

# Are Corpses the Best Method for Practical Anatomy Assessment, According to Health Course Students?

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## Abstract

The aim of this study was to evaluate the student's conception in reference to the teaching materials used for the practical assessment of the discipline of Human Anatomy. The study was quantitative and qualitative, exploratory and descriptive. The materials were industrialized synthetic anatomical models, models made of inexpensive material by students, human cadaveric material, photocopied images and software. The study included 97 students, who after analysis indicated cadaveric materials (35%) as the best educational tool to be applied for the practical assessments of Anatomy. The photocopied images (3%) were the material with which the students presented greater difficulty. The content analysis of the discursive questions showed 5 factors in learning Human Anatomy: little time per table; difficulty in identifying, locating and memorization of anatomical structures; the quality of material used; comparing these materials; and cadaveric material. The study proved to be relevant for the evolution of teaching quality, in addition to the cadaveric material as the best tool to be used in practical assessments of Human Anatomy. We suggest the use of this material the more frequent, in laboratories that have the same materials as analyzed here, because the corpse can never be substituted in teaching and learning of Anatomy.

## Keywords

- ▶ gross anatomy education
- ▶ software
- ▶ photocopied images
- ▶ anatomical structures manufacture
- ▶ corpses prosected.

## Introduction

Anatomy analyzes biological structures and the morphology of different organisms (both in macro and microscopic terms) as well as the function and organization of the

structures present in the body as a whole or in its particularities.<sup>1</sup> Learning is a multimodal process, which obtains satisfactory results confronted with diverse types of materials and methods, making the classes more dynamic and interesting to the students.<sup>2</sup> However, the scarcity of didactic

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resources and the bureaucracy in acquiring them affects the quality of student learning.<sup>3</sup>

In addition to theoretical knowledge, practical study complements the contents studied at the classroom, allowing more dynamic anatomical study and correlated with the profession. One of the main factors that hinder the learning of practical content in laboratories is the discrepancy between the number of students and pieces of quality.<sup>4</sup>

Institutions and professors invest in developing innovative teaching methods to adapt discomfort regarding to the study of Human Anatomy. At the same time the aim is to create innovative alternative and skills of those that invest training creative and critical professionals in the health and science sector.<sup>5,6</sup>

In the current situation, the technological dominance in anatomical study simplifies the learning of contents that need visual acuity.<sup>2</sup> Thus, it is necessary to train the professor,<sup>7</sup> to elaborate pedagogical techniques that facilitate and support the transition between the virtual application to the reality of anatomical knowledge,<sup>8</sup> resulting in successful learning.<sup>2</sup>

Bureaucratic difficulties to obtain quality material, especially the cadaveric material,<sup>9</sup> and the reality of worn materials, the photocopy of atlas, demonstrates practicality by providing visual and nominal information on the various structures of the human body in a simplified way.<sup>10</sup> Another material that can be employed in those circumstances is the industrialized synthetic material, available for anatomy laboratories, but with inadequate size or morphology, thus preventing a more detailed view of the necessary structures of the learning process.<sup>11</sup>

Careful observation is important to teaching Human Anatomy,<sup>6</sup> thus the modeling technique proposes to transcribe the cadaveric pieces as a way of topographic memorizing, the structures if they improve the student's interaction with the discipline.<sup>12-14</sup>

However the use of cadaveric resources is essential for to training health sciences professionals, making it the effector more humanized actions, although some students state this kind of material brings visual repulsion, inducing nightmares and unpleasant odor of the solution with formaldehyde, blocks the learning process.<sup>15</sup> Nevertheless, most of the students are aware that studying Anatomy with the help of the corpse and enhance their degree knowledge of morphology in all its particularities.<sup>16</sup>

Certain setbacks faced by the students against the didactic resources in the practical classes of the human morphology is perceptible. The evaluation of materials, and its conditions, by the students will contribute to the focus of the professors much more effective teaching strategies that contribute to the learning process. In this context, the aim of this study was to analyze the perceptions of students regarding the efficiency of teaching resources, alternative and classic, in the applicability of practical assessment of the discipline of Human Anatomy.

## Methodology

Both exploratory-descriptive, quantitative and qualitative. It has been developed at the Laboratory of Human Anatomy at

the Petrolina campus at the Human Anatomy – University of Pernambuco (UPE). The participants were students of Physiotherapy, Nursing, Nutrition and Undergraduate in Biological Sciences, enrolled during of the semester of 2016. All participants have signed an Informed Term of Consent.

Eligibility criteria included volunteers of both sexes who had already been approved at the the discipline of Human Anatomy or who were enrolled in that discipline at the time of the data collection. And those who did not meet the criteria for participation in the research, were excluded.

The study was developed through a knowledge gymkhana. The material used were industrialized synthetic anatomical models, manufacture models of low cost materials by students, prosected corpses, photocopied images and software. All of the above resources belong the Petrolina laboratory of Humana Anatomy, UPE.

The recruitment of volunteers was made through invitation, resulting in the participation of 97 volunteers. The study was divided into two stages: the first one, corresponding to the practical part of the study, the practical assessment; and the second, related to critical-reflexive perception which it was made to answer the guiding questions.

The collection of data was performed between April and May 2016, at times and days agreed between the researchers and the participants, at the Human Anatomy Laboratory of the institution. Before the collect period, the didactic material used in the gymkhana was randomly chosen, although respecting general patterns for identification.

Ten tables were arranged in two rows with 5 tables, listed in ascending order from 1 to 5. The materials used in this study were arranged as follows: ► **Table 1** - computers with software (Anatomica | Goodwill Enterprise Development, LTD.), with three-dimensional images of anatomical structures; ► **Table 2** - photocopied images of atlas of Human Anatomy; ► **Table 3** - anatomical structures manufacture by the students themselves during practical classes of the referent curricular component; ► **Table 4** - industrialized synthetic parts of the laboratory collection; and finally table 5 - corpses prosected.

Participants received an answer sheet (► **Fig. 1**) before entering the laboratory in pairs. The stipulated time for the resolution of each table by the researchers was two minutes, allowing the participants to identify the nomenclature of the four anatomical structures present in each table.

The second stage of the study began after the contest. Participants were directed to an anteroom to the laboratory so that they could answer the discursive questions of the answering sheet. After collecting the end data, the researchers began to analyze the answers. The quantitative findings

**Table 1** Categories associated with the score obtained, after data collection

Punctuation	Concept	Score
1 - 5	Unsatisfactory	1
6 - 10	Average	2
11 - 15	Satisfactory	3
16 - 20	Excellent	4

**Table 2** Results of the feedback from participants showing the best method

Workbench	Used material	N	%	Standard-deviation
1	Software	27	28	9.3 ± 0.2
2	Photocopy	3	3	9.0 ± 0.6
3	Manufactured model	15	15	9.0 ± 0.2
4	Industrialized model	18	19	8.81 ± 0.2
5	Prosected corpses	34	35	9.0 ± 0.1

**Table 3** Feedback from participants for the worst material

Workbench	Used material	N	%	Standard-deviation
1	Software	12	12	4.4 ± 0.6
2	Photocopy	43	44	4.3 ± 0.3
3	Manufactured model	19	20	5.8 ± 0.3
4	Industrialized model	6	6	6.3 ± 0.5
5	Prosected corpses	17	18	6.2 ± 0.3

**Table 4** Individual result participants after the gymkhana

Correct answers	N	%	Result	Category
1 to 5	1	1	Mark 1	Unsatisfactory
6 to 10	9	10	Mark 2	Median
11 to 15	44	45	Mark 3	Satisfactory
16 to 20	43	44	Mark 4	Excellent

were categorized by the researchers, so that each item corresponded to 1 point, which added up, to obtain a maximum of 20 points, associated to a specific categorization, as shown in ► **Table 1**.

The qualitative analysis was performed through the method proposed by Minayo,<sup>17</sup> whose analysis starts with the search for the meanings, manifest and latent of the material collected by all the speeches of those involved in the research. Three steps have to be followed. In the first, the data were organized with the transcription of the answers obtained through the guiding questions, followed by double-cross reading the material, organizing it into categories; then the data were ordered, performing strenuous and repeated reading of the texts, with the detection of sense nuclei. The final analysis was made by means of triangulation with the theoretical reference and the material collected.

Quantitative data were processed and analyzed using the SPSS program (SPSS Inc., Chicago, IL, United States of Amer-

ica, Release 15, 2008). Initially, the data was entered through double typing, consolidated and validated. The categorical data was presented in absolute and relative frequencies, as well as the mean and the standard deviation.

All participants signed the Informed Consent and Informed Term, in line with the Resolution 466/2012 of the National Health Council, which values the confidentiality of the participants. The present study was approved by the Ethics and Research Committee of Human Research from University of Pernambuco after registration CAAE: 51066115.1.0000.5207.

## Results

The study included 97 volunteer students, 30 from the Biological Sciences course, 51 from the Physiotherapy course, 02 from the Nursing course and 14 from the Nutrition course. The sociodemographic characteristics of the volunteers showed that the mean age of the participants was 21.9 (±3.5) with female prevalence in the health courses.

► **Table 2** lists the relative and absolute frequency, as well as the mean and standard deviation according to the feedback from participants, regarding the best method applied in the practical assessments of Human Anatomy. The highest percentage representation was obtained by the cadaveric material, followed by the software method, synthetic and manufacture models. While the lower representativity was observed with the photocopies method.

► **Graph 1** shows the heterogeneity of the punctuation given to the materials used in each workbench, for which in the individual opinion of each participant, the cadaveric material was the best method applied in the gymkhana. The axis of ordinates presents the score attributed to the best method applied in the gymkhana, the latter being represented in the axis of abscissae.

In a first aspect it was possible to observe the absence of an outlier, and deeper perceives a equidistant mean score for 3 of the 5 methods (photocopy, manufacture models and cadaveric pieces), and a mean with similar value maximum score attributed to the two remaining methods (software and industrialized synthetic models).

► **Table 3** shows the frequency and meaning value of the participants' understanding of the type of material in which they reflected the greatest difficulty during the study, therein it portrays the real situation on the practical assessments of the discipline. The photocopied material anatomical atlas brought greater difficulty of interpretation on behalf of the participants.

► **Graph 2** presents the variations of the punctuation attributed to each table referring to the difficulties with identification and interpretation of anatomical structures. Thus, there is association between question 5 ("What punctuation would you give to the workbench where you had the most difficulty?") and question 4 ("In your opinion, what was the worst method in terms of difficulty? Identify the workbench number.") on the answer sheet.

Like the previous graph, it can be seen the absence of outliers and mean score variation compared between each method of the gymkhana. The software and the photocopy

**A N S W E R S H E E T**

**Age:** \_\_\_\_\_ **Sex:** \_\_\_\_\_ **Course:** \_\_\_\_\_

1) Identify the structures marked on the pieces on the workbench.

**Workbench 1)**

a) \_\_\_\_\_  
b) \_\_\_\_\_

c) \_\_\_\_\_  
d) \_\_\_\_\_

**Workbench 2)**

a) \_\_\_\_\_  
b) \_\_\_\_\_

c) \_\_\_\_\_  
d) \_\_\_\_\_

**Workbench 3)**

a) \_\_\_\_\_  
b) \_\_\_\_\_

c) \_\_\_\_\_  
d) \_\_\_\_\_

**Workbench 4)**

a) \_\_\_\_\_  
b) \_\_\_\_\_

c) \_\_\_\_\_  
d) \_\_\_\_\_

**Workbench 5)**

a) \_\_\_\_\_  
b) \_\_\_\_\_

c) \_\_\_\_\_  
d) \_\_\_\_\_

2) In your opinion, what was the best method applied? Identify the workbench number.

\_\_\_\_\_

3) What a method would you rate the best one applied? (Punctuation: 1 -10)

\_\_\_\_\_

4) In your opinion, what was method you found most difficult? Identify the workbench number.

\_\_\_\_\_

5) What punctuation would you give to the workbench where you had the most difficulty? (Punctuation: 1 -10)

\_\_\_\_\_

6) List workbench in ascending order by facility to 5 methods applied.

1 - \_\_\_\_\_  
2 - \_\_\_\_\_  
3 - \_\_\_\_\_  
4 - \_\_\_\_\_  
5 - \_\_\_\_\_

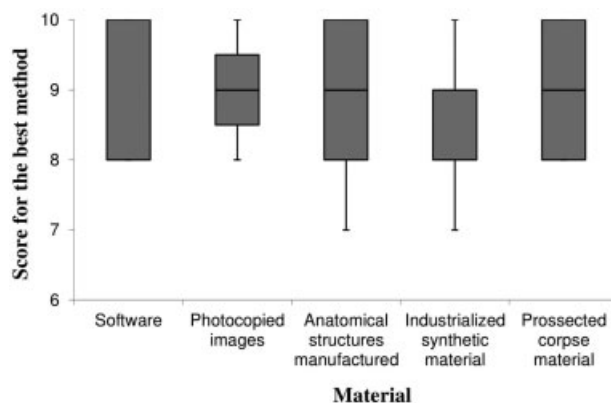
7) What difficulty do you find in the practical assessment of Human Anatomy, when applied by the professor of the discipline, in relation to the materials used in its elaboration? Why?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

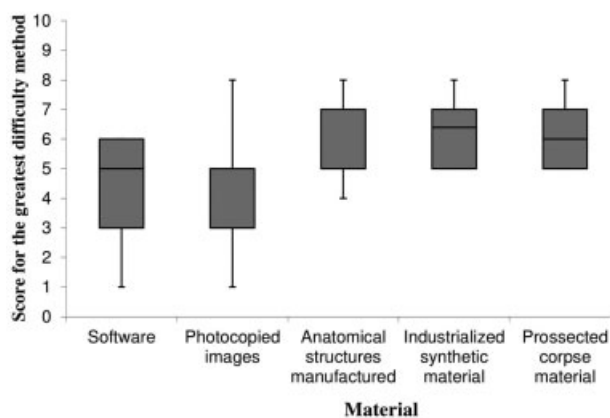
8) In your opinion, do you agree with the use of corpses and prosected pieces? Why?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

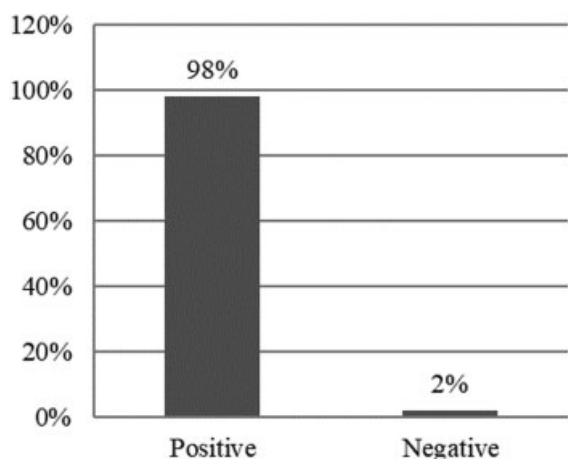
**Fig. 1** Answer sheet received by participants for answering the questions of gymkhana into the human anatomy laboratory. The duration in each table was two minute.



**Graph 1** Heterogeneity of the punctuation given to the each materials for participants.



**Graph 2** Heterogeneity Greatest difficulty method according participants.



**Graph 3** Importance and acceptance using of cadaveric pieces during classes and assessment for the professors of the human anatomy discipline.

method showed the same mean, however the score attributed to photocopy coincides with the highest one, 5. The manufactured model method presented a mean value consistent with the minimum score, 5. The others methods had a mean score with apparent non-normal deviation of the opinions.

► **Table 4** shows the categorization of the correct answers offered by the researchers, with scores interpretation at the first stage of the study.

In the analysis of the results expressed above, most of the volunteers reached high classificatory concepts. 89% of the participants reached 11 to 20 correct answers, being assigned to scores 3 and 4, with the classifications of satisfactory and excellent. A clear interpretation is allowed on how much didactic information the volunteers learn from the discipline of Human Anatomy.

The efficiency of the methods for practical assessment are consistence with the acquisition of knowledge on behalf of the student about the disciplines of Human Anatomy in the health courses.

The discursive questions allowed the researchers to identify important categories for data analysis. Thus, guiding questions were used: “What difficulty do you find in the practical assessment of Human Anatomy, when applied by the professor of the discipline, in relation to the materials used in its elaboration? Why?” and “In your opinion, do you agree with the use of corpses and prosected pieces? Why?.”

After the qualitative analysis, the researchers identified the categories: short time; difficulty, localization and memorization anatomical structures; cadaveric material quality; and comparison between materials. When the participants were asked about the importance of the use of cadaveric pieces and their continuation, their acceptance for the practical teaching of Human Anatomy was notorious, their continuous use in classes and assessments and practical tutorials, as shown in ► **Graph 3**.

## Discussion

The pedagogical strategy in higher education is associated with the teaching-learning process, and as essential what is taught as what is learned.<sup>18</sup> Based on this perception, there are gaps in knowledge left throughout the student’s academic development, for multifactorial reasons, which limits the performance of this student, the adherence to new knowledge.<sup>18</sup>

Adopting alternative techniques and materials for Human Anatomy education process is a measure taken to the evident discrepancy between the demand of students and the supply of quality didactic-practical materials available in the institutions.<sup>19</sup> Thus, professors should look for pedagogical tendencies in a concise and convincing way that reflect learning,<sup>5</sup> such as manufactured anatomical models, cadaveric and prosthetic pieces, photocopies, industrialized synthetic models and conscious of the evolutionary framework of technology, to insert virtual reality and high-tech, software, video-lessons, social networks, as feasible possibilities to the pedagogical practice in education and teaching of Human Anatomy.<sup>2,5</sup>

In respect to the analysis of the comparison between the methods studied here, the participants reported that the photocopied images showed less efficiency in the teaching and learning process of Human Anatomy. It is known to the scientific areas that photography cadaveric material is not

allowed for bioethical reasons.<sup>15</sup> Therefore, images provided by atlases and textbooks are used as didactic support. However, the acquisition of this type of bibliography becomes inaccessible to many undergraduate students, either because of its high cost or because of the low number of copies available in libraries, which often do not meet the high demand of students.<sup>20</sup>

The use of photocopied images, evaluated in the present study, is the most common practice among higher education students. Copying images of atlases and textbooks, present in the collection of the university's library or laboratory, allows them access in a more accessible, non-profit manner.<sup>21</sup>

The modeling technique is equivalent to assimilating one piece to another, using artistic materials such as modeling mass and biscuit.<sup>14</sup> The three-dimensional anatomical models manufactured by students themselves, with low cost materials,<sup>12,13</sup> transcribe the cadaveric material.

The models used in the present study were produced by students. However they did not present as a promising option for the practical assessments of Anatomy, obtaining considerable rejection by the participating students. This result, corroborated by Collipal Larre and Silva Mella's study,<sup>22</sup> the use of these models, for the practical anatomical study, results in an easy, unreal, artificial and invariable teaching. However Falcão et al. study,<sup>23</sup> unlike the above study and the results obtained, they observed that construction of similar structures is possible for cadaveric. In addition, the material obtained a good acceptance by students in practical classes and in schools and colleges visits.

The use of cadaveric material in teaching Human Anatomy obtained a significant score, in terms of acceptance by the participating students. The data of the authors of the present study corroborate Costa, Costa and Lins' study<sup>15</sup> who stated that the use of corpses, even just for demonstration of anatomical structures is considered indispensable for to the teaching-learning process of the human anatomical studies. Satisfaction, from the use of the corpse in teaching Anatomy, is due to the contribution of better technical formation of health professionals. It permits knowledge of the anatomical variations. It contributes for humanistic training of future health professionals; and it promotes advances and innovation in surgical techniques.<sup>15,24</sup>

As pointed out by Souza et al. study,<sup>16</sup> the use of corpses in the process of building basic knowledge for undergraduate, postgraduate, and other levels of knowledge is essential. However, there is a positive consensus with regard to the use of new technologies, as a means of complementing the knowledge acquired with the use of corpses.

The use of software, the more functionality the material offers, more attractive and stimulating it becomes for the student.<sup>5</sup> In the present study, it was possible to perceive the great potential of the software that was considered as the second best method in the opinion of the participants of the study (28%).

With technological advances in education, innovative alternatives have emerged in teaching and learning Human Anatomy, facilitating offering playful visualization of anatomical structures.<sup>25</sup> According to Souza et al. study<sup>16</sup> and

Collipal Larre and Silva Mella,<sup>22</sup> the students' perceptions for this updated study are efficient and do not put aside traditional methods of teaching practice, continuing to report that they consider the use of corpses as relevant.

Anatomists have commercially developed software programs in education that include computerized 3D interactive models of human body structures.<sup>26</sup> Three-dimensional modeling is the process of obtaining anatomical models from measurements of a real object in three dimensions (length, width and height), allowing to produce a computerized graph of the desired structure.<sup>27</sup> 3D interactive virtual model exhibits that can be handled efficiently, showing the studied structures, layer by layer.<sup>28,29</sup> Thus, students have already begun to realize that the use of this technology in virtual dissection may aid in anatomical study, in the absence of cadaveric material.<sup>8,29,30</sup>

In accordance with aforementioned authors, the software in the present study was presented as a method accepted by the students, and another alternative in the teaching-learning process of Human Anatomy.

Analyzing the means values of data, the industrialized synthetic material was well accepted by the participants (19%). They become they become dynamic, close to reality, providing specific and detailed characteristics as observed by Portugal et al.,<sup>31</sup> when they compared synthetic models with cadaveric female pelvis, proving to be an effective tool for the study.

Thus, it is necessary to validate how didactic alternative models support the visual construction of the structure, but does not replace the morphology of the corpse. On the other hand, attention is paid to the richness of details and interest for their similarity in the organization, as in the human body.<sup>32</sup>

The qualitative analysis of the present study obtained five categories that allowed the identification of items that provide better learning of Human Anatomy, as can be seen in **Graph 4**.

### Shortage of Time

The practical assessment of Human Anatomy is considered by the students as an unpleasant evaluative method.<sup>33</sup> The inclusion of the discipline in the first year of higher education, associated with the great amount of information and complexity treated of the discipline, gives visibility to the students' inexperience in academic activities and specific anatomical nomenclatures. According Santos et al.,<sup>33</sup> the shortage of time compromises the final result of the students.

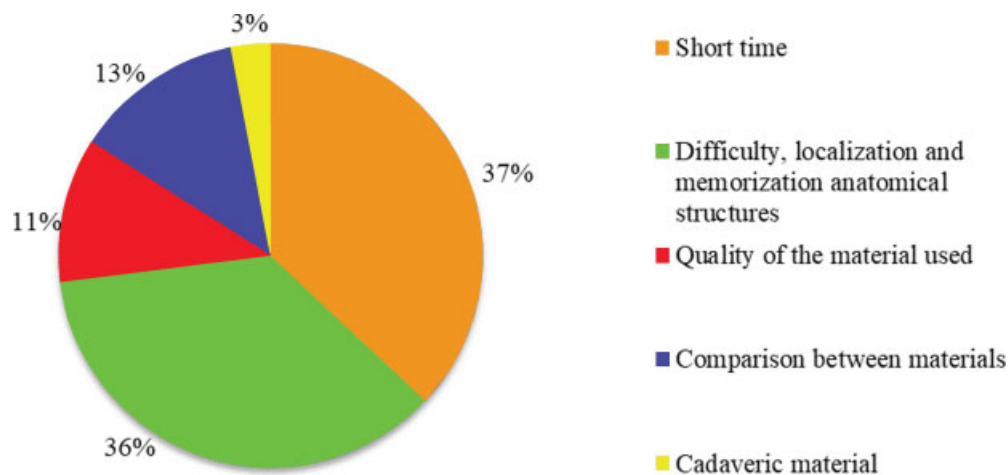
The participants were asked to describe the difficulties they faced during the practical classes of Human Anatomy, the report on reduced time presents as the greatest obstacle to learning:

The time for each table is very reduced, this implies the nervousness. (A3)

Too short time for hard and meticulous assessment. (A30)

The time, some structures that we seek to identify and are not readily apparent. (B3)

The evaluation as assessment need to be performed in a quiet atmosphere, allowing students' knowledge to flow



**Graph 4** Qualitative analysis has showed five categories that provide a better learning to the discipline.

naturally, without neuroses or anxiety states, that block their performance.<sup>12,33</sup>

The Santos et al. study,<sup>33</sup> demonstrates the meaning of the evaluation, according to the student, in assessment with microscopy slides showing the significance that the evaluation represents and its necessity. However, the way it is done - several possibilities of answers, processed in a short period of time - leads the students to a high level of stress.<sup>34</sup>

In respect to the psychological state of the student, De Azambuja Montes and Vieira de Souza<sup>35</sup> presented some difficulties encountered by the students of Human Anatomy, amongst which: the programmatic content of the discipline, that is usually quite extensive and is not always appropriate to the course objectives; The lack of have didactic material (cadaveric and/or synthetic pieces) and, most of the time, insufficient for the number of students; the emotional reaction of the students to the contact with the study material (corpse); and the current evaluation pattern makes the student's resourcefulness difficult. Like a way of solving this disorder to the students, these same authors cite the more active action of the student, who it is the actor of his own learning, creating a pedagogical interaction with the professor and the contents of the discipline.

The use of alternative methods in teaching Human Anatomy facilitates learning, increases the amount of information and develops the artistic abilities of the students, as in the case of manufactured anatomical models.<sup>12</sup> Therefore, it is highly important to implement innovative models that lead to a higher level of anatomical knowledge apprehension.<sup>5,12</sup>

#### **Difficulty, Localization and Memorization of Anatomical Structures**

In the present study, the students' difficulties were verified in the regarding to questioning. According De Azambuja Montes and Vieira de Souza<sup>36</sup> and Falcão et al.<sup>23</sup> teaching Human Anatomy presents challenges due to the complexity of the terminology and the difficulty in visualizing structures, which hinders their understanding for most of the students, as mentioned in the students' report, quoted below:

Visualization of structures. (B23, B24, B30)

Memorization of anatomical terms and some structures visualization. (B27)

Difficulty in identifying structures because they are not easy to visualize. (B28)

Difficulty in remembering the names of some anatomical structures and locating accidents. (A11)

Memorizing information leaves the students submissive in this performance of the assessment. They don't considered knowledge a something important for the construction of their future in the desired profession. Thus, the evaluation of learning is not really meaningful for the student, who is not attentive in learning what was passed in class, but rather in memorizing names and functions, just to answer questions of proof.<sup>37</sup> In this sense, the students erroneously report that Anatomy is a discipline that they only read. They don't read to understand the contents, principally when involving a detailed knowledge with a descriptive approach. This fact hinders the good anatomical learning process.<sup>4</sup>

The location of anatomical structures and their comprehension are the second major problem encountered in the performance of practical assessments. The teaching-learning process related to the morphological aspects provides an intricate way, since the memorization of such structures becomes an inflexible and discouraging task for a good part of the students,<sup>3,38</sup> as corroborated with the reports of the participants of this study.

In this category, it is important to emphasize that it is incumbent upon teachers to seek innovative didactics to arise the interest and attention of academics, presenting positive results in learning the discipline.<sup>12</sup> However, the creation of new alternatives for teaching Human Anatomy are extremely necessary, especially methodologies that place the student as an active subject.<sup>38</sup>

#### **Quality of the Material**

In anatomical studies, the essential condition in which the anatomical pieces are found is indispensable: adequate dimensions and good conditions with respect to quality for all to have

access, without difficulty of understanding or interpretation,<sup>39</sup> this is patent from the participants' report below.

The greatest difficulty is related to identifying what the professor really wants [...] color confusion. (C36)  
The cadaveric material is generally deteriorated. (C4)

Pre-existing bodies are not conditioned and adequately handled by universities, resulting in the degradation of the material with consequent difficult to visualize the anatomical structures.<sup>40</sup>

In some worn-out corpse parts, it is often difficult to identify the structure. The same happens with the synthetic parts. (C8)

The indication of the structures in the cadaveric piece, because often the state in which the corpse is found difficult to view and identify. (C26)

The corpses parts in bad condition, which makes it difficult to visualize the structures. (C7)

A viable and low maintenance cost alternative is the creation of anatomical models by students,<sup>12</sup> which can be sustained for long periods.<sup>41</sup> Although these have not been approached as one of the best methods, several studies point to it as a facilitator in the process of learning Human Anatomy, evaluation and good performance in future professional activities.<sup>11,12,31</sup>

### Comparison between Materials

The use of alternative resources to learning of Human Anatomy is showing efficiency. Numerous pedagogical techniques have been indicated, integrating teaching to the current reality.<sup>42,43</sup>

The resulting information, according to the opinion of the participants, was not directly related to the methods, but the confrontation between the materials used in the practical assessment proves are the best method to learn:

The difference between a model piece and the reality can bring doubts to students. (C11)

The study in PVC pieces or materials manufactured by students makes it difficult to learn because it does not have much resemblance to cadaveric parts (in many cases). The use of very old cadaveric material parts also makes learning difficult. (C35)

The use of synthetic parts alone makes it difficult to identify structures and memorize anatomical terms. (B58)

Some pieces are not reliable. (A76)

As a consequence of the scarcity and inadequate preparation of cadaveric material, the inclusion of new methods is seen as a new way for teaching Human Anatomy, including the insertion of technology.<sup>38</sup> However, the receptivity of the methods is not unanimous to all participants. Many of them emphasize that alternative materials are important, and good methods, but they do not substitute prosected cadaveric material.

Disagreeing with the authors above, Falcão et al.,<sup>23</sup> and Przybysz and Scolin<sup>14</sup> report that the manufactured material, for the most students, does not contribute effectively to the anatomical understanding, as expected. As the synthetic

models results, they do not match the Portugal study,<sup>31</sup> in which the method fits with didactic potential, to allow the best anatomical teaching and learning.

Corroborating the study of images, manufactured and synthetic models try to reproduce the corpses' parts, but it is the point of view of the modeler or photographer who will be represented in the piece or image (photo), which may be a factor that subsequently complicate adherence to knowledge.<sup>3,44</sup>

### Cadaveric Material

The use of dissected human bodies represents the oldest form and one of the most used today to teach Human Anatomy through dissection procedures.<sup>12,15</sup> The study of certain anatomical contents is difficult to understand due to the complexity of the structures submerged to the overlapping of anatomical elements.<sup>31</sup>

The difference between the atlases, the books and the pieces used, especially cadaveric. Because they are reliable generally. (C14)

The material used, cadaveric parts, are often difficult to visualize. It depends on the state and form presented to us. (C15)

Identify the structures in the practical classes. (B14)

I believe that the corpses parts still make it very difficult to visualize, it is difficult to perceive some structures, because they suffer alterations in coloration due to the products that use for their preservation. (A20)

The use of cadaveric material in the teaching-learning process of Human Anatomy is a unique and indispensable activity,<sup>12,16,23</sup> because it allows understanding the shape, location and relations of the different parts between organs and structures that make up the human body.<sup>3,9,22</sup>

Cadaveric material continues to be considered indispensable to study Human Anatomy, providing skills and competences the students from health courses, as well as the humanistic side of the professional future.<sup>15</sup>

According to Oliveira et al.<sup>45</sup> to allow the study of cadaveric parts, for a longer period autolysis, it is necessary to use fixation and preservation methods, such as formaldehyde. Karam study<sup>46</sup> formalization, a low cost technique based on the application of formaldehyde, is the main form of preservation and fixation of corpses, and anatomical pieces, used up to present days. However, the same authors point out several harmful factors associated with the application of this solution to the cadaver body, such as darkening, gaining weight and stiffness of the soft parts of material, besides presenting strong and unpleasant odor.

This chemical solution causes adverse reactions to those that manipulate it, such as mucosal irritation, burning, irritation in the eyes and nostrils, dermatitis among others one.<sup>47</sup> The use of chemical fixatives should be increasingly employed in the ideal concentrations, reducing the destruction of structures and the inconvenience caused to those involved in their study.<sup>48</sup>

However, the use of corpses remains as the most efficient and indispensable method to acquire knowledge of human morphology, as reported by De Meneses,<sup>1</sup> Collipal Larre and



Silva Mella,<sup>22</sup> Cotta,<sup>20</sup> Moraes et al.,<sup>12</sup> which corroborate the students' report when asked about the concordance of the use of corpses and prosected pieces.

We students assimilate better what was proposed by the professor and thus learning is better. (B1)

Their utilization makes it more evident what part of the body, showing the reality to students. (B10)

Because we study by a real method. (B6)

We know, in fact, how the human body presents itself and how we, the future health professionals, will find it in our clinical practice. (C14)

## Conclusions

Analyzing the perceptions of students of the Petrolina campus of the University of Pernambuco, regarding the materials used in the practical assessment of Human Anatomy, was relevant in times of evolutionary changes attributed to the quality of teaching.

It is essential to report that among five materials used in the practical assessment the participants reported that the best method of the use cadaveric material. Nevertheless, the use of photocopies did not obtain acceptance (photocopied material of printed anatomical atlases), which the participants presented greater difficulty during the gymkhana.

The use of software obtained a great acceptance by the participants, too. Important information lays on the technological era in modern times and this method can be used as a complement to the traditional study of Human Anatomy. The deficient topics in Human Anatomy learning lead us to believe that there is still a need to reformulate the techniques of practical assessment and adherence to new models that arise the interest aimed at the construction of knowledge in the students' mind. While the students' positioning regarding the application of cadaveric material used in the Anatomy practice assessment has been widely accepted, it is necessary that this material be preserved and that seek ways to acquire this type of material to be used, daily, in practical classes of the referring curricular component. No method will ever replace the use of the corpse which can be presented as complement that contributes to the process of knowledge acquisition.

Thus the cadaver was presented as the best method to be used in practical assessment of Human Anatomy at the University of Pernambuco. We need to emphasize the importance of its use in practical classes and practical assessments, according to the representative acceptance by the students. The alternative methods, approached here to the traditional teaching of Human Anatomy, serve as a complement for the teaching-learning process, and never as a substitutes.

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