INTRODUCTION

In late 2019, a new virus, SARS-CoV-2, was discovered. The virus first appeared in Wuhan (China), from where it spread at an exponential rate and thus became a global problem. As pointed out by the World Health Organization (WHO), it is the cause of the disease, COVID-19. In January 2020, WHO declared the outbreak of the new disease as a pandemic with international importance, classifying it on March 11, 2020 (Díaz-Castrillón & Toro-Montoya, 2020).

Social distancing, the initial and most effective prophylactic measure against the disease, brought the need to evaluate the learning process. As presented by students from all over the world, new methods are needed to adopt new information and communication technologies (ICT) for the continuation of their studies. The inability to perform presential classes resulted in an increasing replacement by ICTs and by the internet; a system adopted by all educational institutions, including those of higher education (Gomes et al., 2020; Moura et al., 2020).

As remote teaching became an effective means for social distancing, many gaps in the learning process were pointed out because of the absence of student-professor interaction. Therefore, after the pandemic, educational institutions must emphasize the importance of adequate planning for the supplementation and insurance of continual teaching and learning outcomes (Gomes et al., 2020).

Regarding training in the health and medical fields, anatomy stands out among the basic subjects for the entry of students Kruse, 2004). During anatomy subjects (whether human or animal), students learn to correlate the functions, shapes, and locations of the constituent structures of the human or animal body (Braz, 2009).

To achieve and obtain knowledge about anatomy, several methodologies and modern techniques have been applied, such as the use of artificial anatomical models (mannequins), electronic resources,
2 | MATERIAL AND METHODS

In the Animal Anatomy Laboratory of the Faculty of Animal Science and Food Engineering (FZEA/USP) in Pirassununga, São Paulo, Brazil, 123 anatomical kits were prepared for veterinary medicine students, each student received 1 kit. In the attempt of allowing the handling of animal structures by the students, 62 kits for Animal Anatomy II subject (especially splanchnology) were prepared for 62 students in their first year of veterinary school and 61 kits for Applied Anatomy subject (for the topographic study of surgical accesses of animal body regions) were prepared for 61 students in their third year of vet school. Animal anatomy II kits contained the visceral block, that is, the pluck (oral, cervical, and thoracic viscera, including the tongue, larynx, oesophagus, trachea, thyroid and parathyroid glands, thymus, lungs, and heart), gastrointestinal tract, liver, spleen, and urogenital organs; all organs were removed as a unit so students could appreciate the anatomy and organs disposition. Applied anatomy subject kits contained a forelimb and a hindlimb and part of the spine. In total 93 cadavers were used to prepare all 123 kits. This study was approved by the ethics committee (CEUA-CEP/FZEA nº 7474300620).

From the ninety-three cadavers used in this study, eighty-five dogs and cats cadavers were obtained in partnership with the Zoonosis Control Center (CCZ) of Conchal City, São Paulo, Brazil, which develops public policies to collect deceased animals in the city, and eight stillborn pigs were obtained in partnership with the Swine Breeding Program from the Faculty of Animal Science and Food Engineering (FZEA/USP), Pirassununga City, São Paulo, Brazil, which donates their stillborn for research and teaching activities upon reasonable request. In addition, this process did not generate chemical or microbiological contaminants.

The animal's cadavers were received by the CCZ and then frozen for conservation purposes before being sent to us. Upon arrival at our laboratory, the animal's frozen cadavers were thawed and fixed in a 10% formaldehyde solution via the carotid artery (Walker & Hickman, 1980). After 24 h of thawing, they were placed in lateral decubitus and trichotomized in the jugular sulcus; a longitudinal incision was made to access and remove the sternohyoid and sternocleidomastoid muscles, allowing visualization of the carotid artery proximal to the vagosympathetic nerve, trachea, and oesophagus. A cannula compatible with the diameter of the artery was inserted, through which 10% formaldehyde was injected until the entire system was perfused, ensuring correct fixation of the cadavers.

Subsequently, 62 cadavers were dissected for the preparation of the Animal Anatomy II anatomical kits. They were placed in a dorsal recumbent position; a superficial incision was made ventrally from the pubic area to the mandibular region. In the abdominal region, an incision was made next to the xiphoid cartilage; that is, cranially along the alba line, passing through the thoracic region, and exposing the thoracic cavity. At that moment, we performed bilateral costochondral disarticulation and removed the sternum, proceeding with the incision to the mandible region. At this location, two incisions were made next to the lateral branches of the mandible; that is, to cut the local musculature and dismantle the hyoid bone, thereby releasing and inverting the tongue. Later, through an inverted V incision, the visceral block was released and collected as a single piece (comprising the digestive tract from the tongue to the anus, respiratory, and reproductive systems).

Additionally, half-heads were prepared using a band saw, which complemented each study kit. For the preparation ofApplied Anatomy kits, the cadavers of 31 animals were sectioned (also swine models) to obtain four sets of parts: thoracic limbs with and without the head, and pelvic limbs with and without the tail. Each student of the Applied Anatomy subject received a kit containing a thoracic limb (with or without head) and a pelvic limb (with or without a tail).

After the preparation, all anatomical pieces were stored in a tank containing 70% alcohol for 2 days and sequentially were placed in plastic bags containing 50% alcohol. The bags were sealed and placed in a black plastic box with a lid. Due to the possible volatilization of the maintenance liquid, it was necessary to send two extra bottles containing 1 L of alcohol 50% each inside the maintenance box kit so that the student could carry out the maintenance of the parts (Figure 1).

All students and legal guardians informed interest in receiving the material through signed consent terms. The kits were distributed on August 29 and September 26, 2020, respecting all protocols of distance and avoiding contamination. According to the location of the students’ housing, two locations were designated for kits distribution: USP campus São Paulo/Brazil and USP campus Pirassununga/SP/Brazil. USP campus São Paulo (Cidade Universitária - São Paulo - Brazil) was chosen for kit distribution to students residing in and around São Paulo city. For students who live in cities in the countryside of São Paulo state, USP campus “Fernando Costa” at Pirassununga/SP/Brazil was chosen.
At the end of the classes, the students received a link to an optative questionnaire to evaluate the teaching method employed. In order to evaluate their academic progress, online tests were applied using the institutional MOODLE. Finally, the student's grades were compared to the grades from four pre-pandemic classes using the analysis of variance. The significance level considered was 5% ($p < 0.05$).

3 | RESULTS

Anatomy is the subject responsible for studying the structure and organization of living beings, both externally and internally. Its main objective is to enable students to learn about the morphological and structural organization of animals. The subject of anatomy constitutes a theoretical and practical approach to the human body,
thereby allowing the experience in great depth about the theme. In veterinary medicine, the subject of animal anatomy is responsible for leading the student to learn about the shape, layout, and structure of the tissues and organs that compose the animal’s body.

Although the course introduces new technologies for the process of teaching and learning, such as the use of virtual animal models or even the use of handmade anatomical models, mannequins, and simulators, practical laboratory learning, in which the student experiences direct contact with the pieces of the cadavers and their tissues, cannot yet be replaced. Despite the wide collection of anatomical pieces, the Laboratory of Animal Anatomy of the Department of Veterinary Medicine of FZEA/USP could not contemplate all students with it in this new pandemic context, especially with the need for social and educational distance. To supply this demand in handling animal pieces, thus avoiding compromise on learning, the professor decided to make anatomical kits to be delivered to the students. The classes were taught in real-time via Google Meet, with the explanation of the professor while the students, directly from their homes, each manipulated their anatomical kit (Figure 2). In addition, we observed the students’ sensitivity during discipline learning for acquiring a good theoretical and practical foundation.

As the questionnaire was optative, almost half of the students (49.17%) answered it. The results showed that the anatomical pieces remained in a good conservation state and no kit suffered from decomposition during the courses. 98.1% of the students were satisfied or very satisfied with the anatomical kit received. The great majority (91.15%) of the students considered the online classes satisfactory or very satisfactory and 96.1% stated that they had the opportunity to dissect the pieces and were capable of viewing the anatomical structures presented. At least 96.65% of the students enjoyed and recommended the use of the kits in case of online classes. Regarding the students’ grades, the students who had online classes aided by the anatomical kits had a better academic performance when compared to students who had regular presential classes (p < 0.05).

The purpose of these kits was to establish knowledge based on the ethical precepts in veterinary medicine. The acceptance of the kits was unanimous with adherence by all the students, who had the opportunity to experience the Anatomy class in its entirety, without leaving their homes. This didactic material is of wide importance in enabling the deepening of the contents presented in theoretical classes.

4 | DISCUSSION

Authors, such as Mompeo and Péres (2003) and Madeira (2008), consider anatomy to be the basis of all clinical disciplines and as well as an indispensable and effective intellectual instrument. Hence, it is an intrinsic need for all health professionals. For this reason, practical anatomical laboratories are of great scientific importance, leading to a significant evolution focusing on academics and the teaching-learning process of students (Yasser and Tolba 2009). The handling of synthetic and/or cadaveric anatomical pieces is indispensable for satisfactory teaching and deep learning of the anatomical aspects of an organism (Cury et al., 2013). Therefore, the “Animal Delivery” kit sought to meet this need while respecting the limitations of social isolation pertinent to the pandemic. It is important to emphasize the satisfactory acceptance on behalf of the veterinary medicine students when receiving the “Animal Delivery” kits, since these were prepared using odour-free and/or contaminant-free preservation techniques, as employed by Cury et al. (2013). Currently, we can count on a wide variety of techniques that help in animal tissue preservation for study, without the mischaracterization of anatomical structures (Cury et al., 2013; Karam et al., 2016; Kimura & Carvalho, 2010).

Upon using the anatomical kits at home, the students have come to realize the importance of the teaching and learning contents proposed by the subject, as these may greatly contribute to their professional training. Even though most students are in the initial semesters of a veterinary medicine course, they have already realized the importance of contextualizing and relating the content learned to the academic and professional realities, in the same way as Costa et al. (2008) and Kimura and Carvalho (2010).

Acquiring the knowledge proposed by anatomy disciplines is to understand the fundamental essence of the profession, since students in the health field are prepared to identify and know the organic functions, body dimensions, and, later, the pathologies in an objective way. When a student feels encouraged to build his knowledge with guidance and encouragement from the teacher, learning is grounded in a deeper and more lasting way.

5 | CONCLUSION REMARKS

The acceptance of the anatomical kits “Animal Delivery” was positive and with excellent learning by the students as an alternative method to study veterinary anatomy during the COVID-19 pandemic. The theory and the use of anatomical pieces worked together and complemented each other as efficient tools to facilitate the understanding and visualization of anatomical structures.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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