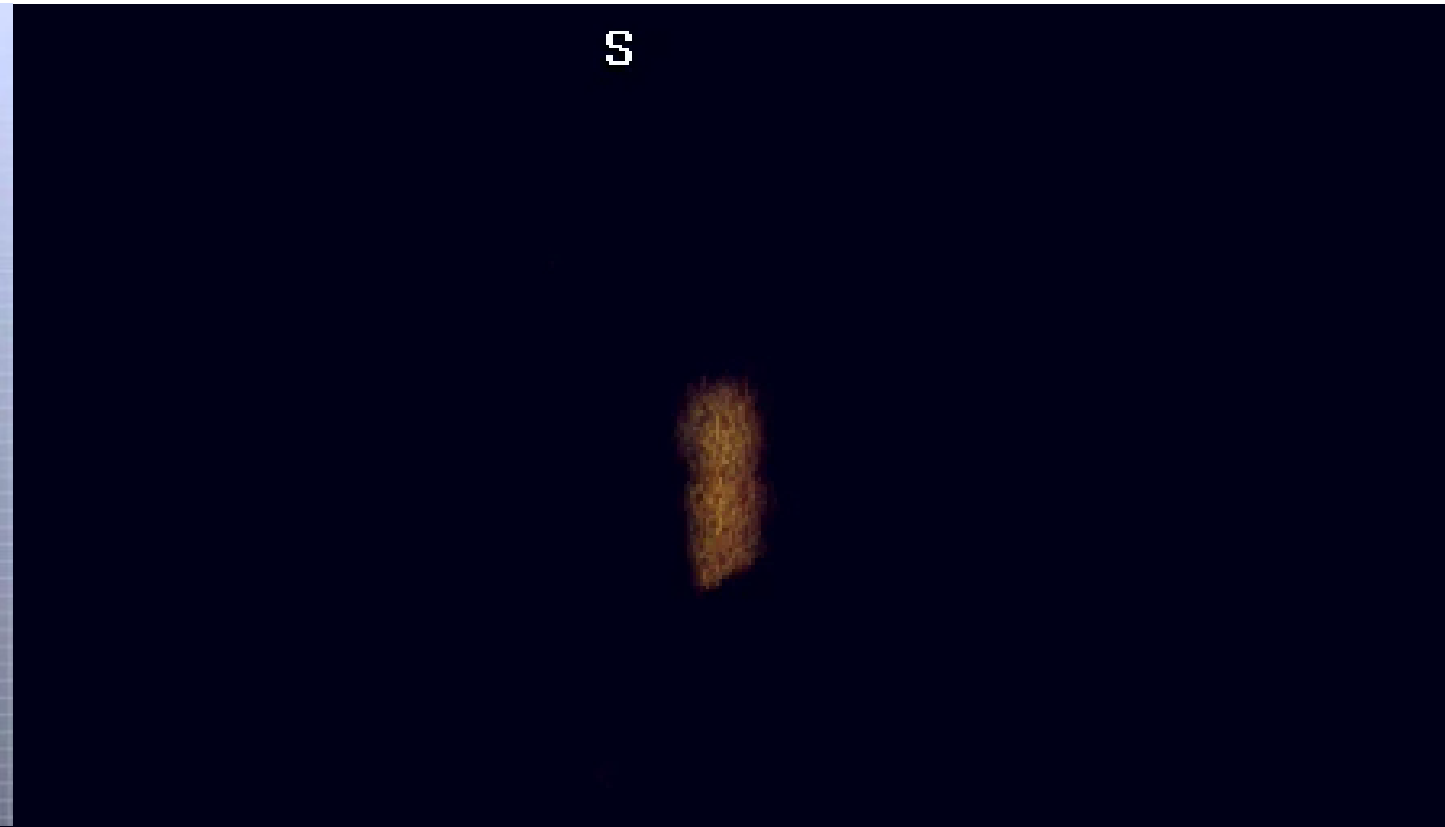
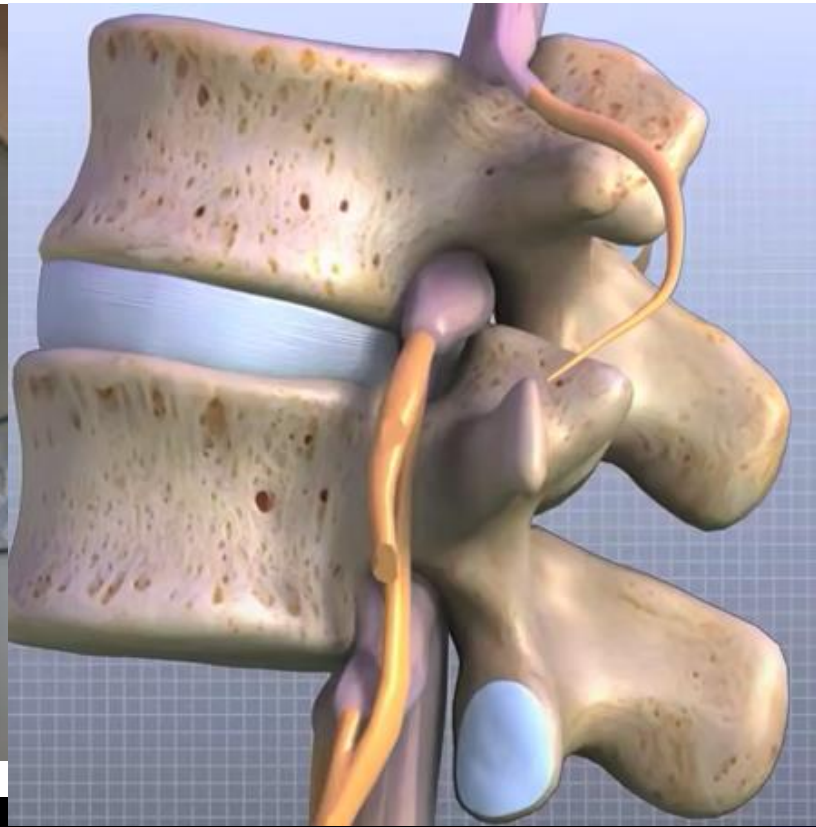
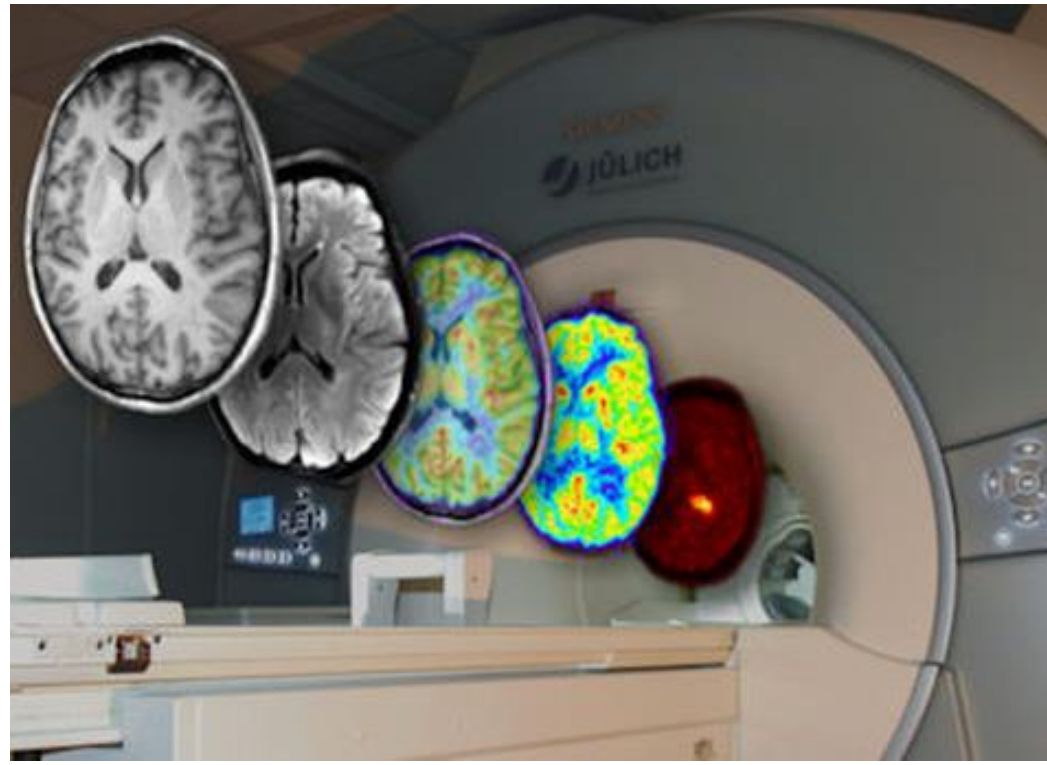
The socio-constructivist (or socio-interactionist) model is a learning theory that argues that knowledge is actively constructed by the individual through social and cultural interaction. Based on the studies of Lev Vygotsky, it understands that **learning occurs in relationships with others and with the environment.**

Fundamental Pillars:

Active Role: The student is not merely a receiver of information, but rather the builder of their own knowledge.

Mediation: The teacher acts as a facilitator or mediator, encouraging the student to think and solve problems, instead of simply transmitting content.

Culture and Environment: Cognitive development is shaped by the tools, language, and experiences that society provides.





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PROPOSAL FOR BUILDING A CLASS WITH MIXED INTERACTIVE MODELS FOR LEARNING ANATOMY

Proposal 1

Digital & Exploratory Learning

- Anatmage Table + CT/MRI datasets
- Guided exploration of anatomical structures
- Progressive learning (Bloom's taxonomy)
- Teacher as mediator

Focus: Spatial understanding through real imaging

Proposal 2

Interactive & Collaborative Learning

- Genially / BioDigital Human
- Group-based activities and quizzes
- Peer discussion and problem-solving
- Active knowledge construction

Focus: Collaborative and active learning

Proposal 3

Hands-on & Experiential Learning

- Ultrasound practical sessions
- Real-time image manipulation
- Identification of anatomical landmarks
- Clinical correlation

Focus: Learning by doing

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