Revista Cognosis
Revista de Filosofía, Letras y Ciencias de la Educación
ISSN 2588-0578

Teaching human anatomy based on 3d anatomical models in the Obstetric Career

AUTHORS: Jean Michel Chuquimarca Mendizábal[1]
Nelly Carolina Larrea Astudillo[2]
Jessica Carolina Analuisa Maiguashca[3]
Estefanía Rocío Cruz Báez[4]
Cintia Carolina Cruz Báez[5]

ADDRESS FOR CORRESPONDENCE: cynthiac1417@live.com

Reception date: 24 - 01 - 2021 Acceptance date: 15 - 04 - 2021

ABSTRACT

The subject of Human Anatomy treats in a theoretical and practical way the morphology of the different systems of a living being, being one of the preclinical subject's base for every career in the health, through which the future professional is used to diagnose and cure various pathologies. Worldwide the teaching of this subject has been through the master class where the teacher is the one who explains on an illustrative plate to a course of about 40 students, Ecuadorian universities that offer health careers are not the exception. At present there are teachers who resort to these traditional practices, which causes the students community to resort to self-education. This is limited to the acquisition of knowledge in the appropriate manner, resulting in disadvantages in the development of the analytical plan. To this end, the objective is to develop a methodology with learning strategies and techniques through the use of virtual environments and learning methods to improve academic performance in the first semester of the Obstetrics Career of the Central University of Ecuador. In order to achieve this objective, a methodology based on Design Science has been created, which aims to solve social problems through the use and application of technological devices. These devices such as 3D models have been implemented together with the Design Science methodology to positively influence academic performance. (221) In order to achieve this objective, a methodology based on Design Science has been created, which aims to solve social problems through the use and application of technological devices. These devices such as 3D models have been

[1] Investigador Independiente. Ecuador.
[2] Investigador Independiente. Ecuador. E-mail: nclarrea@gmail.com
[3] Investigador Independiente. Ecuador. E-mail: jcarolina2412@gmail.com
[4] Investigador Independiente. Ecuador. E-mail: stefy0008@gmail.com
[5] Investigador Independiente. Ecuador. E-mail: cynthiac1417@live.com

implemented together with the Design Science methodology to positively influence academic performance. (221) In order to achieve this objective, a methodology based on Design Science has been created, which aims to solve social problems through the use and application of technological devices. These devices such as 3D models have been implemented together with the Design Science methodology to positively influence academic performance. (221)

KEYWORDS: Academic performance; Human Anatomy; Virtual classroom; 3D anatomical models.

INTRODUCTION

The Human Anatomy subject provides the fundamental knowledge of the morpho-function of the different devices and systems of a living organism in order to deepen clinical and surgical studies throughout the career and guide the future health professional to be able to treat and identify the various pathologies that affect the physiological homeostasis of patients. In addition, it is one of the driest subjects in the preclinical disciplines for health science students (Parra et al, 2015; Vidal et al, 2019). Mompeó and Félix, (2016) mention that in the study of clinical subjects the student must have access to specific teaching resources, such as bones, corpses and models to provide quality teaching and strengthen learning.

For Martinez and Tuesca (2018), the teaching-learning process has been affected due to the overcrowding of students in health careers and the lack of specific didactic resources for each subject of morphological sciences, such as the low number of pieces anatomical or optimal microscopes for each student, which leads to an unfavorable result in academic performance and later at a professional level. In addition, Mera Chóez et al (2018) mention that in the teaching of preclinical sciences, students must learn literally, what is written in the texts and dictated by the teacher.

The Obstetrics Career of the Central University of Ecuador has as its mission access to universal understanding in order to generate research linked to the development of the human race through social and experimental research and the correct connection with Ecuadorian society. Therefore, it is intended to train excellent professionals with high levels of knowledge and academic performance.

Academic performance is the manifestation of skills of an individual that are in constant development through the learning process, which give them the possibility of obtaining academic results that are synthesized in a grade throughout a university or school period (Vizoso & Arias, 2016). Additionally, it is defined as a relationship between the student's ability to carry out a task and the effort that she invests in it (Cid-Sillero, 2019).

Figure 1 outlines the factors that affect academic performance:

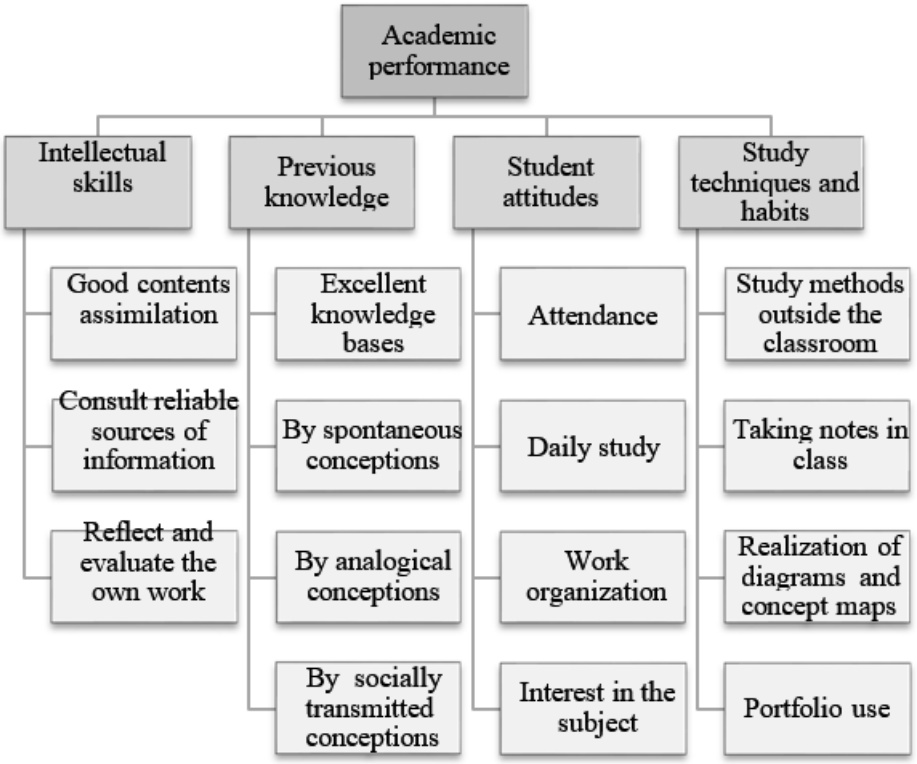

Figure 1. Factors of academic performance Source: Own authorship

With the arrival of information technologies in the educational field, new teaching strategies are being integrated, one of which is the design and use of virtual environments in educational platforms (Morado & Ocampo, 2019).

Romero (2018) defines educational platforms as a site on the internet where you can find various support tools for both students and teachers, with interactive educational activities. Currently they are used for the implementation of online courses around the world, shortening the distance for students who wish to continue with their studies. With the help of these platforms, a large repository of information and tasks can be if students can solve individually and autonomously as in homogeneous groups within the virtual course, communication given through forums, chats and even scheduled video calls (Mendoza & Placencia, 2018).

By implementing the use of virtual learning environments in a higher education institution, students are given the opportunity to grow autonomously in the teaching-learning process (González de Dios et al, 2017).

In addition, the application of simulation rooms oriented in a hospital or legal setting can be evidenced, allowing future professionals to approach the reality with which they are going to face in their profession. In these simulators they have the guidance of a teacher who exercises the degree, who can provide immediate feedback effectively (Guerrero-Hernández et al, 2017). There are simulators for teaching preclinical subjects in the health area, such as Anatomiou, whose didactic method is framed to explore the human body in an

immersive 360 ° way with the use of the virtual reality viewer accessory for smartphones IOS and Android, it is freely accessible (Castro et al, 2019).

Another simulator is Virtual Medical Vision, closed access software (requires payment) through which students have images of radiographs and histological plates, its methodology is based on images of real tissues in which the student can zoom in and out of the photos without distortion, it supports Windows and Mac (LA Romero, 2018).

Finally, Human Anatomy Atlas for PC, similar to Anatomyou with the difference that the student does not need an accessory for their mobile device to explore the human body. It is free software, however to obtain extra tools, it requires payment. Its methodology is based on systems and apparatus of the human body that allow separating the organs that are not of study interest and indicates the names of anatomical structures, it supports all types of devices (Weyhe et al, 2018).

In a study carried out by Fernández-Vega and collaborators (2020), at the University of Oviedo in the Medical School, in the Pathological Anatomy subject, the "Kahoot" platform was used, an application for mobile devices to prepare quick questionnaires at the end of each class and reinforce knowledge of the subject. The population of the present study was 55 students, in the satisfaction survey carried out 90% of the students responded that it is advisable to use the app or a similar one in each class and 73% that it is important to use this type of platform in other subjects. As a conclusion, it is observed that students are receptive to the use of applications on mobile devices in the classroom, achieving a high number of correct answers in the questionnaires.

In an investigation carried out by Casas (2020), at the Private University of San Juan Bautista del Peru in the faculties of Health Sciences, Law, Administrative Sciences, and Engineering in the subject of Preparation of Research Projects. The blended modality was used with the help of the Classroom platform where teachers uploaded the didactic material and a final integrative project. The study population was 978 teachers of which 98.3% were satisfied with the use of the platform, 91.8% were easily accessible and 91.6% expressed that the material was great help for the continuity of the course. The use of the semi-face-to-face modality was extremely positive and is expected to motivate its implementation in other subjects.

On the other hand, in a study by Castro (2018), at the University of Las Palmas de Gran Canaria, Faculty of Medical Sciences, subject of histology. The use of interactive atlases of histological sections was implemented in the classroom. The research sample was 158 students, where 54.2% answered in a survey that facilitates the study of histology when using interactive atlases. The conclusion was that there is a favorable predilection of students to the use of digital and interactive atlases over traditional ones, and an increase in academic performance can be observed.

Finally, Carino (2015) regarding the incorporation of virtual learning environments as didactic tools for the study of pathological anatomy in the dental school of the National University of Trujillo. The population was 31 students, with whom a virtual environment created on the "Moodle" platform was used, in which the participants had access to videos created by the teachers, use of virtual microscopes and virtual PBL seminars. Through the application of a Rochester test of scale 1-7 whose measured parameters were interest in using the platform, perceived competence, perceived choice and pressure. The results obtained were that 60% of the students resorted to the virtual classroom to be able to solve the practical cases of the subject, 13.3% asked for help from their classmates, 6, 6% consulted additional books and 20% did not perform the tasks. As conclusions, it can be deduced that as the course progressed, the students became accustomed to using the virtual classroom and to thinking critically to solve tasks, working autonomously, and promoting active participation in the classroom.

For this reason, the objective of this research is to determine the effectiveness of the application of 3D models and anatomical pieces in the academic performance of students in the first semester of the Obstetrics Career year 2019.

DEVELOPMENT

In the Human Anatomy subject of the Obstetrics Career, there are 60 students, who were divided into group A (experimental) and group B (control). For group A, a virtual learning environment was designed and implemented on the Moodle platform. This environment consists of study materials such as video tutorials of the teacher of the subject, activities / tasks and evaluations, these being the same last two used in group A, unlike the study material, since it was carried out through the projection of images from the Atlas of Human Anatomy book, that is, without the use of 3D simulators and virtual environment.

The application of the 3D simulator and anatomical pieces was implemented within the virtual environment designed for the 30 students (group A). The simulator was projected in the classroom from a computer while the students followed the app on their cell phones. In this way, the students had the freedom to manipulate and explore all the anatomical pieces studied to recognize their characteristics and anatomical accidents of an organ. To reinforce the knowledge of the class, the students later had the material uploaded in the virtual classroom. As an activity, the participants had to make a video and an-atlas, which will be uploaded at the end of each week on the virtual platform.

For this, an induction workshop was developed on the use of the Moodle platform aimed at students in group A.

To analyze the results, it was categorized by rating ranges attributed to knowledge. That is, 9-10 excellence of the subject; 4-8.99 intermediate knowledge of the subject; 3.99-1 basic knowledge of the subject and 0-0.99 insufficient knowledge of the subject.

At the end of the semester in the Human Anatomy subject in the Obstetrics Career, it was possible to obtain data that allow to present the results of the use of 3D simulators and anatomical pieces compared to traditional classes, without the use of existing technologies. Figures 2 and 3 show the results obtained within the topic called "Bones of the lower limb" between the experimental group and the control group.

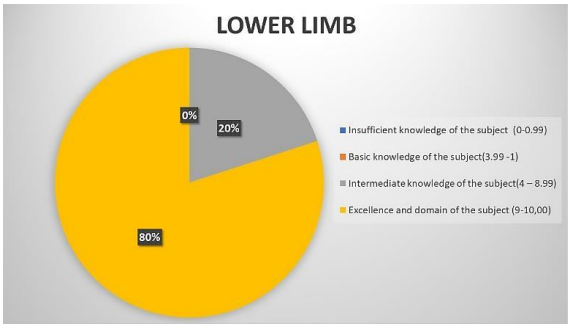

Figure 2. experimental group in the subject of lower limb. Source: Own authorship

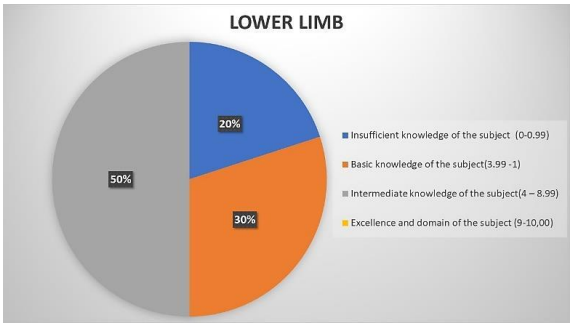

Figure 3. control group in the lower limb theme. Source: Own authorship

It can be seen that in a large percentage (80%) the students of the experimental group, where the 3D simulator and the virtual environment were used, obtained a score between 9 and 10 points, while 20% obtained between 4 to 8, 99 points. On the other hand, it is observed in figure 3 that the control group and the experimental group where 50% of the students obtained a score between 4 and 8.99 out of 10points in the evaluation of the subject, while 30% reflect a score of 1 to 3.99 out of 10 and finally 20% obtained from 0 to 0.99 points.

Excellence and mastery of the subject with the subject with the use of 3D models was demonstrated for the 80% of the experimental group, as mentioned by Carino (2015) in his study that the joint use of anatomical pieces and 3D models are effective and efficient in the field of pathology, producing an increase in academic performance. intermediate knowledge of the subject as indicated by Tronchini et al (2018) in terms of the master class was demostratesd by the 50% of the control group, the teacher needs to do a dynamic class so that students do not lose interest and have high academic performance.

Figures 4 and 5 show the comparison of the pelvimetry issue between the experimental group and the control group:

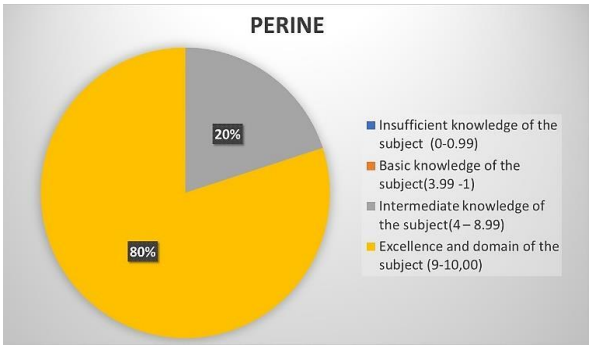

Figure 4. experimental group on the subject of perineum. Source: Own authorship

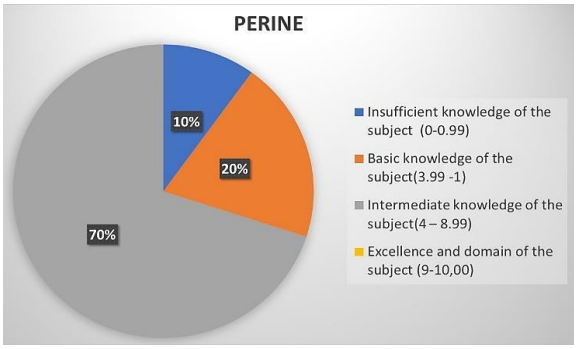

Figure 5. control group in the perineum topic perineum. Source: Own authorship

It can be seen that 80% of the students in the experimental group present excellence and mastery of the subject (Figure 4), reaching a score of 9 to 10 out of 10 points who used the 3D simulator and virtual environment, while 70% intermediate knowledge being the control group (Figure 5) with a score of 4 to 8.99 out of 10 points. Scores from 0 to 0.99 out of 10 was reached by the 20% of the students who used the 3D Simulator and the virtual environment, while the control group presented 10% of the students.

Finally, only in the control group, 20% of the students obtain a 3.99 out of 10 qualification, which corresponds to the fact that the knowledge is basic on the subject, it says that the knowledge is insufficient on the subject. Excellence and mastery of the subject with the use of the virtual classroom was demonstrated 80% as mentioned by Lázaro et al (2019), students get better used to using the platform and increase their academic performance over time when performing tasks weekly.

Intermediate knowledge of the subject was demonstrated by the 70% as explained by Soria et al (2019), the master class encourages mechanistic learning because students memorize the subject, meaningful learning does not occur and causes poor academic performance. Figures 6 and 7 show the comparison of the pelvimetry topic between the experimental group and the control group:

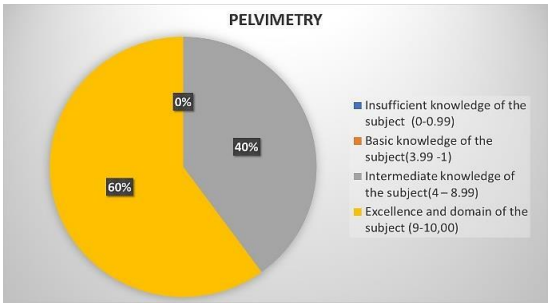

Figure 6. experimental group on the subject of pelvimetry. Source: Own authorship

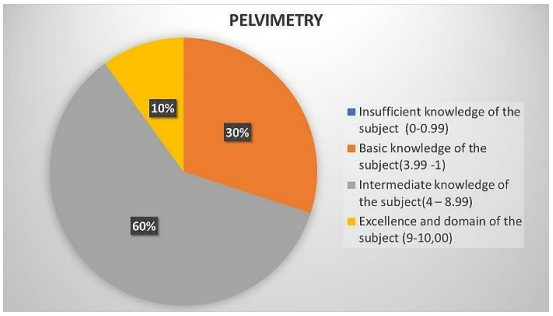

Figure 7. control group in the subject of pelvimetry. Source: Own authorship

In figure 6 and 7 the comparison of the pelvimetry issue between the experimental group and the control group is observed, it is evident in figure 6 that 60% of the students of the experimental group where the 3D simulator and environment were implemented virtual, they obtained a note between 9 and 10 points, while 40% obtained 4 to 8.99 points. On the other hand, in the control group it is evidenced that 60% of the students managed to achieve a grade of 4 to 8.99 points, followed by 30% who reached 3.99 to 1 point and only 10% managed to obtain a high weighting from 9 to 10.

Excellence and mastery of the subject with the use of 3D models in the mobile app was demonstrated by the 60%, as indicated by Cabero et al (2019) in their study, the application of the EVA in conjunction with the 3D anatomical model's app produces an increase in academic performance and students show more interest in classes. Figures 8 and 9 show the comparison of the vascularization issue between the experimental group and the control group:

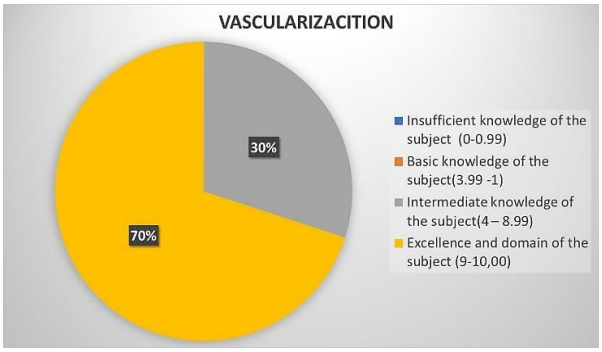

Figure 9. control group on vascularization issue Source: Own authorship

It can be seen that 70% of the students in the experimental group present excellence and mastery of the subject (Figure 8), reaching a score of 9 to 10 out of 10 points who used the 3D simulator and virtual environment, while 70% intermediate knowledge being the control group (Figure 9) with a score of 4 to 8.99 out of 10 points; 30% of the students who used the 3D Simulator and the virtual environment achieved scores from 4 to 8.99 out of 10, while the control group presented 10% of the students basic knowledge of the subject. Finally, only in the control group, 20% of the students obtain a 9-10 out of 10 qualification that corresponds to the domain of the subject.

As indicated by Castro et al (2019), by implementing an immersive 3D model application, students are motivated to learn and actively participate with the teacher, promoting collaborative learning and critical thinking.

CONCLUSIONS

The academic performance of the first semester students of the obstetrics career before the application of the 3D models was low since the students do not know the structures of the pelvic region. Fernández & Aguado (2017) affirm that the traditional method favors repetition techniques for memorizing the contents. This factor caused short-term learning as students were not able to remember anatomical structures.

The improvement of the academic performance of the students of the first semester of the obstetrics career was carried out through the implementation of 3D models and anatomical pieces. Basurto & Hernández, (2018) state that when students are in a simulator, they lose their fear of real situations and learn from their mistakes. This aspect made it possible to potentiate autonomous learning since the students discover by themselves the correct location of the anatomical structures.

The application of 3D models and anatomical pieces in the experimental group increased the academic performance of obstetrics students since the students obtained a score higher than 9 points out of 10. Bonilla et al, (2019) mention that the application of 3D simulators in the classes allows students to participate actively and show more interest in learning. This factor produced innovative learning, with high levels of academic performance in the anatomy subject, because the students felt motivated to interact in both face-to-face and virtual classes.

REFERENCES

Basurto Guerrero, M., & Hernández Revelo, JA (2018). Tutorial for the subject computerized numerical control mediated by computerized simulation using augmented reality (postgraduate thesis). Israel University, 150.

Bonilla Trujillo, D., Villamil Reyes, V., & Montes Mora, J. (2019). use of 3d simulators as techno-pedagogical strategies for the transfer of knowledge in the learning of animal anatomy. Working papers-ECAPMA, 12.

Cabero, J., Barroso, J., & Llorente, C. (2019). Augmented reality in university education. REDU, 14.

Carino, A. (2015). The incorporation of tics in elective courses of pathological anatomy in the FOUNT curriculum. Memories of the Sixth Ibero-American Virtual Congress on Quality in Virtual and Distance Education, 21.

Casas Lucich, A. (2020). Perception of a "blended" course as a tool for continuous improvement in Health Sciences, experience of a Peruvian university. Medical Education, 4.

Castro Alonso, P. (2018). Introduction to the use of digital images in web format in the learning of human histology. Medical Education, 4.

Castro, PL, Garvia, J., Ramírez, JA, Monpeó, B., Pérez, L., Baraza, A.,.Rodriguez-Florido, MA (2019). Use of the immersive 3D application Anatomyou® to teaching in health sciences, 6.

Cid-Silleroa, S., Pascual-Sagastizabal, E., & Martínez-de-Morentin, J.-I. (2019). Influence of self-esteem and attention on the academic performance of ESO and FPB students. Psychodidactics, 9.

Fernández, CL, & Aguado, MI (2017). Problem-based learning as a complement to traditional teaching in Physicochemistry. Chemical Education, 9.

Fernández-Vega, I., Santos-Juanes Jiménez, J., & Quirós, L. (2020). Use of the Kahoot app to quantify the degree of attention of the student in the subject of Pathological Anatomy in Medicine and evaluation of the experience. Medical Education, 5.

González de Dios, J., Hijano Bandera, F., & Continuum work team. (2017). Continuum: the power of virtual learning and Web 2.0 in medical training in Pediatrics. Three years of experience. Medical Education, 9.

Guerrero-Hernández, A., Palacios-Zertuche, J., Reyna-Sepúlveda, F., & Muñoz-Maldonado, G. (2016). Laparoscopic training by use of a physical simulator and its application in the general surgery residency. Medical Education, 5.

L., A. Romero (2018). Technological environments of anatomo-radiological 3D vision for the study of pelvic structures (doctoral thesis). University of Salamanca, 250.

Lázaro Cantabrana, JL, Sanromá-Giménez, M., Molero-Aranda, T., & Gisbert Cervera, M. (2019). Use of a video analysis tool to evaluate the Teaching Digital Competence: design of a classroom using a 3D virtual environment. Octahedron, 13.

Martinez, E., & Tuesca, R. (2017). Learning styles and gross anatomy assessment outcomes at a Colombian School of Medicine. Medical Education, 5.

Mendoza Rojas, HJ, & Placencia Medina, MD (2018). Teaching use of information and communication technologies as didactic material in Human Medicine. Scielo, 9.

Mera Chóez, OP (2018). Knowledge of Histology with relevance in the practice of the doctor in Ecuador. Conrado, 5.

Mompeó Corredera, B., & Félix Domínguez, E. (2016). Competences to be developed by Medicine students in the discipline of Human Anatomy in Spanish public universities. Medical Education, 5.

Morado, MF, & Ocampo Hernández, S. (2019). An experience of techno-pedagogical support for the construction of virtual learning environments in higher education. Education magazine, 18.

Parra Gámez, L., Ibarra Ramirez, VH, González Ríos, J., García Hidalgo, A. (2015). The recognition of basic-clinical concepts under international anatomical terminology towards medical training. Research in Medical Education, 6.

Soria, G., Quandt, E., Bru, S., Ribeiro, M., Ricco, N., Clotet, J., & Jiménez, J. (2019). Analysis of the use of audience response systems (clickers) in microbiology master classes at a medical school. Classroom, museums and collections, 8.

Tronchoni, H., Izquierdo, C., & Anguera, T. (2018). Participatory interaction in the master classes: foundation and construction of an observation instrument. Publications, 28.

Vidal Ledo, MJ, Avello Martínez, R., Rodríguez Monteagudo, MA, & Menéndez Barvo, JA (2019). Simulators as teaching aids. Higher medical education, 13.

Vizoso Gómez, C., & Arias Gundín, O. (2016). Academic stressors perceived by university students and their relationship with burnout and academic performance. Psychology Yearbook.

Weyhe, D., Uslar, V., Weyhe, F., Kaluschke, M., & Zachmann, G. (2018). Immersive Anatomy Atlas-empirical study investigating the usability of a virtual reality environment as a learning tool for anatomy. Frontiers in surgery, 8.