Original Communication

THE IMPORTANCE OF ANATOMY PRACTICE USING CADAVERS AND NEW TECHNOLOGIES IN UNDERGRADUATE BIOLOGICAL SCIENCE AND NURSING COURSES

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RESUMEN

Este estudio tuvo como objetivo abordar la importancia de la práctica de la anatomía humana, el uso de cadáveres y las nuevas tecnologías de acuerdo a las opiniones de los estudiantes. Se trata de un estudio cuantitativo, descriptivo y transversal. Los datos fueron recolectados a partir de cuestionarios aplicados en el año 2015 a 173 estudiantes matriculados en cursos de pregrado Ciencias Biológicas y de enfermería para ambos niveles de la disciplina anatomía humana en el centro de Ciencias Biológicas de la Universidad Estatal del Norte de Paraná (UENP). Los datos confirman la relevancia de las prácticas anatómicas con partes del cuerpo humano y de cadáveres para la preparación práctica y emocional de los futuros profesionales. Llegamos a la conclusión de que hay una aceptación hacia las nuevas tecnologías, aunque como un complemento al uso de cadáveres humanos.

***Palabras clave**: Anatomía humana; prácticas; enseñanza; educación en salud*

ABSTRACT

This study aimed to address the importance of human anatomy practice, the use of cadavers and new technologies according to student opinions. This is a quantitative, descriptive and cross-sectional study. Data were collected from questionnaires applied in the year 2015 to 173 students enrolled in undergraduate Biological Science and Nursing courses for both levels of the Human Anatomy discipline at the Biological Sciences Center of the State University of Northern Paraná (UENP). The data confirms the relevance of anatomical practices with human parts and corpses for the practical and emotional preparation of future professionals. We conclude that there is an acceptance toward new technologies, although as a complement to using human cadavers.

***Keywords**: Human anatomy; practices; teaching; health education*

INTRODUCTION

Education and teaching offered by public and private institutions make use of different methodologies for applying knowledge, using both traditional methods and innovative techniques. The connecting entity between traditional education and new ideas is the teacher, who is responsible for developing and transmitting knowledge, which is also a reflection of their own knowledge (Damasceno and Sabini, 2003).

Anatomy knowledge is essential at the beginning of health education, and the knowledge gained through the dissection of human cadavers is an indispensable part in the education of health professionals (Ajita and Singh, 2007).

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Throughout the history of anatomy, obtaining corpses has always been a big issue (Sehirli et al, 2004). In Europe, the corpses of criminals were used for anatomical studies. Later, they were replaced with unclaimed corpses, and for the last 50 years donated bodies have been the main source of corpses for study. These changes have been occurring since the 12th century until today (Sehirli et al, 2004). In India, the *Anatomical Act*, a State Act enacted by the Legislative Power in 1949, regulates the use of unclaimed corpses in medical and educational institutions for the purpose of anatomical dissections (Ajita and Singh, 2007). In this case, death should occur in hospital or at a public place within the zone prescribed by the medical institution, and the police must declare a period of 48 hours after death without the corpse being claimed (Subrahmanyam, 1999). The Indian government has also encouraged voluntary donations of corpses through making people aware about the importance of this action with the intention of having no shortage of corpses in medical institutions (Pampilly, 2005).

The teaching of human anatomy in higher institutions is relevant, and theoretical teaching is necessary since this is a powerful tool, however it does not replace practice. Theoretical training is the basis for students to become accustomed and adapted to studied content that will be part of their daily lives in their chosen profession. One factor that concerns educators of this course is that Anatomy is taught at the beginning of the course, a time when many students enter the institution without having a sense of what they really want, and then it is up to the teacher to mediate the pre-established information, such as the history and function of different systems (Fornazieiro et al*,* 2010).

Human anatomy is essential for the training of health professionals, as anatomical practices bring students closer to their future professional reality. Practical classes allow for an easier learning process for students (Bucarey and Álvarez, 2006).

Undergraduate students of courses such as medicine, dentistry, nursing, physical education, physical therapy, psychology, biology, nutrition and pharmacy take Anatomy in the first year and soon realize that the knowledge of anatomy is essential for the proper understanding of other disciplines in their courses, such as Physiology, Histology, Biomechanics, Biochemistry, Genetics, Microbiology, etc. Therefore, the basic curriculum of these courses requires the discipline of human anatomy, since it is a normative discipline of noted relevance.

The teaching and learning process of this subject is complex due to the large amount of concepts and structures to be assimilated by the students. Practical classes in the laboratory approach and familiarize students with the structures seen in theoretical classes, assisting in the construction of reasoning and in consolidating learning (Aversi-Ferreira et al, 2009). Studying cadavers extrapolates the knowledge of living human beings, as a whole and their parts. Most human anatomy teachers in Brazil consider practical classes with cadavers an extremely important part in the success of student learning and that they will use this knowledge in their daily professional lives (Baptista et al, 2012).

Knowledge of human anatomy is essential to the training of new professionals as they need to deeply understand the structures of the locomotor system. This knowledge is of fundamental importance for good communication between these professionals (Novak et al, 2008; Oliveira and Bertolini, 2012).

In face of difficulties, institutions have challenges in acquiring anatomical specimens due to bureaucratic aspects. The use of anatomical specimens brings theory closer to reality, since students use the practice gained in the classroom to guide their future professions, considering that practices with artificial anatomical parts will differ from the "true" reality encountered (Costa and Lins, 2012).

Thus, this study is justified to further subsidize research in the higher education sector in relation to human anatomy, with a goal to improve the applicability of practical classes and the use of human cadavers for professional training in health and biological areas.

MATERIAL AND METHODS

A quantitative, descriptive and cross-sectional approach was used in order to address the importance of human anatomy practice and the use of corpses and new technologies, according to students' opinions. Quantitative research is a suitable method to explain the issues of social reality with regard to objectivity, often involving a rigorous and controlled design (Minayo and Sanchez, 1993).

The focus of a quantitative study uses collection and analysis of items that answer the research questions and tests previously-deduced hypotheses based on the measurement of numbers and statistical analysis, establishing behavioral patterns of individuals (Hernandez et al, 2013).

Study subjects were undergraduate students of Biological Science and Nursing courses of the Northern Paraná State University (UENP). The

sample was composed of 173 students of both genders (34 men and 139 women) of all the years and graduation periods on 2015. Ages ranged between 18 and 25 years old. All the students of Biological Science and Nursing courses were invited (the number of students from both courses was 180 students), and we were able to obtain a satisfactory number of participation, with 96.11%.

A validated questionnaire was used to collect data asking the students about: if

they used corpses for studying in their practical classes; if their use was essential and if they could be replaced by computer programs, animal or synthetic material, as well as whether they should only be used for research; which were the auxiliary teaching materials they used and if their teachers were using any technology in the classroom. Regarding bioethics, there were posed questions about: if they had received any information about the importance of respect when handling a corpse; if having courage and emotional maturity was needed to handle corpses, as well as religious influence; if human anatomy lessons prepare future professionals to have emotional balance (Costa and Lins, 2012).

Data collection was performed by the researcher on the campus of UENP. Before the applying each questionnaire, the project objectives were explained and each participant was given assurance of anonymity. The students were invited by the researcher, and those who agreed to participate were taken to a room away from noise and distraction that could interfere with their responses. After thorough reading of the free and informed consent form, the details, reasons and objectives of the research were explained.

Tables were used to present the results, and categorical variables were expressed in absolute numbers and percentages. The research meets the Brazilian CNS Resolution No. 466/12, which governs research involving human beings, and all the participants signed a clear and informed consent form. The project was approved by the Research Ethics Committee via Platform Brazil, under approval number 45401115.2.0000.0108.

RESULTS

The results refer to the questionnaires answered by 173 undergraduate students of Biological Science and Nursing courses of the State University of Northern Paraná (UENP) in 2015. Of the total of 173 students, 84 belonged to the Biological Science course and 89 belonged to the Nursing course.

According to the analyzed questionnaires, all students (n=173, 100%) took Anatomy classes during their course. This number would probably be the same if this study was carried out at other universities, as this discipline is mandatory in undergraduate health courses in the in Brazil. The quality of human anatomy classes was also questioned, and the majority of students considered the classes as great and good, as shown in Table 1.

Classification	Course					
	Biology		Nursing		Total of students	
	Quantity	%	Quantity	%	Quantity	%
Great	28	33.33	26	29.21	54	31.21
Good	42	50	46	51.69	88	50.88
Regular	12	14.29	15	16.85	27	15.6
Bad or very bad	2	2.38	2	2.25	4	2.31
Total	**84**	**100**	**89**	**100**	***173***	***100***

Table 1 - Distribution of the quality of human anatomy lessons, according to the students of the Nursing and Biological Science courses.

All the students of Biological Science (n = 84) and Nursing (n = 89) courses had classes with human parts and/or cadavers during their under graduation. When asked about the feeling that the human anatomy class transmits, most of the students believed to it be fundamental; however, 12.36% of nursing students thought it to be indifferent, as shown in Table 2.

Classification	Course					
	Biology		Nursing		Total # of students	
	Quantity	%	Quantity	%	Quantity	%
Excellent	32	38.10	14	15.73	46	26.59
Indifferent	5	5.95	11	12.36	16	9.25
Essential	47	55.95	64	71.91	111	64.16
Total	**84**	**100**	**89**	**100**	**173**	**100**

Table 2 - Distribution concerning the feeling that the lessons of human anatomy convey

When asked if these classes could be replaced by other teaching tools instead of human parts, most of those surveyed believed them to be irreplaceable, as represented by the data shown in Table 3.

Classification	Course					
	Biology		Nursing		Total # of students	
	Quantity	%	Quantity	%	Quantity	%
Artificial parts/specimens	13	15.48	3	3.37	16	9.25
Computer	0	0	0	0	0	0
Animals	1	1.19	1	1.12	2	1.16
Irreplaceable	70	83.33	85	95.51	155	89.59
Total	**84**	**100**	**89**	**100**	**173**	**100**

Table 3 - Distribution regarding replacing the use of human parts/specimens/corpses by other methods of teaching Human Anatomy.

DISCUSSION

All of the students interviewed had practical lessons in human anatomy, and most students believe that this subject/discipline is important and relevant in preparing emotional balance for the area to be followed; this data is also confirmed by Costa and Lins (2012), where the use of corpses proved to be essential for lessons. According to Aversi-Ferreira et al (2010), the use of corpses in human anatomy is an important tool for training/education in teaching methodology that encourages critical and investigative thought; on the other hand, Piazza and Reppold Filho (2011) indicate that the use of different materials are additional resources for teachers, making education interactive and viable. Educational materials are used as aids, contributing to the understanding of the proper functioning of the body organs and construction of knowledge (Bucarey and Álvarez, 2006).

When asked about their feelings that the classes were inspiring, most students of both Biological Science and Nursing courses believed these classes to be crucial, as they relate to the importance of preparing and handling anatomical parts for their training. An important reflection made by Costa and Lins (2012) is that emotional maturity is essential in order to adopt an appropriate posture in front of a corpse, and they also stated that in order to follow a career in the health sciences, an individual must necessarily have the courage to see a corpse and to manipulate it; although this reflection was not further explored in this study.

According to Fornazieiro et al (2010), substituting artificial parts with computers or animals does not exempt anatomical practices with human parts

and corpses, as they are essential in several aspects such as development of skills and experiences to improve the training of health professionals.

Prior to contact with practical activities, respectful guidelines for handling and using corpses or human anatomical parts are relevant to be introduced, considering they are not a simple study topic and involve cultural, religious and historical background issues among the students, thus also being an issue of awareness (Ronqui et al, 2009).

Still considering a philosophical aspect of education, the teaching method and educational technique should be continued to be reflected upon and learning arise that are acquired; not just concepts, but also procedures, values and attitudes to be developed and transmitted (Coll, 1989).

Teaching and education enable means for developing skills and technical procedures, and redesign concepts which have already been acquired, with the purpose of further reflections (Damasceno and Sabini, 2003).

Education and teaching offered by public and private institutions make use of different methodologies for the application of knowledge, either by using traditional methods or educational innovation (Damasceno and Sabini, 2003). It is believed that successful educators reflect and think about their actions in the classroom, but favorable conditions are necessary for a better use of these methodologies in order to achieve satisfactory teaching, learning and education.

Teachers, in addition to being the connecting link between traditional education and new ideas to be developed, are also a reflection of their own knowledge. They are responsible for the transmission, production and investigation of knowledge; they are the ones who shape it and give meaning to it from being in contact with students.

Theoretical teaching is relevant in teaching human anatomy since this is a powerful tool in teaching, however it does not replace actual practice. Theoretical training is the basis for the student to get accustomed and adapt to the content. One factor that concerns educators is that this subject (Anatomy) is taught at the beginning of the course, a time when many students enter the institution without having a sense of what they really want, and so it is up to the teacher to mediate the pre-established information, such as the history and function of different systems.

According to Fornazieiro et al (2010), human anatomy is essential to the training of health professionals. Some of the respondents advocate the use of expository classes as the most coherent teaching technique, while others favor group discussions and meetings. Conversely, others argue self-learning as the best technique, or self-study through books or materials provided by information technologies.

The use of anatomical practices brings the student closer to their future professional reality. According to Bucarey and Alvarez (2006), students learn the shape and location of the anatomical structures. However, some freshmen students entering higher education are repulsed by the practice, but being indispensable to gradually link them to teaching techniques so that the students develop skills. This repulsion was also noted in the present study, but with low incidence.

From the bioethical standpoint, human corpses should not be seen simply as an object of study. The issue of death is present from the beginning of medical education and other professions in health, being undeniable that the advancement of medicine gives thanks to the possibility of teaching and ethical research on corpses (Cohen and Gobbetti, 2003). However, several distinct opinions can be found, such as the advantages of using cadaver parts/specimens in teaching human anatomy. Some point to visual disgust and the strong odor of formaldehyde as negative aspects for using cadavers in teaching (Costa and Lins, 2012). Others argue that the absence of corpses for studying compromises the learning of students of all health care courses (Kruse, 2004).

According to Lunetta (1991), the use of anatomical practices facilitates the process of student learning, enabling better development toward scientific concepts and research, as well as in solving problems. Moreover, practical lessons serve to support the teacher in addition to revisiting theoretical content in its own practice, enabling students to expand their knowledge and reflect on problems (Leite et al, 2008). In practical classes, students face unanticipated outcomes, they learn to interact with their own doubts, to exercise skills such as cooperation, concentration, organization and handling equipment. From theoretical classes, students continue to practical lessons where artificial and human resources are used for demonstration.

We emphasize that researchers and institutions face difficulties in acquiring anatomical parts/ specimens in Brazil, as there are many bureaucratic and ethical issues to overcome. The use of anatomical parts/specimens brings theory closer to reality as students use the practice gained in the classroom to guide their future professions (Costa and Lins, 2012). Perhaps this crucial reality helps to avoid the total failure of

teaching anatomy. In many educational institutions, there is a replacement of human anatomical parts/specimens for artificial parts/specimens which are more easily obtained. This minor manipulation of the material inspires a lack of interest by the student, since the knowledge of the texture of body tissues by touching is crucial.

It is reported that the use of computer programs and artificial anatomical parts/specimens is poorly accepted by students; however they do not condemn their use since they consider them as important support material.

Human anatomical parts/specimens are similar to the reality found in the "living" human body, in contrast to artificial and computer parts/ specimens which represent cold teaching technique that distance the student from humanization and consequent emotional balance (Bucarey and Álvarez, 2004).

In this study, it was found that all the students had Anatomy classes during their undergraduate training, and a significant percentage considered the use of corpses irreplaceable for learning. There is acceptance towards new technologies, however as a complement to the use of human corpses.

This study made it possible to understand the importance of human anatomy practice through the use of human cadavers and new technologies from the opinions of undergraduate students of Biological Science and Nursing courses. This research highlights the need for further studies focusing on this theme of using corpses in order to confirm, expand and compare the results obtained in this study.

Conflict of Interest
None

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Ethical Approval
This study was approved by the Brazilian Platform with protocol number 45401115.2.0000. 0108.

Informed Consent
The standard informed consent forms were collected from participants prior to the study.

Author Contributions
H.C.S: Participation in the study design, questionnaire, data analysis and writing of the manuscript. J.L.T.N and D.S.B: Participation in the study design, questionnaire, data analysis, manuscript writing and reviewing the final text.

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