

Preparedness, Challenges and Processing of the Anatomy Laboratory Experience by First Year Medical Students

Preparación, Desafíos y Procesamiento de la Experiencia en el Laboratorio de Anatomía por Estudiantes de Medicina de Primer Año

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SUMMARY: Learning anatomy is critical for all health science students and working with body donors is considered as a superior learning tool. For many students this would be their first experience working with a deceased human body. In this study we assessed the emotional, intellectual and spiritual preparation that first year medical students felt in anticipation for their first experience in the anatomy laboratory. We hypothesized that incorporating a pre-work education module to help students prepare for the experience, as well as a post-experience reflective exercise would help students in processing their first anatomy laboratory experience. The findings of this study demonstrated that there is a statistically significant difference noted following the pre-module intervention. As part of the post-reflection, students responded to open ended questions. Their responses to these questions highlighted the importance of reflective, mindful practice for both their first anatomy laboratory experience and their future professional lives. While there are many formative experiences in medical school, this early encounter with body donors offers unique challenges and opportunities for professional identity formation. Educational interventions to help prepare for and process this experience demonstrated a positive impact on students. Future studies will focus on the impact of these activities on student learning by reducing cognitive load.

KEY WORDS: Anatomy; Education; Laboratory; Body Donors; Preparedness; Challenges; Processing.

INTRODUCTION

Dissecting a human body donor has been described as the rite of passage to becoming a doctor. Moreover, learning about the human body has always been associated with dissecting a human body (McLachlan & Patten, 2006). Traditionally, anatomy teaching could be divided into two complementary strategies, a lecture-based approach followed by a practical session (Sugand *et al.*, 2010). During the practical session different methods and resources can be used to aid in student learning. Some of the teaching methods include case-based learning, self-directed learning, and formative assessment. Meanwhile, some of the resources used include plastic models, radiological imaging, electronic resources (virtual dissection and videos), plastinated specimens, prosected specimens, and full body dissection (Abdullah *et al.*, 2021). Several studies have reported the benefits of practical anatomy teaching to help students gain

a better understanding of the covered topics (Huitt *et al.*, 2015; Pizzimenti *et al.*, 2016). During a didactic lecture, students are typically presented with new information accompanied by 2D images. It is in the laboratory where students are able to appreciate the 3D nature of anatomy by utilizing hands-on approaches when working with the available teaching resources (Abdullah *et al.*, 2021).

Working with human body donors in the anatomy laboratory provides students with an opportunity to work with the closest model to the living human body. Many factors impact the decision on what type of approach will be used when incorporating human material into an anatomy course (Balta *et al.*, 2015). Some of these factors could be the logistics behind setting up a dissection laboratory, the availability of donated human material, finances associated

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with the process, expertise needed to work with human material along with other factors related to the curriculum such as time and learning outcomes. Working with human body donors provides the students with an opportunity to appreciate the three-dimensional aspect of anatomy, the relationship between body systems, anatomical variations between individuals and gain dissection skills (Abdullah *et al.*, 2021).

The impact of learning from a human body donor goes beyond the cognitive and psychomotor domains to impact the affective learning domain (Stephens *et al.*, 2019). This includes important competencies needed in many, if not all, careers, such as ethics and professionalism. Over the past few years, there has been an increasing interest in utilizing the anatomy learning experience as a tool to address important topics such as informed consent, death and dying, medical ethics, self-care, and professionalism (Escobar-Poni & Poni, 2006; Kumar Ghosh & Kumar, 2019; Stephens *et al.*, 2019). This opportunity provides medical students with a safe environment to learn and practice these competencies before they start working with patients.

The challenges for medical students encountering death as they are training to become physicians, has been well documented (Williams *et al.*, 2005; Dosani & Neuberger, 2016; Romo Barrientos *et al.*, 2019). For many students, their encounter with a body donor in the anatomy laboratory is their first close encounter with a deceased human being. Previous studies have determined the high levels of anxiety for first-year medical students beginning their first-year anatomy laboratory experience, though these numbers decrease significantly by the end of their first year (Dosani & Neuberger, 2016). Though ways to approach death and dying are taught throughout medical curricula, it is in the anatomy laboratory that students typically first experience this firsthand as part of their education.

The challenges of facing human mortality are not limited to medical students. Most people in the United States have not witnessed death. It is removed from view, often taking place in institutions outside of the home, such as hospitals or hospice facilities (Dugdale, 2015). This is a shift from the beginning of the 20th century where only 14 % of deaths occurred in institutions (Dugdale, 2015). It is no surprise then that when medical students begin their journeys to becoming physicians, the reality of encountering death up close, both through the anatomy laboratory and even in-patient care, there is anxiety in anticipating this experience.

Across programs, preparing students for dissection has garnered various approaches. Methods such as incorporating documentary films and recorded interviews are one such approach, particularly as a method to emphasize

the donor's humanity. In a study by Dosani & Neuberger (2016), the impact of these interventions was measured, including looking specifically at the impact of the video on the student perception anticipating their anatomy laboratory experience. They found a range of responses that included emotional validation, increasing anxiety, and the humanizing of donors (Dosani & Neuberger, 2016). In a more recent study specifically looking at YouTube videos created to help students prepare before their first anatomy lab, it was found that this intervention utilizing a social platform increased anxiety amongst incoming medical students, rather than alleviating it (Attardi *et al.*, 2021).

In this study, we aimed to evaluate the preparedness, challenges, and individual processing faced by first-year medical students in relation to their experience in the anatomy laboratory. Specifically, we wanted to assess how emotionally, intellectually, and spiritually prepared first-year medical students were for the experience and potential challenges they would face in relation to participating in dissection in the anatomy laboratory. We hypothesized that the creation of a combination of an online module, followed by post-laboratory in-person reflective classroom activities to process any challenges they had throughout this experience, would help the students prepare for their first encounter with a deceased human body prior to the anatomy laboratory.

MATERIAL AND METHOD

As part of their anatomy training, all first-year medical students (n = 209) were given the opportunity to participate in both a pre-laboratory module and a post-laboratory group discussion on either side of their experience in the anatomy laboratory. The purpose of these sessions was to engage students in a way that would help them prepare for encountering and working with the body donor for the first time and create intentional space for reflection afterwards. The primary focus was on topics of ethical and professional identity reflection and the emotional impact of the encounter in addition to introducing what to expect from a knowledge perspective. The relevant learning objectives of these sessions were as follows:

- Prepare the students for encountering the professional, ethical, spiritual, and emotional aspects of their first body donor experience.
- Highlight the possible emotional challenges and ethical considerations of human dissection.

Pre-laboratory module

The pre-laboratory session was designed as an online module that students participated in asynchronously prior

to participating in the anatomy laboratory. The students were able to self-select as to whether or not they wished to complete this module. The module consisted of an overview followed by four parts. Each part consisted of a short video and/or slides with voiceover on the following topics: (1) An introduction to the anatomy laboratory; (2) A personal narrative; (3) Legal and ethical considerations; and (4) Professionalism. Students also engaged in pre and post survey quizzes to measure the impact of this educational intervention. These quizzes include Likert scale questions.

Post-laboratory module

The final component of this intervention consisted of a post-laboratory session. The session took place in person with conversation led by two faculty members. As part of this session, students engaged in small group discussion with classmates and were presented with an opportunity to discuss and reflect on their own experience, as well being presented with and discussing an ethical case related to the teaching and learning of anatomy. Like the pre-laboratory session, this session was not mandatory.

Data Collection

All first-year medical students (M1) were invited to participate in this study in various ways, including participating in an online module prior to the anatomy laboratory experience and participating in a post laboratory in-person group discussion with two faculty members.

Two data sets were collected as part of this module. As mentioned above, an online survey questionnaire was given prior to and following the online, pre-laboratory module with Likert scale questions. The students were asked the same questions both prior to and after completing the module in order to account for how the educational intervention may have impacted their responses. This composed the first data set (Data set 1) which included quantitative data. This questionnaire measured students' perceptions of their own preparedness to begin the anatomy laboratory dissection experience. Survey results were reviewed and analyzed using Microsoft® Excel®, 2016 (Microsoft Corporation, 2016). The questionnaire considered the impact of the pre-laboratory online module on how students felt going into the laboratory experience.

The second data set (Data set 2) was collected using paper forms during the in-person post-laboratory group discussion. Data from this session was collected using an open-ended questionnaire (narrative response) to allow for students to reflect and expound on their experience and its personal impact. Students completed the questionnaire in

the live-session and returned their forms to the instructors at the end of the session. This questionnaire asked about the challenges faced by the students, and giving them the opportunity to process the experience, as well as consider and address a specific ethics case scenario. This data set comprised the qualitative data.

Data Analysis

Statistical analysis was conducted on the pre/post survey (together comprising Data set 1) responses using Microsoft® Excel®, 2016 (Microsoft Corporation, 2016) and a p-value of < 0.05 was considered statistically significant. Descriptive and inferential statistics were performed. For data that were comparing responses in a pre/post survey where the data was not linked, an F-test for two-sample variances was performed to determine if two samples came from two independent populations having the equal variances. A two-sample t-test (assuming equal variances or assuming unequal variances) was used for comparisons regarding students' responses to the pre-survey and post survey.

The qualitative data from Data set 2 was reviewed looking for themes across student responses to each question, measuring the occurrence of each theme. This was done by manually reviewing each response and tracking mentions of responses fitting into the various identified themes, including responses of dissociation and alternatively meditative and reflective practices. These responses were categorically grouped based on student narrative responses. Thematic analysis was used to investigate themes in student responses, noting the number of occurrences of types of responses across the questionnaires. Some responses incorporated more than one theme in their answer to an individual prompt. In these scenarios, each identified theme was noted and included in analysis and discussion.

Ethical Approval

This study was approved by the institutional review board under log number 2020B0096 on 03/23/2020.

RESULTS

Background

A total of 117 out of 209 first-year medical students elected to participate in the intervention and completed the pre-lab online module and survey, of these 117 students, 94 completed the post-lab survey totaling 80.34 % of those completing the pre-lab survey also completing the post-lab survey (Data set 1), and 22 of the students who elected to

participate in the intervention attended the face-to-face optional group discussion sessions (reviewed for Data set 2). Participation was optional, and students were not requested to provide a reason as to why they chose/did not choose to participate.

In the pre-laboratory questionnaire students were asked initial questions to ascertain their previous exposure to deceased human bodies, whether or not they had participated in anatomy coursework previously, as well as a series of questions measuring emotional, intellectual and spiritual considerations relevant to their experience all prior to completing the educational online module (intervention).

Students were asked to indicate whether or not they had ever seen a deceased human body in person. Of the 117 responding M1s, 32 % (n = 38) indicated they had not previously seen a deceased human body; 68 % (n = 79) indicated that they had.

Following this question, students were asked to indicate all methods that had been used to learn human anatomy. The highest response (69.2 %, n = 81) indicated a method of using online/computer-based resources including images from a deceased human body. Over one-fifth of the students (21 %, n = 25) indicated they had never been exposed to human materials prior to their medical school anatomy laboratory experience. Figure 1 summarizes the findings of the above-mentioned question about methods used to learn anatomy.

When asked to rate the importance of medical students working with body donors to learn human anatomy in the pre-module survey, 99 of the 117 students rated this as “very important,” with 17 students rating as “important” and one student rating “neutral.” No students selected the options of “Somewhat unimportant, Unimportant or Very unimportant.” In the post-module survey, all students who participated (n = 94) indicated that working with body donors to learn human anatomy was “important” or “very important.”

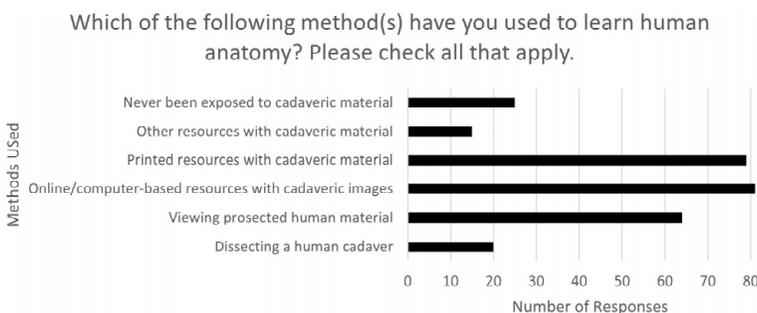


Fig. 1. A summary of students’ responses in relation to the methods used to learn human anatomy.

Preparedness

Overall, a statistically significant difference was observed in how intellectually, emotionally, and spiritually prepared the student felt after participating in the online session compared with prior to engaging in the online session as outlined in Table I. Each of these elements was measured independently, asking students to rank to what extent they felt (intellectually, emotionally, and spiritually), respectively, prepared for their first dissection lab. In their post intervention survey, following the online module, students were asked to again rank their perceived preparedness level for each of these elements. 94 students completed both the pre and post module (intervention) surveys.

Regarding intellectual preparation, it is noteworthy that after the educational intervention, no students reported feeling “not at all” or “to a small extent” prepared. There was also a significant increase in students who reported feeling prepared “to a very great extent” (SD 8.485). In regard to emotional preparedness, the most significant difference was noted in the decrease of students reporting feeling prepared “to a moderate extent” followed by an upward trend showing in students reporting feeling prepared “to a great or very great extent.” Similarly, to the response regarding intellectual preparedness, in regard to spiritual preparedness after the educational intervention, no students reported feeling “not at all” or “to a small extent” prepared. Also similar to the emotional preparedness responses, a significant difference was noted in the decrease of students reporting feeling prepared “to a moderate extent” followed by an upward trend showing in students reporting feeling prepared “to a great or very great extent.” This was also the only preparedness measurement question that some students selected the “not applicable” option, though the number selecting this decreased from the pre to post survey responses. In conclusion, despite a smaller number of participants in the post module survey (n = 117 pre; n = 94), raw number increase and a demonstrable significance was measured in the impact on students’ perception of intellectual, emotional, and spiritual preparedness.

Challenges

In the post laboratory survey (Data set 2) using a Likert scale, students were asked to rank on a scale of 1 (most difficult) to 5 (least difficult) the challenges they faced in the following categories: spiritual, emotional/psychological, physical, cognitive (intellectual), and other. Of the 22 respondents reviewed to contribute to Data set 2, students averaged the

Table I. The results of the questions associated with the student’s emotional, intellectual, and spiritual preparedness before and after completing the pre-laboratory module.

	Intellectually Prepared		Emotionally Prepared		Spiritually Prepared	
	Before	After	Before	After	Before	After
Not At All	3	0	0	0	2	0
To a Small Extent	7	0	3	0	3	0
To Some Extent	24	8	15	7	14	7
To a Moderate Extent	39	27	41	23	36	23
To a Great Extent	34	37	37	38	34	34
To a Very Great Extent	10	22	21	26	20	24
Not Applicable*	N/A	N/A	N/A	N/A	8	6

following responses ranking difficulty: spiritual – 2.588; Emotional/Psychological – 1.809; physical – 3.318; cognitive – 2.9 indicating on average students found the emotional/psychological aspect of the anatomy dissection experience to be the most difficult.

In response to identify and describe challenges in relation to the Likert scale items students ranked, some students included written commentary regarding their personal responses towards the items listed relevant to their processing of their experience in the anatomy laboratory. One student stated, “This is an experience with death, and it sparks concerns about how life should be lived when we know it is temporary and this is what the end looks like.” Another stated, the experience “Brings up thoughts of my own mortality, family, etc. Disconnection between body and consciousness” while another student expressed, “Being hands on with a human corpse at first is very visceral. It's not something we should be automatically adjusted to. In my opinion with time and understanding the importance of the sacrifice I was able to become comfortable.”

Processing

Students were also given the opportunity for open-ended responses on the post laboratory survey (Data set 2) in addition to their scaled responses. Of the collected student qualitative responses, the most prominent themes identified in response to the question, “What strategies did you use to process your first anatomy laboratory experience” focused on processing their first anatomy laboratory experience were: dissociation, with 8 students indicating practices consistent with this approach, and meditative/reflective practices being used by 7 students.

For example, student responses indicative of a dissociative response included, “I had to focus on the task at hand and not think about the person/cadaver.” Another student stated, “I was just like ‘I can’t think about this right now’ and started cutting, and then the feeling eased up.”

Regarding meditative or reflective practices, one student stated they reflected on who the patient was; “We started by learning about the cause of death of our cadaver, so we knew more about her. It helped remind me that this was once a human (which also make it harder for me to process the lab, when it was over interestingly).” Another student demonstrated physical meditative practice techniques in their response, “I took deep breaths until I accustomed myself to the body.”

Students were also asked to consider the impact of their experience in the anatomy laboratory on their professional formation and identification, specifically responding to the prompt “Describe how can this experience help you learn about self-care as a physician” where 9 students indicated practicing mindfulness as a way to promote self-care. One student reflected, “It’s important to be mindful and aware of your experience not robotic in how you live life. Your state of mind directly effects the way you treat patients.” Another student shared how this experience “showed me the importance of reflection.” One response stated, “This was a prime situation to practice mindfulness. What is bothering me? How do I feel? How can I handle this?”

DISCUSSION

As hypothesized, the educational intervention of an online pre-laboratory module followed by a post-laboratory in-person reflective classroom activity to process any challenges they had throughout this experience demonstrated a positive impact for helping students prepare for their first encounter with a deceased human body prior to the anatomy laboratory. This was observed in the significant impact the students noted in their preparedness increase across multiple factors after completing the pre-laboratory online module. Students also indicated a highly positive response for the in-person, post-laboratory session impacting their readiness, with all students indicating they “agreed” or “strongly agreed” with the statement that

participating in the post-laboratory debrief helped to improve their readiness for the ethical and professional issues encountered in the anatomy laboratory, demonstrating the positive educational intervention of small group debriefing and discussion opportunity for the students. Recognizing the multi-faceted dimensions impacting students' experiences in the anatomy laboratory and acknowledging these beforehand, while providing a space for a structured reflection and debriefing afterwards, empowered students in this experience.

How prepared are the students?

While undergraduate anatomy courses are recommended across many medical colleges and anatomy courses are an integral part of medical education, they are not required undergraduate prerequisites for admission (Association of American Medical Colleges, 2026). Following this, many incoming medical students have limited exposure to human body donors prior to entering medical school. However, this changes as students progress through medical school, where about 95% of gross anatomy courses have students complete some amount of dissection with human body donors (McBride & Drake, 2018).

Exposure to images from deceased human bodies and body donor materials prior to beginning the anatomy laboratory experience ranged amongst the M1s surveyed. While a large number of respondents had viewed human material, a large cohort had not prior to their M1 anatomy laboratory experience. This demonstrates that a level of preparedness of M1 students cannot be universally assumed. It is also relevant to consider that many students may not have witnessed death or a deceased human person prior to their laboratory experience. This may also impact the effect of the laboratory experience on the student personally.

As demonstrated in this study through the intervention, preparation includes more than just knowledge. Preparation can also include emotional, spiritual, and psychological factors, in addition to knowledge and skills. While preparation in these less tangible forms is challenging to measure, we found it an important step to acknowledge the impact the educational experience of dissecting a human body donor may have on each of these aspects of a student and seek to help them begin to prepare for the experience. Ensuring that students are prepared for their first body donor experience might reduce their cognitive load in the laboratory and therefore improve their ability to achieve their course learning outcomes.

What are the challenges that the students face?

One challenge of this educational intervention was considering the emotional impact of a student's first encounter with a human body donor. As recognized, mental distress and the following emotional impact often are realized in the dissection process of parts of the body considered to be more intimate, or in things indicating the personality of the donor (Chaudhuri, 2022). In this intervention, nearly one-third of the students indicated they had never seen a body donor prior to their first anatomy laboratory experience. Religion, folk beliefs, culture, and local history may also influence students' emotional impact with the donor and their approach to human body donation (Habicht *et al.*, 2018). Though this study did not address all of these factors, we acknowledge the importance of being attuned to these issues in teaching and leading this experience, creating an environment where students are encouraged to engage in self-care, discussion, and reflection, sensitive to their own backgrounds that may influence their experience in the anatomy laboratory.

In addition to the anticipated challenge of addressing the emotional impact of the laboratory experience with students, a practical challenge was realized in the application of this intervention. Though part of the curriculum for M1s, participation in this component was optional for the M1 students and they were able to opt in rather than being required to complete this curricular component. This led to participation being those who self-selected, rather than capturing the impact on a larger sample size. This also may have led to participants being students who had more apprehensions about engaging in the laboratory experience than would have been captured in a larger sampling.

How did the students process the experience?

There were a range of ways students processed their experience, with most students gravitating towards the ends of the poles of levels of engagement. As noted in the results section, most of the students who completed the reflective component of the intervention noted they processed the experience through either dissociation on one pole or through reflective and meditative practices on the other pole. It was interesting to observe, though the sample size was small, the dichotomy presented in student reflections on their coping mechanisms.

The impact on education could include creating space for reflection, but recognizing many students may not be ready to engage in this manner as they are actively working in the laboratory. A place to consider adding in this reflective space could be integrating it into the curricular element of

medical education as part of a Medical Student Portfolio Program. Though not ubiquitous in medical education, Medical Student Portfolios are a space for student reflection and can help foster professional development (Tan *et al.*, 2022). For colleges with these programs in place, a reflection on the anatomy laboratory experience built into the Medical Student Portfolio could provide a space within the curriculum for students processing their experience. Additional means to help with student processing and reflection could include memorial services that programs hold for human body donors. These services may provide emotional comfort while humanizing donors for students, in addition to being a way to acknowledge and honor the gift of the donor by students and for the donors' friends and family (Pawlina *et al.*, 2011).

Implications for experiences beyond the laboratory

The anatomy laboratory presents a safe space for students to begin practicing professionalism skills that will lead into their future practices as physicians. Working with body donors affords students an immeasurable opportunity to practice professionalism prior to working with patients. These students are able to practice strategies for handling new and potentially stressful situations as well as begin to develop leadership skills and independent exploration (Pawlina & Lachman, 2004). Naming these opportunities and engaging in educational interventions shaped to help students reflect upon and process these experiences can help develop a skill that will be translatable beyond the laboratory, including the ability to balance between detachment and sensitivity (Charlton & Smith, 2000; Rizzolo, 2002).

Connection to future practice

Medical education is intended to transform individuals from students to physicians. Professional identity formation is an important aspect of this experience for learners (Goldie, 2012; Chandran *et al.*, 2019). As students engage in the anatomy laboratory, they are faced with human frailty and death, as well as given the opportunity to implement practices to help cope with new, challenging, and perhaps stressful situations. This encounter may be formative in professional identity. As students noted how reflective practices were helpful, this connection could apply to the way in which they practice as future professionals and form habits leading to establishing self-care practices, such as mindfulness and self-reflection.

CONCLUSION

Working with human body donors continues to be an integral component of medical education. This is due to the important role it plays in the learning of anatomy along with

the development of critical competencies needed to practice as a clinician. As demonstrated in this study, developing a pre-laboratory education module and post-laboratory reflection interventions would reduce the anxiety felt by students in association with their laboratory experience. This was indicated in the students' Likert scaled responses and qualitative feedback reflecting on their experiences. We also found that these interventions provided better learning experiences for students and presented an opportunity to incorporate the teaching of ethics and professionalism explicitly tied to clinical care. Future studies will focus on the educational advantages that these interventions will provide as it reduces the students' cognitive load and in turn help improve their anatomy learning experience.

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RESUMEN: Aprender anatomía es fundamental para todos los estudiantes de ciencias de la salud, y trabajar con donantes de cuerpos se considera una herramienta de aprendizaje superior. Para muchos estudiantes, esta es su primera experiencia trabajando con un cuerpo humano fallecido. En este estudio, evaluamos la preparación emocional, intelectual y espiritual que sienten los estudiantes de medicina de primer año antes de su primera experiencia en el laboratorio de anatomía. Planteamos la hipótesis de que la incorporación de un módulo de formación pre-laboral para ayudar a los estudiantes a prepararse para la experiencia, además de como un ejercicio reflexivo posterior, les ayudaría a procesar su primera experiencia en el laboratorio de anatomía. Los hallazgos de este estudio demostraron que existe una diferencia estadísticamente significativa observada tras la intervención previa al módulo. Como parte de la reflexión posterior, los estudiantes respondieron a preguntas abiertas. Sus respuestas a estas preguntas destacaron la importancia de la práctica reflexiva y consciente, tanto para su primera experiencia en el laboratorio de anatomía como para su futura vida profesional. Si bien existen muchas experiencias formativas en la facultad de medicina, este encuentro temprano con donantes de cuerpos ofrece desafíos y oportunidades únicas para la formación de la identidad profesional. Las intervenciones educativas para ayudar a preparar y procesar esta experiencia demostraron un impacto positivo en los estudiantes. Los estudios futuros se centrarán en el impacto de estas actividades en el aprendizaje estudiantil al reducir la carga cognitiva.

PALABRAS CLAVE: Anatomía; Educación; Laboratorio; Donantes de Cuerpos; Preparación; Desafíos; Procesamiento.

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