

## Challenges for teaching the Human Morphology subject in times of COVID-19 pandemic: Lessons and opportunities in the face of future crises

Desafíos para la enseñanza de la asignatura de Morfología Humana en tiempos de pandemia por COVID-19: Lecciones y oportunidades ante futuras crisis

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Recibido: 14/10/2022

Aprobado: 26/02/2023

Dear Director:

The interesting article by Castro-Yanahida *et al.*<sup>(1)</sup> illustrates how the COVID-19 pandemic has challenged educators to adopt new, active strategies for teaching Anatomy in the last two years, favouring virtual or hybrid teaching-learning modalities. In retrospect, the COVID-19 pandemic generated an unprecedented health crisis, drastically affecting society, particularly educational systems. In most countries, due to the impossibility of face-to-face activities, the teaching coordinators and teachers of anatomy and related subjects were forced to adapt quickly to this new scenario. They started by using new technological-virtual tools, developing creative and innovative activities, adapting assessment instruments and new teaching approaches, planning adjustments according to the new contexts, and proposing alternative strategies to traditional sessions characterised by face-to-face classes and in-person laboratories.<sup>(2)</sup> This article describes our experience teaching Human Morphology in Chile during the COVID-19 pandemic crisis. This experience has provided the opportunity of identifying specific tips in order to react promptly to future crises.

The subject “Human Micro and Macroscopic Morphology” of health majors of Bernardo O’Higgins University (UBO, an accredited private institution in Santiago, Chile) comprises face-to-face lectures and a practical component in the laboratory sessions. This course aims to provide undergraduate students with the fundamental theoretical-practical knowledge and tools necessary to acquire a global vision of the micro and macroscopic structures of the human body, integrating morphological sciences through the study of the main structures that make it up (*i.e.*, cells, tissues, organs, and systems).

When adapting to the COVID-19 pandemic, various resources were used to help teachers compensate for implementing comprehensive teaching (Table I). Among

these resources, we may highlight the Modular Object-Oriented Dynamic Learning Environment (MOODLE™) software, allowing the remote application of new activities and assessment.

**Table I-** Human Morphology teaching resources used during COVID-19 pandemic

Textbooks in digital versions	Web pages	Softwares
<ul style="list-style-type: none"> <li>• Brüel A, Christensen EI, Tranum-Jensen J, Qvortrup K, Geneser F. <i>Histología</i>, 4ta. ed. Buenos Aires: Ed. Médica Panamericana; 2015.</li> <li>• Junqueira L, Carneiro J. <i>Histología Básica: Texto y Atlas</i>. 12th ed. México DF: Ed Médica Panamericana; 2015.</li> <li>• Gartner LP. <i>Histología: Atlas en Color y Texto</i>. 7th ed. Madrid: Lippincott Williams &amp; Wilkins. Wolters Kluwer; 2018.</li> <li>• Moore K, Persaud TVN, Torchia Mark. <i>Embriología Clínica</i>. 11th ed. Barcelona: Elsevier Health Sciences; 2020.</li> <li>• Carlson BM. <i>Embriología Humana y Biología del Desarrollo</i>. 4th ed. Barcelona, España: Ed. Elsevier Mosby; 2009.</li> <li>• Moore KL, Dalley AF, Agur AMR. <i>Moore: Anatomía con Orientación Clínica</i>. 8th ed. Madrid: Lippincott Williams &amp; Wilkins. Wolters Kluwer; 2018.</li> <li>• Rohen JW, Yokochi C, Lütjen-Drecoll E. <i>Atlas de Anatomía Humana: Estudio Fotográfico del Cuerpo Humano</i>. 8th ed. Barcelona: Elsevier; 2015.</li> <li>• Hansen JT. <i>Netter. Anatomía Clínica</i>. 4th ed. Madrid: Elsevier; 2020.</li> <li>• Lee KS, Carmichael SW, Vilensky JA, Weber EC. <i>Netter. Anatomía Radiológica Esencial</i>. 2nd ed. Barcelona: Elsevier; 2015.</li> <li>• Drake RL, Mitchell AMW, Vogl AW. <i>Gray. Anatomía para estudiantes</i>. 4th ed. Madrid: Elsevier 2020.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Atlas Digital de Histología</i>. Available from: <a href="http://www.facmed.una.m.mx/deptos/biocetis/atlas2013A/index.html">http://www.facmed.una.m.mx/deptos/biocetis/atlas2013A/index.html</a></li> <li>• <i>Atlas de Histología Vegetal y Animal</i>. Available from: <a href="https://mmegias.webs.uvigo.es">https://mmegias.webs.uvigo.es</a></li> <li>• <i>Atlas de Histología</i>. Available from: <a href="http://wzar.unizar.es/ac/ad/histologia">http://wzar.unizar.es/ac/ad/histologia</a></li> <li>• <i>3D Atlas of Human Embryology</i>. Available from: <a href="https://www.3dembryoatlases.com">https://www.3dembryoatlases.com</a></li> <li>• <i>eSkeletons (Skeletal Anatomy and Osteology Database)</i>. Available from: <a href="https://www.eskeletons.org">https://www.eskeletons.org</a></li> <li>• <i>Anatomía Humana 3D</i>. Available from: <a href="https://anatomiahumana">https://anatomiahumana</a></li> </ul>	<ul style="list-style-type: none"> <li>• Modular Object-Oriented Dynamic Learning Environment - MOODLE™</li> <li>• Zoom Meetings - Zoom™</li> <li>• Motic Images Plus 2.0ML™</li> </ul>

	<a href="#">3d.com/</a>	
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Source: Authors' compilation.

For the transmission and development of the theoretical classes and the practical activities, the online videoconference platform Zoom™ was used (Table I); the preceding, initially in a context of non-attendance due to the sanitary restrictions (lockdowns and quarantines) imposed to avoid COVID-19 contagion. The classes were based on synchronous expository teaching by means of the use of slides, displaying images extracted from the digital versions of Human Morphology texts (*i.e.*, Anatomy, Histology, and Embryology; Table I), both for the theoretical sessions and for the laboratories. The practical activities mainly assessed the students' recognition and analysis of morphological images; these images were not labelled and were previously prepared for the activity. Additionally, as health restrictions permitted, live synchronous transmissions were made from the laboratories, with a detailed explanation of the anatomical and histological surveys, which were also recorded as a backup for subsequent students' review. Finally, the Project-Based Learning strategy was applied.<sup>(3)</sup> This approach involved developing a bibliographic search and analysis project in order to solve a scenario or problem associated with their particular disciplinary training –*e.g.*, in the Speech Therapy (also known as Phonoaudiology) programme, the problem of morphology and possible pharyngeal anatomical variables was raised. These projects were worked on in groups (5 students). They were carried out by integrating the teacher as a learning guide throughout the project's development to support, deepen and solve doubts that arose in the groups.

This aforementioned set of adopted measures finally converged in carrying out a blended course during much of the pandemic. This course applied new and diverse methodologies in a compensatory manner so that students could meet the proposed learning outcomes and acquire and develop the skills and knowledge necessary for clinical practice. Interestingly, some studies on similar subjects (*i.e.*, Anatomy) have reported on the educational effect of blended learning, revealing even better or similar results than conventional methods.<sup>(4-6)</sup> The preceding supports the maintenance of most new activities implemented during the pandemic. Thus, we agree with Castro-Yanahida *et al.*<sup>(1)</sup> on the importance of implementing new virtual strategies for teaching morphological sciences such as Anatomy.<sup>(1)</sup> In addition, it reinforces the idea that students received training in Morphology in a blended manner that was reasonably equivalent to that provided prior to the pandemic.

In conclusion, it can be mentioned that the challenges and adaptations that had to be implemented for teaching Human Morphology during the COVID-19 pandemic catalysed the establishment of innovative teaching methodologies, including new resources provided by information and communication technologies, many of which were previously under-utilised or unknown. As a future projection, at the same time the pandemic is slowly leaving, we are rapidly transitioning to a Fifth Industrial Revolution – 5IR.<sup>(7)</sup> It will profoundly impact on social and educational systems to increasingly include artificial intelligence and human-machine collaboration in all educational processes.<sup>(7)</sup> The teaching of morphological sciences will not be exempt from this Fifth Industrial Revolution.

Finally, the crisis caused by the COVID-19 pandemic added to other global or regional crises we are currently facing (*e.g.*, climatic change crisis, socioeconomic tensions, or armed conflicts) in this era of great uncertainty. These crises provide biomedical educators with powerful lessons and experiences that should

permanently guide us to put student learning at the centre of the educational process.

### Acknowledgements

We thank Prof. Carolina Santander Gómez (UBO) for her useful comments about this manuscript.

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### **Conflicts of interests**

None of the authors of this article has a financial or personal relationship with other people or organizations that could inappropriately influence or bias the manuscript's content.