

SECTION: ARTICLES

## Human Anatomy course assessment practices: what have professors been doing?<sup>1</sup>

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### Práticas avaliativas na disciplina de Anatomia Humana: o que os professores têm feito?

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### Prácticas de evaluación en la asignatura de Anatomía Humana: ¿qué han estado haciendo los docentes?

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#### ABSTRACT

This study investigated the assessment strategies used by Human Anatomy professors at Brazilian universities. The professors used the "snowball" method to collect information. The data were collected by professors using a questionnaire validated by specialists and approved by the Research Ethics Committee of the University of the State of Mato Grosso do Sul under protocol number 5.311.817. The sample included 41 professors, predominantly male (73.17%) and aged between 29 and 45 (51.21%). Around 78% reported having a Human Anatomy

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background. During both the diagnostic and formative assessments, dialogued lectures (70.7%) and practical assessments (61%) prevailed, whereas practical and theoretical assessments predominated in the summative assessment (82.9%). Reported difficulties included the need for more efficient assessment tools and the reduced hours allocated to the course. The results emphasize the need to rethink assessment in Human Anatomy courses, considering students' prior knowledge and progress. Although theoretical and practical assessments are predominant, it is essential to promote learning-centered assessment with ongoing professor training to develop students' skills. Understanding assessment practices can stimulate discussions about improving the assessment process, considering the significance of human anatomy for future healthcare professionals.

**Keywords:** Anatomy; learning; assessment; teaching.

### RESUMO

Este estudo investigou as estratégias de avaliação utilizadas por professores de Anatomia Humana em universidades brasileiras, empregando o método "bola de neve" para a coleta de informações. A coleta de dados foi realizada por meio do preenchimento de um questionário validado por especialistas e aprovado pelo Comitê de Ética em Pesquisa da Universidade do Estado de Mato Grosso, sob o protocolo número 5.311.817. A amostra foi composta por 41 professores, sendo a maioria do sexo masculino (73,17%) e com idades entre 29 e 45 anos (51,21%). Cerca de 78% relataram ter formação na área de Anatomia Humana. Durante as avaliações diagnóstica e formativa, prevaleceram aulas expositivas dialogadas (70,7%) e avaliações práticas (61%), enquanto avaliações práticas e teóricas predominaram na avaliação somativa (82,9%). As dificuldades relatadas incluíram a necessidade de instrumentos avaliativos eficientes e a redução da carga horária destinada à disciplina. Os resultados destacam a necessidade de repensar a avaliação em Anatomia Humana, considerando o conhecimento prévio e o progresso dos estudantes. Embora as avaliações teóricas e práticas sejam predominantes, é essencial promover uma avaliação centrada na aprendizagem com formação contínua para os professores, visando o desenvolvimento das competências dos estudantes.

**Palavras-chave:** Anatomia; aprendizagem; avaliação; ensino.

### RESUMEN

Este estudio investigó las estrategias de evaluación utilizadas por profesores de Anatomía Humana en universidades brasileñas, empleando el método de "bola de nieve" para la recopilación de información. Esta recopilación se llevó a cabo a través de un cuestionario validado por expertos y con la aprobación del Comité de Ética en Investigación de la Universidad del Estado de Mato Grosso, bajo el protocolo número 5.311.817. La muestra estuvo compuesta por 41 profesores, la mayoría de sexo masculino (73,17%) y con edades

entre 29 y 45 años (51,21%). Aproximadamente el 78% informó tener formación en el área de Anatomía Humana. Durante las evaluaciones diagnósticas y formativas, prevalecieron las clases expositivas dialogadas (70,7%) y las evaluaciones prácticas (61%), mientras que las evaluaciones prácticas y teóricas predominaron en la evaluación sumativa (82,9%). Las dificultades informadas incluyeron la falta de instrumentos de evaluación eficaces y la reducción de las horas de clase dedicadas a la materia. Los resultados subrayan destacan la necesidad de replantear la evaluación en Anatomía Humana, teniendo en cuenta el conocimiento previo y el progreso de los estudiantes. Aunque las evaluaciones teóricas y prácticas son predominantes, es esencial promover una evaluación centrada en el aprendizaje con formación continua para los profesores, con el objetivo de desarrollar las habilidades de los estudiantes.

**Palabras clave:** Anatomía; aprendizaje; evaluación; enseñanza.

### INTRODUCTION

As a proactive and formative tool, assessment is pivotal in academic development, learning stimulation, and decision-making throughout the learning process (Sobrinho, 2003). It involves carefully examining relevant data obtained through learning, such as tests, exercises, student responses, and activities (Luckesi, 2005). The professor's pedagogical practice is intricately linked to assessment, as it allows for analyzing the context or circumstances that may influence final performance (Sobrinho, 2003).

The literature categorizes evaluation methods into three types based on their functions. A diagnostic assessment aims to gauge the student's prior knowledge, guide improvements in learning quality, and promote the democratization of education. Formative assessment is a continuous and dynamic process that provides targeted feedback, allowing for interventions throughout the learning process. On the other hand, summative assessment is a process that quantifies learning by assigning grades to students, which determines their classification based on their performance. This approach often prioritizes grades over student development, limiting decision-making for improving learning (Luckesi, 2005; Zeferino; Passeri, 2007; Panúncio-Pinto; Trocon, 2014; Ferris; O'Flynn, 2015; Louhab *et al.*, 2018).

According to O'Loughlin *et al.* (2019) and Vitorino *et al.* (2020), Human Anatomy is an essential subject in the health field, as future professionals will apply it in their clinical experience. Many studies have been conducted to develop effective teaching and learning strategies for Human Anatomy, including assessment methods. These strategies aim to improve the overall quality of education in the field.

In the Human Anatomy context, students are evaluated based on their performance in various assessments, such as their behavior in class, laboratory assessments, unit tests, and final exams. However, classroom observation as a form of evaluation can be ineffective due to its

subjective nature and the need for more well-defined criteria (Niu *et al.*, 2022). Technology-based resources such as three-dimensional models and quiz games are increasingly used to assess students studying Human Anatomy. Collaborative approaches such as team-based learning (TBL) are also being incorporated. Additionally, objective, and structured assessment of practical skills using OSPE<sup>8</sup> (Eladl; Jarrahi, 2020) is being implemented along with other strategies. The combination of these approaches efficiently assesses students' knowledge and skills in human anatomy, improving teaching and learning in this subject (Choudhury; Freemont, 2017 (Choudhury; Freemont, 2017; Mogali *et al.*, 2019; Hammerton *et al.*, 2022).

It is well-known that assessing human anatomy poses persistent challenges despite implementing various teaching and learning strategies. Azevedo and Bezerra (2006) identified several difficulties, such as the continuous evaluation of practical performance during dissections, which is hindered by the limited availability of cadaveric specimens concerning the number of students and the shortage of professors. Several issues related to assessment have been raised. Some of these include the use of unclear assessment criteria, a disproportionate emphasis on theoretical activities at the cost of practical application of knowledge, implementation of stressful assessment methods like timed anatomy laboratory exams, where students must identify anatomical structures from arranged specimens, and the use of assessments that are not contextual and do not facilitate redirecting students' learning.

The research hypotheses aim to address the need to modernize teaching and assessment methods, highlight the significance of teaching and assessment approaches, consider the learning context while training students, and emphasize the value of incorporating subjective assessment aspects besides just grading. This study aims to facilitate a discussion on the assessment strategies used by Human Anatomy professors in Brazilian universities. It will cover diagnostic, formative, and summative assessments. The study aims to describe the profile of participating professors, the subject's characteristics, assessment strategies and resources used, difficulties faced in the assessment process, and the characteristics professors consider essential during the assessment process.

## METHODS

This study was descriptive and comprised a population of 41 Human Anatomy professors from 35 universities in Brazil. The participants were selected through the "snowball" method, a network sampling strategy. This method involves contacting potential participants based on references from previous participants, thus establishing a chain of referrals.

According to Vinuto (2014), this method is justified due to its effectiveness in research involving populations dispersed over a wide area, such as the sample in this study. The participants were requested to complete a validated questionnaire. The link to the

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<sup>8</sup> Objective Structured Practical Examination.

questionnaire was provided through the Google Forms® tool and sent to them via email. They were given a deadline of one month to respond, and the system allowed only one response per user. The Research Ethics Committee of the State University of Mato Grosso approved the study under protocol number 5.311.817.

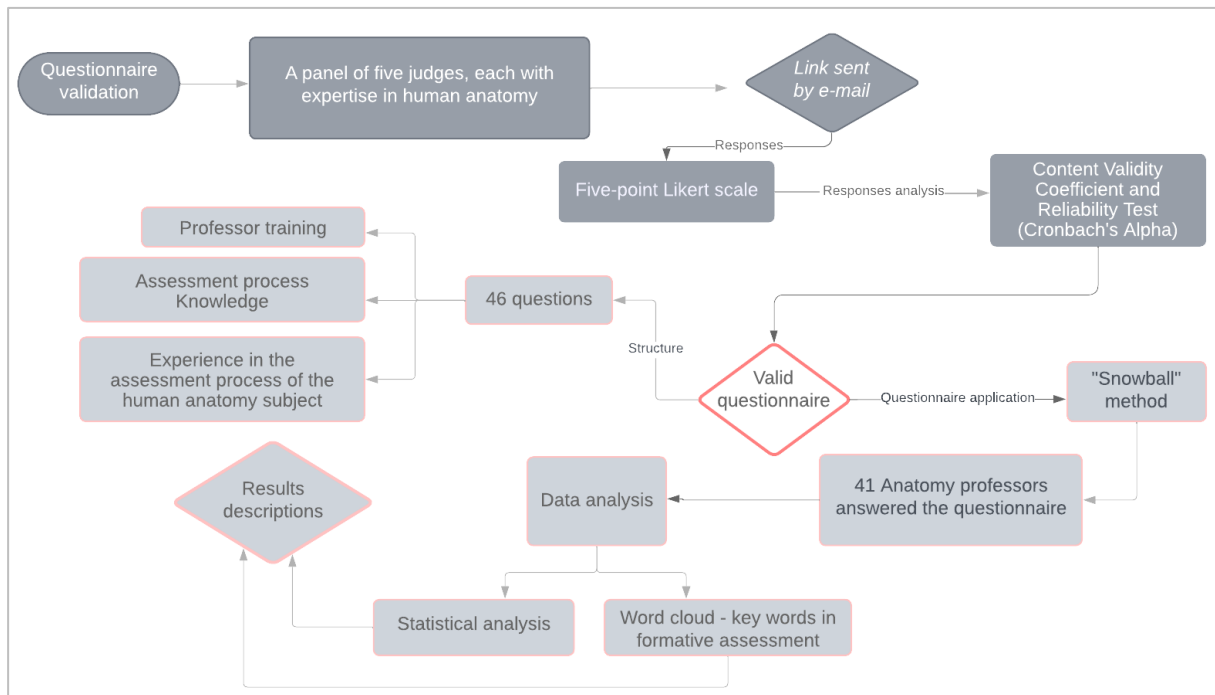
The questionnaire comprises 46 questions classified into three domains: professor training, knowledge of the assessment process, and professor experience in the assessment process (as provided in Appendix 1). The "professor training" domain aims to gather data about the Human Anatomy professors' profiles. The "knowledge of the assessment process" questions aim to collect information about professors' understanding of assessment in their subject. This includes their comprehension of terms such as diagnostic, formative, and summative assessment, the degree of adherence to course guidelines in their assessment practices, the use of instruments that cover different aspects of student performance (knowledge, skills, and attitudes), the approach to the subject of "assessment" in continuing training, and their perception of assessment's importance in the educational context. The questions about the "professor's experience in the assessment process for the subject of human anatomy" include various topics. These topics range from the type of assessment used (practical, theoretical, or both) to the resources used in diagnostic, formative, and summative assessments, the provision of feedback to students, the characteristics considered in formative assessment, the conversion of these characteristics into quantitative indicators for assigning grades, and any difficulties encountered by professors in the assessment process.

The questionnaire was developed based on previous studies by Brenner *et al.* (2015), Wilson *et al.* (2017), and Vitorino *et al.* (2020) and went through a validation process. Five experienced judges in teaching Human Anatomy validated the questionnaire. Although 15 judges were initially invited, only five responded to the validation form within 2 months. According to the studies by Alexandre and Coluci (2011) and Salomé, Rosa, and Rosa (2022), the number of judges involved in the validation process aligns with the recommended standards. The judges were selected based on their experience of more than five years teaching human anatomy and their training in the relevant field. The judges were sent a Google Forms® link via email to access the questionnaire proposed to the professors for validation. The validation form consisted of a five-point Likert scale (1 - Strongly disagree, 2 - Partially disagree, 3 - Indifferent, 4 - Partially agree, 5 - Strongly agree). The Content Validity Coefficient (CVC) was employed to evaluate the relevance, accuracy, clarity, and objectivity with a predetermined criterion of  $CVC \geq 0.80$ , as guided by Filgueiras *et al.* (2015). This rigorous standard ensures the reliability of the results. Cronbach's alpha reliability test was applied to assess internal consistency, and a minimum acceptable value of 0.70 was considered. Values between 0.80 and 0.90 were deemed ideal, as per Streiner's (2003) guidelines.

In the statistical analysis, the normality of the data was assessed using the Shapiro-Wilk test. The means were compared using the Kruskal-Wallis test and Dunn's post-test. Spearman's correlation test was used to investigate the correlation between quantitative and categorical

variables. GraphPad Prism, version 8.1, was used for quantitative data, and SPSS software, version 22.0, was used for categorical data. A significance level of  $p < 0.05$  was used. To identify the most frequently cited terms used by professors about the essential qualities of formative assessment, a word cloud was created using Wordclouds®. The terms were inferred from the word cloud through content analysis and organized by citation frequency. The methodology used is illustrated in Figure 1 through a flow diagram.

**Figure 1** – Flowchart of the applied methodology.



Source: Designed by the authors.

## RESULTS AND DISCUSSION

The judging panel comprised five Human Anatomy experts, whose profiles are presented in Table 1. The CVC attained an index score of 0.92, which indicates strong content validity. Moreover, the instrument demonstrated good reliability of the answers with an internal consistency of 0.88.

**Table 1** – Profile of the judges who validated the instrument.

<b>Analyzed Variable</b>	<b>Total N (%)</b>
<b>Judges' quantity</b>	05 (100%)
<b>Sex</b>	
<i>Male</i>	03 (60%)
<i>Female</i>	02 (40%)
<b>Bachelor degree</b>	
<i>Biological Sciences</i>	02 (40%)
<i>Physical Therapy</i>	02 (40%)
<i>Physical Education Professional</i>	01 (20%)
<b>Academic degree</b>	
<i>Master degree</i>	03 (60%)
<i>Ph.D. degree</i>	02 (40%)
<b>Human Anatomy Training</b>	
<i>Human anatomy specialization with dissection emphasis</i>	02 (40%)
<i>Human movement sciences specialization</i>	01 (20%)
<i>Health science specialization</i>	01 (20%)
<i>Human anatomy training course - Sarah Kubitschek, non-governmental organization</i>	01 (20%)
<b>Teaching experience</b>	
<i>From 05 to 15 years</i>	02 (40%)
<i>20 years</i>	02 (40%)
<i>28 years</i>	01 (20%)
<b>Institutional affiliation</b>	
<i>Private</i>	03 (60%)
<i>Private and public</i>	02 (40%)

Source: Designed by the authors.

The study sample included 41 professors with teaching experience in human anatomy, ranging from 3 to 45 years. 78% of the participants reported receiving Human Anatomy training, including postgraduate degrees, courses in anatomical techniques, and dissection. When comparing the length of the experience (over 10 years) and professor training, a statistically significant correlation was observed ( $p=0.001$ ), indicating a moderate positive correlation ( $r=0.463$ ).

Implementing effective assessment processes requires high-quality teacher training, directly impacting student learning outcomes (Christoforidou; Kyriakides, 2021). Teacher training, particularly concerning assessment, enables a comprehensive approach that ensures effective and quality teaching by developing mechanisms to gather information that identifies situational problems. Continuous learning opportunities for professors are essential. This includes participation in training programs, specialization courses, and academic events that cover aspects related to professional and pedagogical training (Castanheira; Ceroni, 2007).

Many professors lack education training in teaching human anatomy, highlighting the need for ongoing pedagogical training related to the teaching and learning process, including

assessment. According to a study by Cruz *et al.* (2019), approximately 60% of the interviewed teachers expressed their desire to use diversified teaching strategies. However, a lack of experience and didactic pedagogical training were common challenges that hindered the implementation of these new approaches. The primary demand of the professors to improve the teaching-learning process in the Medicine course was to promote didactic-pedagogical training.

In the sample, 73.17% of the professors were male, with ages ranging from 29 to 45 accounting for 51.21%. As indicated in Table 2, most professors had a doctorate (53.65%) or a master's degree (38.58%).

**Table 2** – Variables analyzed in the study.

<b>VARIABLE</b>	<b>Proportion (%)</b>
<b>Professors</b>	<b>41 (100%)</b>
<b>Sex</b>	
<i>Male</i>	30 (73,17%)
<i>Female</i>	11 (26,82%)
<b>Age</b>	
<i>From 29 to 45 years</i>	21 (51,21%)
<i>From 46 to 60 years</i>	09 (21,95%)
<i>Above 61 years</i>	11 (26,82%)
<b>Academic degree</b>	
<i>Specialization</i>	02 (04,87%)
<i>Master's degree</i>	15 (38,58%)
<i>Ph.D.</i>	22 (53,65%)
<i>Associate Professor</i>	02 (04,87%)
<b>Classroom experience (years)</b>	
<i>Up to 10 years</i>	12 (29,26%)
<i>From 11 to 20 years</i>	16 (39,02%)
<i>Above 21 years</i>	13 (31,70%)
<b>Human anatomy teaching experience</b>	
<i>Up to 10 years</i>	19 (46,3%)
<i>From 11to 20 years</i>	09 (22,0%)
<i>Above 21 years</i>	13 (31,7%)
<b>Human anatomy training</b>	
<i>Yes</i>	32 (78,0%)
<i>No</i>	09 (22,0%)
<b>Course</b>	
<i>Independent</i>	19 (46,30%)
<i>Integrated into morpho-functional sciences</i>	22 (53,70%)
<b>Applied methodology</b>	
<i>Traditional teaching</i>	13 (31,70%)
<i>Mixed teaching or active methodologies</i>	28 (68,30%)
<b>Are the assessments carried out according to the National Curriculum Guidelines?</b>	
<i>Yes</i>	38 (92,70%)
<i>No</i>	03 (07,30%)



<b>Do you attend continuous training or courses that guide you through the assessment process?</b> <i>Yes</i> <i>No</i>	31 (75,60%) 10 (24,40%)
<b>The assessment process represents the following:</b> <i>Multidimensional aspect</i> <i>Classificatory function</i>	39 (95,10%) 02 (04,90%)
<b>Are you familiar with the term's diagnostic, formative, and summative assessment?</b> <i>Yes</i> <i>No</i>	30 (73,20%) 11 (26,80%)
<b>Do you use the expositive dialogical class as a tool for the diagnostic assessment?</b> <i>Yes</i> <i>No</i>	29 (70,70%) 12 (29,30%)
<b>Do you use the practical and theoretical assessment integrating summative assessment?</b> <i>Yes</i> <i>No</i>	34 (82,90%) 07 (17,10%)
<b>Do you use the practical assessment integrating formative assessment?</b> <i>Yes</i> <i>No</i>	03 (07,30%) 38 (92,70%)
<b>Do you use the practical assessment with the clinical application?</b> <i>Yes</i> <i>No</i>	31 (75,6%) 10 (24,4%)

Source: Designed by the authors.

According to studies by Reis *et al.* (2013), McBride and Drake (2018), Rockarts *et al.* (2020), and Merzougui *et al.* (2021), most professors teach Human Anatomy in an integrated way with other areas of the morphofunctional sciences. Driven by curricular changes since the 1990s, these studies underscore the integration between basic and clinical subjects. This process significantly impacted assessment methods, especially in medical courses. As a result, assessments that consider theoretical knowledge and students' ability to apply this knowledge in clinical practice have been implemented. Montes and Souza (2010) introduced the optional subject Anatomy Lessons, which illustrates how this integration has enabled the implementation of diversified teaching and assessment methods, often suggested by the students. This led to a more comprehensive education that meets clinical practice demands and encourages active student participation in the learning process. This approach prioritizes the practical application of knowledge, aligning it with clinical needs and promoting comprehensive training in human anatomy. In other words, it reflects a change in the paradigm for human anatomy teaching.

There is a discussion regarding the traditional method and active methodologies in the teaching and learning Human Anatomy. The traditional teaching method emphasizes passive learning through information transmission and assessment via testing. According to Luckesi (2005), traditional pedagogy emphasizes the transfer of knowledge, the role of the professor,

and the intellect. On the other hand, in active methodologies, the focus is on learning rather than teaching. In this context, the professor serves as a mentor who guides the students throughout their learning journey (Rodrigues; Moura; Testa, 2011).

According to the pedagogical proposal of the professors' courses, 34.1% use traditional teaching, while 65.9% adopt a mixed (43.9%) or active (22%) methodology. This indicates a shift towards using diverse approaches in teaching Human Anatomy, reflecting a change in the teaching process. The choice of teaching methodology was found to have statistical significance when associated with the dimensions of knowledge, attitudes, and self-assessment. Ribeiro, Albuquerque, and Resende (2020) suggest that active teaching methodologies can increase student engagement and responsibility in the learning process. This approach promotes students' active participation, develops their critical thinking skills, and helps them acquire skills that are relevant to their daily lives.

The statistical significance ( $p=0.014$ ) of the relationship between practical assessment, clinical application, and the Pedagogical Course Project (PCP) strongly indicates the importance of understanding the documents that regulate teaching practices. The PCP is essential for teachers to ensure their teaching and assessment methods align with the course objectives. This alignment makes it easier for teachers to adapt their teaching methods and strategies to cater to their students' diverse learning requirements.

In addition, the variables related to types of assessment, theoretical assessment, and scored formative assessment, as detailed in Table 3, also showed statistical significance when analyzed concerning the teaching methodology adopted. The results presented here are consistent with the existing literature, highlighting the relevance of assessing teaching and learning methods promoting active learning. This approach is based on a pedagogical relationship that requires intentional actions and involves the development of critical skills and behaviors by professors and students. Theoretical assessment is a method of evaluating fundamental anatomical knowledge. It is usually conducted through objective tests like multiple-choice, matching, or short-answer questions. It primarily focuses on assessing theoretical knowledge. This assessment method also considers the clinical and functional context, as highlighted by Yaqinuddin *et al.* (2013) and Ulloa *et al.* (2018).

**Table 3** – Variables analyzed considering teaching methodology.

Variables	Percentage (%)	p value
<b>Components: knowledge, attitudes, and self-assessment</b>		0,006
Yes	31 (75,6%)	
No	10 (24,4%)	
<b>Types of assessment</b>		0,034
<b>Diagnostic, formative, and summative assessment</b>	09 (22%)	
Formative and summative assessment	20 (48,8%)	
Summative assessment	08 (19,5%)	
Diagnostic assessment	04 (09,8%)	
<b>Theoretical assessment</b>		0,036
<b>In all assessments</b>	34 (82,9%)	
In some assessments	07 (17,1%)	
<b>The assessment considers objectives and learning</b>		0,548
<b>Often</b>	15 (36,6%)	
Very often	26 (63,4%)	
<b>Scored formative assessment</b>		0,030
Yes	29 (70,7%)	
No	05 (12,2%)	
Formative assessment is not carried out	07 (17,1%)	
<b>Quantitative indicators in formative assessment</b>		0,064
<b>Criteria with evaluation</b>	05 (12,2%)	
<b>Grading</b>	24 (58,5%)	
<b>Formative assessment not scored</b>	05 (12,2%)	
Formative assessment not carried out	07 (17,1%)	

Legend: Chi-squared test.

Source: Designed by the authors.

Assessment covers three fundamental areas in teaching human anatomy: knowledge, skills, and attitudes. Applying Zabala's (1998) definitions to the context of Human Anatomy involves understanding anatomical facts and concepts and assessing this knowledge through written tests that evaluate factual and conceptual understanding. Procedural knowledge involves practical activities like analyzing clinical cases and dissecting anatomical structures. The skills encompassing cognitive, behavioral, and affective aspects are measured and nurtured through collaborative opportunities. These opportunities promote the development of ethical and respectful attitudes towards anatomy, the human body, and the patient, providing a comprehensive understanding of the learning process. These dimensions must be assessed continuously, and the professor plays a fundamental role in recognizing the students' competencies through longitudinal monitoring of the teaching objectives and learning progression. The evaluation is intended to measure student performance and be a powerful learning tool (Zeferino; Passeri, 2007).

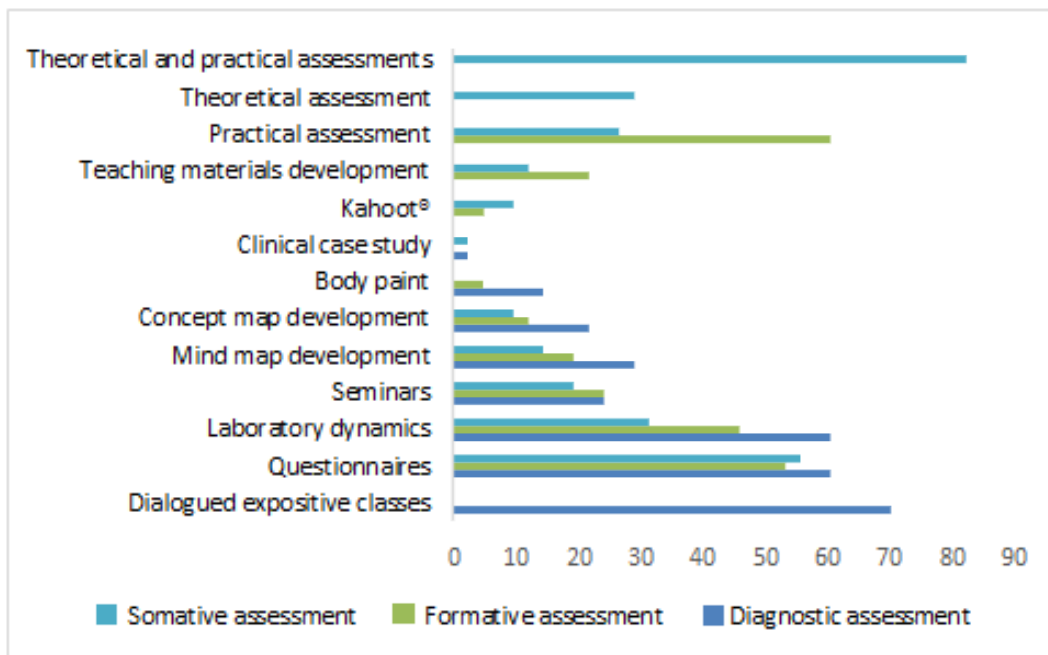
According to Sullivan *et al.* (2021) and Gotwals and Cisterna (2022), the professor's role in the classroom requires knowledge about the practices that promote student learning. Although 75.6% of professors claim to consider the dimensions of knowledge, attitudes, and student

self-assessment during the assessment process, only 31.8% use diagnostic assessment. This contrast raises profound questions about how much knowledge is genuinely considered or whether student performance is merely being assessed. 77% of professors who value these dimensions use active or mixed teaching methods, suggesting a preference for these over traditional methods.

Assessing student progress through formative and continuous means is essential for analyzing the learning process (Abraham *et al.*, 2018). Our study reveals that over 70% of participants reported using formative assessment. However, when creating quantitative indicators for this assessment, 58% of professors turn it into an evaluation focusing solely on educational measurement. This leads to assigning grades based solely on student performance. Interestingly, our research shows that only 12.2% of the professors who conduct formative assessments apply pre-established criteria. Equally, another 12.2% of professors do not assign grades for the formative evaluation. According to William (2006), formative assessment is more impactful when not used to grade the student. It is particularly effective when it is limited to awarding points during the learning process, as this is sufficient to motivate the student (Choudhury; Freemont, 2017).

Choudhury and Fremont (2017) note that assessments in anatomy have shifted from a practical to a theoretical model since the 1990s. According to a survey, over 80% of teachers use theoretical assessments to evaluate their students' knowledge in all the modules, phases, or semesters that cover the content. This use is reported by all teachers who follow the traditional teaching methodology, indicating a widespread trend towards this approach. Moreover, incorporating digital tools into assessments modernizes the assessment process through technology.

According to participants, various resources are used for diagnostic, formative, and summative assessments of Human Anatomy. Dialogic lectures are the most common strategy employed by 70.7% of teachers (Graph 1). When used in dialogue, this approach is valuable for the diagnostic evaluation of Human Anatomy. The teacher provides precise, provocative, and interactive presentations (Pereira; Lima, 2018). Quizzes and laboratory activities are considered effective methods for both diagnostic and formative assessments. According to Evans *et al.* (2014), revision quizzes and laboratory dynamics, such as self-assessment quizzes and dissection checklists, help identify areas that need improvement, thereby enhancing student learning. This results in higher marks in practical assessments and better-quality dissection, highlighting the positive impact of these strategies on formative assessment in Anatomy.

**Graph 1** – Methodological strategies used during Human Anatomy assessments.

Source: Designed by the authors.

Our study highlighted several strategies within the scope of formative assessment in Human Anatomy, including practical evaluations, seminars, and constructing mind and concept maps. When practical assessment is seen as formative, it involves group or individual activities, enhances collaborative learning, provides instant feedback, and enhances comprehension of the subject matter (Mogali *et al.*, 2019). Using concept maps is an effective pedagogical strategy for teaching Human Anatomy, as it promotes knowledge construction and comprehensive integration, as Foureaux *et al.* (2018) pointed out. It is worth pointing out that in 82.9% of the sample, the practical and theoretical assessment of the subject is combined with the summative evaluation, indicating its statistical significance ( $p=0.028$ ). This finding emphasizes the significance of comprehensive approaches that consider various dimensions when evaluating students' knowledge of Human Anatomy.

This study highlights various assessment strategies with a multidimensional approach to Human Anatomy. The methods used include weekly scripts that cover concepts related to recognizing structures and organs. These scripts are carried out outside the classroom, followed by directed studies, dissection practices, and practical seminars. Theoretical seminars, activities at stations in the laboratory, group discussions, and practical evaluations in pairs are also included. Self-assessment, professor assessment of students' attitudes, presentation of scientific articles, clinical case studies, clinical correlation during the theory test, and the use of TBL are also mentioned. In addition, student participation, performance, and assistance to colleagues are assessed, although without any specific details on these assessments.

Choudhury and Freemont (2017) emphasize the significance of utilizing various assessment methods, including theoretical and practical components, to evaluate anatomical knowledge and skills. These skills involve understanding organ location and dimensions, knowing the anatomical structures relevant to surgical procedures, handling surgical instruments, developing clinical reasoning, and acquiring interpersonal skills. Practical experience, including handling cadavers and dissection, is considered an effective method for developing these skills. This learning process enhances academic knowledge and enables future healthcare professionals to provide compassionate and effective patient care, as demonstrated by Silva Neto *et al.* (2007) and Salbego *et al.* (2015).

According to Chakrabarti (2020), Mogali *et al.* (2020), and Williams *et al.* (2020), feedback is crucial in guiding and engaging students throughout the process of learning Human Anatomy. It helps in applying knowledge and concepts to comprehend and solve problems. In the survey, 46.3% of professors provide descriptive feedback. Of these, 29.3% guide towards solutions that favor student learning. Around 31.7% of professors offer punctual feedback, usually through short sentences highlighting students' strengths or weaknesses. Corrective feedback, covering 22% of professors, is characterized by identifying assessment errors. When this feedback is given about the activity, there is immediate feedback (75.6%) and delayed feedback (24.4%). This way, the feedback offered, whether immediate, descriptive, punctual, or even corrective, contributes positively to the students' learning process.

One of the main difficulties pointed out by 26.2% of the sample is the need for a fair, efficient, and precise assessment tool capable of covering anatomical knowledge in its theoretical, practical, and clinical aspects. There is a significant lack of research regarding the challenges of implementing the assessment process in the field of Human Anatomy. However, as underscored in the study by Cavalcante *et al.* (2015), professors question the relevance of assessments and the instruments available, expressing concerns about the need for a fair and adequate evaluation, meeting the requirements of quality training. Finding criteria and tools to evaluate whether students are ready to advance in their studies is crucial. Moreover, students seek assessment methods that instill confidence in the process and guarantee that the assessments are pertinent to the subject (Yaqinuddin *et al.*, 2013). According to the survey results, 23.8% ( $p=0.002$ ) of the participants found it challenging to manage the workload of the Anatomy subject when it was integrated with other areas of the morphofunctional sciences. The assessment process was time-consuming, which made it difficult for them. Additionally, 14.3% of the survey participants reported difficulty planning and preparing for the assessment.

Another issue surveyed refers to the characteristics considered relevant by teachers during student assessment. Professors frequently cited terms such as learning, knowledge, clinical correlation, and participation. They also mentioned engagement, contextualization, interest, assertiveness, punctuality, attendance, clarity and objectivity, interrelationship, and attitudes,

as illustrated in the word cloud below (Figure 2). These aspects contribute to an ethical, critical, and problem-solving education that permeates the field of knowledge.

**Figure 2** – A word cloud was generated using Wordclouds® to visualize the number of citations of terms related to relevant characteristics during formative assessment from the professors' perspective.



Source: Designed by the authors.

Finally, professors were asked for their preferred method of assessing Human Anatomy students. According to a study, professors' most used strategies in evaluating their students' knowledge were theoretical and practical assessments, which accounted for 52.5% of the total strategies used. Diversified assessment models, such as seminars, clinical case studies, dissection, correlation with imaging exams, making models with synthetic and natural material, body painting, palpatory anatomy among peers, apps, virtual reality, and software with three-dimensional anatomical images, accounted for 21.95% of the strategies used. Formative assessments, which involve giving feedback to students during the learning process, were used by 14.6% of the teachers. Active methodologies, such as the inverted classroom and TBL (Team-Based Learning), were used by 12.9% of the teachers. Using diversified assessment methodologies enhances student learning by stimulating autonomy, critical thinking, creativity, and problem-solving skills without limiting their involvement, as suggested by Higashi *et al.* (2018) and Côrtes *et al.* (2022).

### Study limitations

It is important to consider some study limitations when interpreting the data. The minimum sample size could not be calculated, and professors' participation was limited. This resulted in a small sample size despite the support of the Brazilian Society of Anatomy and the use of a questionnaire to gather data. This emphasizes the importance of discussing the assessment process in the context of teaching. The assessment process should be viewed as a tool for monitoring the effectiveness of the teacher's methods and ensuring that students are learning. It is important to note that the study's results may be limited by the subjective nature of the teachers' declarative practices. Additionally, the questionnaire was validated only by judges who were Human Anatomy teachers, without the participation of judges with a

background in pedagogy or other areas related to education and assessment. It is important to note that having judges who are trained in pedagogy would have improved the validation process. This would have ensured that the questions were formulated more effectively from a pedagogical standpoint. As a result, it could have increased the accuracy and reliability of the participants' answers.

### FINAL CONSIDERATIONS

The results of this study highlight the need to reflect on the practices developed during the assessment of human anatomy. Even though formative and summative assessments were the most commonly used in the classroom, most professors use assessments to quantify student learning without considering the student's prior knowledge or progress during the course. There are diverse tools available for evaluation processes, but theoretical and practical evaluations are hegemonic and tend to reflect the methodologies employed while teaching the content covered.

Constructing student learning is challenging and requires valuing the context, learning process, successes, and mistakes. To ensure effective teaching and learning of human anatomy, the student and the teacher must possess reflection, maturity, and responsibility. Additionally, teaching staff require ongoing training on assessment processes and their interfaces in this field. These discussions can change how professors conduct their classes and carry out assessments, promoting a learning-oriented assessment process that contributes to students' acquisition of skills and competencies.

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