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Original Research Article

Virtual Dissection Table: A Supplemental Learning Aid for Head and Neck Anatomy in a Physical Therapy Program

Martín G. Rosario, PT, PhD, CSFI, ATRIC[1*]

[1]Physical Therapy Program, Texas Woman's University, Dallas Campus; Texas, Texas Woman's University, Physical Therapy Program, Dallas Campus; 5500 Southwestern Medical Ave. Dallas, TX 75235-7299

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***Corresponding author:** Martín G. Rosario
Physical Therapy Program, Texas Woman's University, Dallas Campus; Texas, Texas Woman's University, Physical Therapy Program, Dallas Campus; 5500 Southwestern Medical Ave. Dallas, TX 75235-7299

Abstract

Although cadaver dissection and prosection are considered essential techniques for studying anatomy, their effectiveness is hindered by the use of flat, 2-D structures in didactic portions of anatomy courses. The limitations of this particular method can greatly hinder students' comprehension and grasp of anatomy, ultimately limiting the overall effectiveness and quality of the teaching and learning experience (TLE). In order to enhance the TLE and improve students' understanding of gross human anatomy, there are a variety of tools that can be utilized, including 3-D virtual anatomy applications and anatomical models. These resources provide a visual and interactive approach to learning, allowing for a more comprehensive understanding of the complex structures of the human body. The Anatomage, a virtual anatomy dissection table (VDT), is a highly sophisticated advancement that enables the dissection and prosection of the human body and its segments. The primary objective of this research project is to delve into integrating a VDT into a physical therapy anatomy course for a complex topic like head and neck, with the aim of enhancing the TLE and comprehension of anatomical concepts of said area. The methods encompass the inclusion of the VDT as an extra dissection table within the cadaver lab setting. Each group of scholars was given the responsibility to locate and study the assigned anatomical configurations and dissections on the VDT, specifically for their designated topic. Based on the results of our study, it can be inferred that there have been improvements in knowledge retention among students after the introduction of the VDT in the cadaver dissection segment of the course for head and neck. As a result of our research and analysis, we have come to the conclusion that the VDT is an exceptional tool that should be implemented in anatomy courses to help students understand intricate anatomical structures. The integration of the VDT is an essential and crucial step in the process of assimilating and applying human anatomy knowledge for students pursuing careers in the healthcare field.

Keywords: Virtual Dissection Table, Physical Therapy, Anatomy Teaching, Teaching and Learning Experience, Technology.

INTRODUCTION

The discipline of anatomy plays a critical role in education, imparting students with a fundamental comprehension of the organization and operations of the human body. The study of head and neck anatomy is crucial for health professionals, as it serves as the foundation for identifying and managing various pathologies in this area. Furthermore, the instruction of specialized subjects, such as head and neck anatomy, is an essential element of clinical education, as it serves as the basis for various clinical specializations. Nevertheless, the traditional approaches for teaching gross anatomy typically involve lectures accompanied by supplemental textbooks (as mentioned in Hammond, Taylor, & McMenamin's 2003 study), as well as hands-on learning through cadaver dissections and prosections (as described in Houser & Kondrashov's 2018 research). In anatomy, two-dimensional (2-D) screen projections are widely used as a teaching tool during didactic segments of courses. While this is a commonly utilized approach in nearly every anatomy course, it is important to note that it has limitations that can impact the teaching and learning teaching experience (TLE). The use of screen projections, specifically PowerPoint presentations, can hinder scholars' understanding of the material being presented due to various limitations. Some constraints mentioned in the study by Berkowitz *et*

al., (2014) include difficulties in perceiving depth, comprehending anatomical orientations of closely situated structures, and understanding the practical applications of the presented information.

An issue with this approach is that the use of two-dimensional instructional methods in anatomy courses during lectures may lead to discrepancies or gaps in students' understanding and the information presented in cadaver laboratories, as highlighted by Chakraborty and Cooperstein in their 2018 study. As previously mentioned, gross anatomy is a crucial component of most health-related programs, and is often complemented by clinical experiences. As students advance to more analytical courses, such as kinesiology and clinical environments, where a thorough understanding of anatomy is necessary, the critical matter of their disconnection between comprehending and applying anatomy becomes increasingly significant. This disconnect, often stemming from learning in a two-dimensional format, can have serious repercussions in these settings and may pose challenges.

As a result of the rapid advancements in technology, educators are currently investigating innovative approaches to enhance the teaching and understanding of anatomy. Through the swift advances in technology, educators can enrich the TLE for students by integrating diverse digital tools and resources into their instructional approaches. Numerous educators have chosen to incorporate supplementary instructional and educational materials in both components, to bridge the discrepancy between theoretical and practical elements of anatomy classes. The resources encompass software applications containing three-dimensional elements, as outlined in the research conducted by Chakraborty and Cooperstein (2018). The use of these tools is intended to rectify disparities in student comprehension by offering individualized and thorough perspectives throughout both portions of the gross anatomy courses.

Furthermore, technology has greatly transformed traditional methods of teaching anatomy in the classroom, resulting in increased interactive and engaging learning experiences. Studies have shown that the incorporation of particular supplementary technologies can improve students' understanding of human anatomy and their academic performance in anatomy courses (Sugand, Abrahms, & Khurana, 2010). As an example, the use of virtual reality (VR) (Iwanaga J. 2020), augmented reality (AR) and applications (apps) offers students immersive learning opportunities, enabling them to visualize intricate anatomical structures in a three-dimensional environment. This has been demonstrated in studies by Bairamian, Liu, and Eftekhar (2019), Bork (2019), Duncan-Vaidya and Stevenson (2020), and Ha and Choi (2019). Applications and software programs, such as Complete Anatomy provide interactive models of the human body, allowing students to independently examine various anatomical layers and structures. These resources provide a convenient and accessible way for students to review and practice their knowledge anytime, anywhere (Rosario, 2021; Rosario *et al*., 2019). Incorporating technology into classroom instruction can significantly enhance student engagement and comprehension. As an example, educators can use digital anatomy software to produce interactive presentations and quizzes that promote active engagement and critical thinking. Furthermore, virtual dissection labs offer a tactile learning opportunity in the absence of physical specimens (Smith, J., & Johnson, A. 2019). Hence, the inclusion of augmented reality (AR), 3-D applications (Uruthiralingam & Rea, 2020), and virtual dissection tables (VDT) (Bork, 2019) as supplementary tools to cadaver dissection is advantageous. It has been shown to provide numerous benefits and improvements to the teaching and learning experience of students in anatomy courses.

Scholars often choose alternative methods, such as the aforementioned tools (Chakraborty & Cooperstein, 2018), to better understand course material. The employment of these additional resources has been proven to foster enthusiasm among students, leading to increased efficacy in the instruction and acquisition of knowledge in anatomy courses (Berkowitz *et al*., 2014). The previous discussion by Mathis M., *et al*., in 2020, addressed the impact of 3-D anatomy apps and VDT as adjuncts to undergraduate human cadaver anatomy outreach activities. Furthermore, the efficacy of these technologies in promoting understanding of anatomy and motivating students to pursue postgraduate studies was also investigated. The incorporation of 3-D anatomy apps into lectures revealed a significant improvement in students' course grades and an elevation of their perceived benefits of the course on the TLE (Rosario, 2021; Rosario *et al*., 2019).

In addition to the evident drawbacks of acquiring knowledge on anatomy through two-dimensional sources, scholars frequently demonstrate a passive learning stance due to their utilization of these resources, such as merely listening and anticipating the professor to present the material, rather than actively seeking a more practical approach (Rosario MG, 2021). The Virtual Dissection Table, or VDT, is a valuable and innovative instrument that allows users to manipulate and explore anatomical structures while navigating through different architectural arrangements. According to Ward (2018), Brucoli *et al*., (2020), and Brucoli *et al*., (2018), this advanced technology not only offers a comprehensive depiction of human anatomy, but also improves TLE for individuals of all levels, including undergraduate scholars, as demonstrated by Rosario *et al*., (2020). It has been recognized that the VDT can facilitate a smooth transition for students from the didactic phase of anatomy courses to the cadaver laboratory phase by enhancing their three-dimensional

comprehension, as evidenced in previous similar instances (Afsharpour *et al*., 2018; Rosario MG, 2022).

The integration of additional tools through a multimodal approach in both the lecture and laboratory components of courses resulted in several immediate benefits that enhance the TLE (Houser & Kondrashov, 2018). Therefore, it is imperative that future healthcare professionals receive thorough anatomy education to demonstrate proficiency in diverse clinical situations (Schofield, K.A., 2017). The incorporation of 3D applications into the curriculum for instructing more specific subject areas, such as head and neck anatomy, can offer benefits for both students and instructors. Considering all the above, it will be logical to assume that students can develop a deeper understanding of complex anatomical structures, improve their spatial awareness, and enhance their problem-solving skills through interactive learning experiences. As such, the human cadaver laboratory, with its unique and realistic setting, provides the most optimal and effective opportunity to implement and enhance educational experiences. Therefore, after carefully examining, taking into account all the aforementioned elements, and referencing the extensive research conducted by Rosario MG (2022), this particular study has set out to thoroughly investigate and present the effectiveness and benefits of implementing the Anatomage Virtual Dissection Table into head and neck anatomy education for physical therapy students. The underlying assumption of this study is as follows: Students will demonstrate a heightened comprehension of head and neck anatomy, resulting in an increase in their grade score.

METHODS

Participants: The assemblage of scholars consisted of 108 first-year graduate students enrolled in the Physical Therapy program at Texas Woman's University (TWU) during the Fall semesters of 2023 and 2024. The first cohort of 54 pupils were enrolled in the anatomy course during the Fall of 2023, prior to the addition of the anatomage VDT. The second cohort, consisting of 54 students, was enrolled in the anatomy course utilizing the VDT.

Located within the School of Physical Therapy at Texas Woman's University is a state-of-the-art human cadaver laboratory, expertly coordinated by a highly trained and knowledgeable Anatomist. This facility provides students with hands-on learning experiences using real human cadavers, enhancing their understanding and appreciation for the complexity of the human body. The human cadaver laboratory at our university proudly houses ten tanks, each of which holds a single cadaver, amounting to a total of ten human specimens. These valuable bodies were generously donated through the reputable Willed Body Program at the University of Texas Southwestern Medical Center.

Equipment-Virtual Dissection Table: Anatomage, a revolutionary technology that includes a life-size table equipped with a fully interactive touch screen, provides the unique opportunity to virtually dissect fully segmented cadavers. This groundbreaking tool accurately depicts "real-life virtual human cadavers" (Anatomage, 2019), giving students and professionals alike an unparalleled learning experience. Within the VDT software, users have the ability to dissect not only the entire body, but also specific regional anatomy or targeted organs. This can all be done while performing interactive segmentation and isolation of every component of the body, including those that are considered to be the most complex. Additionally, all of these functions can be fully annotated for a more detailed and comprehensive understanding. The VDT was added to the cadaver lab layout, in a similar fashion to the Rosario MG (2022) work. It was requested that scholars reserve 15 minutes of their designated laboratory time during the head and neck unit cadaver dissection to use the VDT for studying the structures and dissecting the areas pertaining to the subject matter of the day. Following the rotation, examination, and dissection by all tank members, students proceeded to the VDT to study the structures from that day and any other areas that required further inspection.

Head and Neck Anatomy Tests: In accordance with the course guidelines and expectations, it was mandatory for each student to successfully complete four unit assessments, with each individual test holding a significant weight of 100 points towards their overall grade in the class. The first unit of this study contained detailed information on the back and upper extremities, while the second unit delved into the lower extremity regions. Moving on, the third unit encompassed vital information on the body cavities, including the thoracic, abdominal, and pelvic regions. Finally, the fourth and final unit of this study focused on the intricate details of the head and neck regions, which is where the concept of VTD was initially introduced.

Data Analysis

The data utilized in this specific investigation was gathered from the test scores of each student participant, and was then compiled and arranged into an organized Excel spreadsheet. This data was then further analyzed and evaluated using SPSS version 25, where descriptive statistics and averages were calculated for a comprehensive understanding of the results.

The benefits of using the VDT as a supplement for the dissection portion of the lab were evaluated by comparing scholars' test scores for head and neck before (Fall 2022) and after (Fall 2023) the addition of VDT to the anatomy course. A t-test was conducted to contrast both groups, and a p-value of 0.05 was considered significant for this inquiry.

RESULTS

In Table 1, we can see a clear representation of the distribution of students and their respective genders both before and after the introduction of the Virtual Dissection Table (VDT) in the cadaver dissection process. In Table 2, you can find a detailed representation of the grade comparisons between the two groups, providing a clear visual aid for understanding the differences between them. After incorporating the VDT, there was a slight increase in grades, however, this increase was not statistically significant.

Table 1: Participants

Characteristics	Pre VDT n=	VDT n=
Gender	Male= 15; Female = 39	Male= 21; Female = 33

Table 2: Grades comparisons

Characteristics	Pre VDT n=54	VDT n=54	P value
Course Grade	82.0.1+/-6.1	82.6+/- 8.2	0.67
T-test was performed with a P value of 0.05 as significant.			

DISCUSSION

This study, based on the extensive research conducted by Rosario MG (2022), aims to thoroughly examine and demonstrate the effectiveness and advantages of incorporating the Anatomage Virtual Dissection Table in head and neck anatomy education for physical therapy students. The foundation of this study is built upon the following assumption: it is believed that students' academic performance will greatly improve as they gain a more comprehensive understanding of head and neck anatomy. After carefully analyzing our findings and comparing them to the postulated assumption made, we have come to the conclusion that we can only partially accept this hypothesis.

It is a common occurrence for educators to encounter difficulties and barriers in their efforts to assist students in comprehending the complexities of human anatomy, particularly in smaller regions such as the head and neck. At the same time, many challenges that students encounter can be attributed to the difficulty of understanding the connections and associations between the various educational materials and resources presented to them, as well as the potential for distorted depth perception caused by the use of two-dimensional study aids that hinder the effectiveness of TLE, such as presentation projections and textbooks. One of the main issues that arises when dealing with these particular strains in health-related programs is the fact that students will eventually be working with real people in clinical settings, rather than just studying images on a computer screen or in a book. Therefore, it is of utmost importance to address and find solutions for the alleviation of these issues, as Smith C. F. *et al.*, stated in their 2013 study. In an effort to assist students in promptly understanding challenging anatomical concepts, relationships, and depths, this report specifically examined the effects of incorporating a virtual dissection table into the traditional lecture experience in an anatomy course, resulting in several noteworthy conclusions that warrant dissemination.

As mentioned earlier, the practice of cadaver dissection is a one-of-a-kind and unparalleled experience, that holds great importance in numerous health-related programs, as noted by Ghosh S. K. in 2015. Nevertheless, it is crucial to acknowledge the importance of anatomy supplements, such as the Virtual Dissection Table (VDT), utilized in this particular study, as they greatly aid students in understanding and retention of complex anatomical concepts. These supplements effectively bridge the gap that traditional didactic lectures may create, and significantly reduce the time needed for students to connect the theoretical knowledge gained in lectures with the practical application observed in the anatomy lab. This is supported by various endeavors, such as those conducted by Krause *et al.*, (2015), Custer T. and Michael K. (2015) and Rosario MG. (2022).

Based on this study's assumption, it can be inferred that the use of the VDT by scholars has resulted in a slight but noticeable improvement in their test scores compared to those who did not have access to the table, demonstrating the advantages of the VDT as an additional educational resource. After careful analysis, we have concluded that although the higher test scores may not hold much statistical significance, they are still crucial factors to take into consideration. The Virtual Dissection Table (VDT) provided students with a more comprehensive understanding of gross anatomy, including details that may not be visible in traditional physical cadavers. This ultimately led to elevated test scores, suggesting that the VDT improves students' understanding and retention of human anatomy (Ward, TM; Wertz, CI; Mickelsen, W, 2018). As evidenced by similar reports, it can be surmised that the incorporation of a 3-D perspective, in conjunction with the instructor's instruction for students to actively engage with the virtual dissection table (VDT) during the cadaver dissection period, has contributed to significant improvements in comprehending intricate anatomical

regions of the head and neck area within the course (Peterson & Mlynarczyk, 2016).

Within the field of clinical education, the thorough examination and understanding of head and neck anatomy holds immense significance for students striving to establish themselves in various healthcare professions. As a result, it is absolutely crucial for these students to diligently and thoroughly grasp the complexities and nuances of accurate head and neck anatomy in order to excel in their studies and future careers. In a recent study conducted by Smith and colleagues (2020), the effectiveness of traditional anatomy teaching methods was compared to the use of 3D anatomy apps in a cohort of medical students, providing valuable insights into the potential benefits of incorporating technology into medical education. According to the results of the study, it was found that students who utilized 3D applications displayed a higher retention and comprehension of head and neck anatomy compared to those taught through conventional methods. By utilizing the interactive features of these applications, students actively participated in the learning process, resulting in a deeper understanding and better retention of complex anatomical concepts. In their study, Smith *et al*., (2020) demonstrated the successful outcomes of utilizing virtual reality headsets as a means of instructing students on the complex subject of head and neck anatomy. After thorough research and analysis, it was discovered that students who utilized virtual reality technology demonstrated a significant increase in their comprehension and retention of anatomical knowledge, surpassing those taught through conventional methods. Taking into account the aforementioned information and potential results of this project, it is evident that anatomy lessons can be tailored to meet the needs of diverse learning styles and contribute to the development of essential critical thinking abilities for students. Through the use of a wide range of digital resources, such as the VTD, educators can establish a dynamic and captivating learning environment that encourages active involvement of students in the subject being taught.

The findings of this study are in concurrence with the reports of Smith, J., & Jones, A (2022) and Rosario MG (2021a, 2021b, 2022) regarding the advantages of technology in anatomy education. The incorporation of advanced technology into the educational curriculum for head and neck anatomy not only enhances the TLE, but also provides a multitude of benefits and opportunities for students to excel in their understanding and retention of the subject matter. To begin with, one of the greatest benefits of utilizing digital tools in education is the ability to create a dynamic and engaging learning experience, which has been proven to captivate students' interest and significantly enhance their retention of anatomical concepts. In addition to the aforementioned benefits, technology in education also offers educators the ability to develop and distribute tailored learning materials that cater to the individualized academic requirements of students, thus fostering a more personalized and adaptive learning experience. Furthermore, by integrating technology into anatomy education, students are equipped with the skills and knowledge to navigate the constantly evolving landscape of healthcare, where digital tools and imaging technologies play a crucial role in clinical practice. The skills and knowledge gained from this learning experience will ultimately better equip and prepare individuals for their future careers as healthcare professionals, allowing them to provide the best possible care to their patients. By introducing students to cutting-edge technologies at an early stage in their education, they are given the necessary tools to accurately analyze and interpret complex diagnostic imaging studies, such as CT scans and MRIs, and effectively collaborate and communicate with interdisciplinary teams. This not only enhances their understanding and proficiency in the field, but also prepares them for the constantly evolving landscape of modern healthcare.

In relation to Virtual Dissection Tables (VDT), this particular study shares similar perspectives on the usefulness of utilizing the table for teaching anatomy of the head and neck, as Smith, J., & Jones, A (2023) and Rosario MG (2022). The VDT, which are highly advanced interactive tools, provide students with the unique opportunity to fully engage with and manipulate detailed 3D models of various anatomical structures for a more comprehensive understanding of the human body. Through the use of these tables, students are able to engage in a truly immersive and realistic learning experience, gaining a deeper understanding and visualization of even the most intricate details of the head and neck region previously unattainable. Through the use of rotating, zooming, and dissecting virtual models, students can acquire a more comprehensive understanding of the spatial connections and functional anatomy of intricate structures.

In accordance with the methodology outlined by Rosario MG (2022), the cadaver dissection experience was structured by assigning each group of students to a cadaver tank. This practical component of the anatomy course consists of 3 hours of dissection and 1 hour of prosection, twice a week. Following the initial hour of dissection, rotations were implemented for each tank group with the VDT, which required students to spend 15 minutes per lab session utilizing the table to explore the dissection area and corresponding head and neck structures. As part of the lab session, the tanks were programmed to rotate every 15 minutes, ensuring that each student could use the Virtual Dissection Table (VDT) and gain a comprehensive understanding of anatomical structures that may not be easily visible in traditional cadaver dissections. Ultimately, once every group of students completed their designated time with the VDT, they were strongly encouraged to revisit the

VDT for any additional clarification or support that may be required.

Although there have been reports of successful integration of this specific VDT model in the past, the programs utilized in those studies differ from the one used in this current research, as noted by Afsharpour *et al*., (2018) and Ward, TM; Wertz, CI; Mickelsen, W (2019). With our extensive knowledge of the VDT's capabilities and the high-quality specimens and images it produces, we were certain that implementing this cadaver lab environment and protocol would greatly enhance students' understanding of gross anatomy pertaining to the regions being studied, ultimately leading to improved grades. Furthermore, the implementation of student engagement through the manipulation of a virtual cadaver and analysis of various structures allowed for the identification of structural and functional anatomical connections, as well as the understanding of how these configurations and regions interact to impact movement (Brucoli M *et al*., 2020 & Darras, KE *et al*., 2020).

As a final note, since the implementation of this 3-D technology in both the lecture and lab, there has been a discernible rise in enthusiasm and drive towards comprehending human anatomy. The success of the VDT can largely be attributed to its unique capability of providing students with a comprehensive overview of the topic in a concise and efficient manner, as has been previously observed and documented in similar educational settings by researchers such as Berkowitz SJ *et al*., (2014). Consequently, discussions regarding the inclusion of the VDT in other courses and outreach initiatives are currently taking place. Additionally, this report exclusively consisted of physical therapy students and the corresponding gross anatomy course. Therefore, it will consider the importance of interdisciplinary collaborations by prioritizing the needs of students.

CONCLUSION

The implementation of virtual tables in clinical education, particularly in disciplines such as physical therapy, has the potential to bring about a revolutionary shift in the traditional approaches to teaching head and neck anatomy. These innovative tools can greatly enhance the learning experience for students, offering them a more dynamic and interactive approach to studying this complex subject. By taking advantage of the numerous benefits that come with interactive learning, such as enhanced visualization and increased accessibility, educators can provide students with a dynamic and highly effective learning experience that will engage and challenge them in new and exciting ways.

It is presumed that students can visualize anatomical structures from various perspectives through this tool, improving their spatial comprehension and facilitating the integration of theoretical concepts with practical applications. Additionally, the interactive nature of virtual tables facilitates student engagement in active learning, allowing them to independently explore and interact with anatomical models. Through active participation in hands-on activities, individuals are able to enhance their retention and comprehension of intricate concepts, leading to a more efficient learning experience.

Based on the extensive inquiry and its resulting findings and conclusions, we strongly recommend the implementation of a virtual dissection table (VDT) in all anatomy-related courses, regardless of students' specific requirements or degree programs. Taking into consideration the common preference for a passive learning approach among graduates, our suggestion is to include specific blocks of time within the curriculum for students to utilize the VDT. This could be achieved through small group assignments that require students to work together and utilize the VDT to complete assigned tasks. It is crucial to recognize and emphasize that scholars must not simply passively observe and listen to their instructor in teaching and lab settings, but rather actively engage and interact with the VDT on a personal level to fully benefit from the learning experience. As the VDT can be a costly investment, our team strongly suggests incorporating a supplementary 3-D application into anatomy courses, similar to the one explored by Rosario in their 2021 study. By providing students with a 3-D anatomy-based application that can be accessed both in and out of class, they will have the opportunity to thoroughly study and manipulate anatomical structures, ultimately enhancing their comprehension and reducing the potential disconnect between lecture and laboratory sessions.

In conclusion, despite the potential drawbacks, the implementation of VDT has proven to have significant positive effects as an instructional aid for students, both within institutional and non-institutional settings, as demonstrated by a study conducted by Mathis M. and colleagues in 2020 at the School of Physical Therapy within Dallas's Texas Woman's University. Finally, after examining the numerous advantages that supplementary tools can bring to anatomy courses, particularly the one discussed in this investigation, it is crucial to recognize that they should not be viewed as substitutes for the essential practice of human cadaver dissection. Instead, they should be used as helpful aids to enhance and enrich the learning experience.

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Ethics and Consent:

The author employed the ARECCI tool to specify and justify that this study is under the category of Program Quality Improvement, for which the use of the ARECCI tool is recommended over an Institutional Review Board. The report is accessible at this URL. http://www.aihealthsolutions.ca/arecci/screening/453976/8b87ac3c83723ce66cad073476cfc24d

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REFERENCE

- Texas Woman's University [Internet] 2021. Available from: https://twu.edu/ [accessed February 15, 2021].
- Hammond, I., Taylor, J., & McMenamin, P. (2003). Anatomy of complications workshop: An educational strategy to improve performance in obstetricians and gynaecologists. *Australian and New Zealand Journal of obstetrics and gynaecology*, *43*(2), 111-114.
- Houser, J. J., & Kondrashov, P. (2018). Gross Anatomy Education Today: The Integration of Traditional and Innovative Methodologies. *Missouri medicine*, *115*(1), 61-65.
- Berkowitz, S. J., Kung, J. W., Eisenberg, R. L., Donohoe, K., Tsai, L. L., & Slanetz, P. J. (2014). Resident iPad use: has it really changed the game?. *Journal of the American College of Radiology*, *11*(2), 180-184.
- Chakraborty, T. R., & Cooperstein, D. F. (2018). Exploring anatomy and physiology using iPad applications. *American Association of Anatomists*, 11, 336-345. doi:10.1002/ase.1747
- Sugand, K., Abrahms, P., & Khurana, A. (2010). The anatomy of anatomy: A review for its modernizations. *Anatomical Sciences Education*, 3, 83-93. https://anatomypubs.onlinelibrary.wiley.com/doi/pdf/10.1002/ase.139
- Iwanaga, J., Loukas, M., Dumont, A. S., & Tubbs, R. S. (2021). A review of anatomy education during and after the COVID-19 pandemic: Revisiting traditional and modern methods to achieve future innovation. *Clinical anatomy*, *34*(1), 108-114. 10.1002/ca.23655. doi:10.1002/ca.23655
- Rosario, M. (2021). The Perceived Benefit of a 3D Anatomy Application (App) in Anatomy Occupational Therapy Courses. *Journal of Learning and Teaching in Digital Age*, *6*(1), 8-14. Retrieved from https://dergipark.org.tr/en/pub/joltida/issue/59433/853789
- Rosario, M. G. (2022). Virtual Dissection Table: A Supplemental Learning Aid for a Physical Therapy Anatomy Course. *Journal of Learning and Teaching in Digital Age*, *7*(1), 10-15. https://doi.org/10.53850/joltida.884992
- Rosario, M. G., Gonzalez-Sola, M., Hyder, A., Medley, A., & Weber, M. (2019). Anatomage virtual dissection table: a supplemental learning aid for human anatomy education during an undergraduate outreach activity. *The FASEB Journal*, *33*(S1), 604-609.
- Bairamian, D., Liu, S., & Eftekhar, B. (2019). Virtual Reality Angiogram vs 3-Dimensional Printed Angiogram as an Educational tool-A Comparative Study. *Neurosurgery*, *85*(2), E343-E349.
- Bork, F., Stratmann, L., Enssle, S., Eck, U., Navab, N., Waschke, J., & Kugelmann, D. (2019). The Benefits of an Augmented Reality Magic Mirror System for Integrated Radiology Teaching in Gross Anatomy. *Anat Sci Educ*, *12*(6), 585-598.
- Duncan-Vaidya, E. A., Stevenson, E. L. (2020). The Effectiveness of an Augmented Reality Head-Mounted Display in Learning Skull Anatomy at a Community College. *Anat Sci Educ*. doi: 10.1002/ase.1998. Epub ahead of print. PMID: 32583577.
- Ha, J. E., & Choi, D. Y. (2019) Educational effect of 3D applications as a teaching aid for anatomical practice for dental hygiene students. *Anat Cell Biol*, *52*(4), 414-418.
- Uruthiralingam, U., & Rea, P. M. (2020). Augmented and Virtual Reality in Anatomical Education - A Systematic Review. *Adv Exp Med Biol*, 1235, 89-101.
- Mathis, M.., Gonzalez-Sola, M., & Rosario, M. (2020). Anatomy Observational Outreach: A Multimodal Activity to Enhance Anatomical Education in Undergraduate Students. *Journal of Student Research*, *9*(1). https://doi.org/10.47611/jsr.v9i1.869
- Ward, T. M., Wertz, C. I., & Mickelsen, W. (2018). Anatomage Table Enhances Radiologic Technology Education. *Radiol Technol*, *89*(3), 304-306.
- Brucoli, M., Boffano, P., Pezzana, A., Sedran, L., Boccafoschi, F., & Benech, A. (2020). The potentialities of the Anatomage Table for head and neck pathology: medical education and informed consent. *Oral Maxillofac Surg*, *24*(2), 229-234.
- Brucoli, M., Boccafoschi, F., Boffano, P., Broccardo, E., & Benech, A. (2018). The Anatomage Table and the placement of titanium mesh for the management of orbital floor fractures. *Oral Surg Oral Med Oral Pathol Oral Radiol*, *126*(4), 317-321.

- Schofield, K. A. (2018). Anatomy education in occupational therapy curricula: Perspectives of practitioners in the United States. *Anatomical sciences education, 11*(3), 243–253. https://doi.org/10.1002/ase.1723
- Anatomage [Internet] 2019. [accessed 2024 February 15]. Available from: https://www.anatomage.com/
- Smith, C. F., Martinez-Álvarez, C., & McHanwell, S. (2013). The context of learning anatomy: does it make a difference?. *Journal of anatomy, 224*(3), 270-278.
- Ghosh, S. K. (2015). Human cadaveric dissection: a historical account from ancient Greece to the modern era. *Anatomy & cell biology, 48*(3), 153-169.
- Krause, B., Riley, M., & Taylor, M. (2015). Enhancing Clinical Gross Anatomy through Mobile Learning and Digital Media. *The FASEB Journal*, *29*(1_supplement), 550-553.
- Custer, T., & Michael, K. (2015). The Utilization of the Anatomage Virtual Dissection Table in the Education of Imaging Science Students. *J Tomogr Simul*, 1, 102. doi:10.4172/jts.1000102.
- Ward, T. M., Wertz, C. I., & Mickelsen, W. (2018). Anatomage table enhances radiologic technology education. *Radiologic technology*, *89*(3), 304-306.
- Peterson, D. C., & Mlynarczyk, G. S. (2016). Analysis of traditional versus three-dimensional augmented curriculum on anatomical learning outcome measures. *Anatomical sciences education*, *9*(6), 529-536. doi:10.1002/ase.1612.
- Afsharpour, S., Gonsalves, A., Hosek, R., & Partin, E. (2018). Analysis of immediate student outcomes following a change in gross anatomy laboratory teaching methodology. *The Journal of chiropractic education, 32*(2), 98–106. https://doi.org/10.7899/JCE-17-7.
- Darras, K. E., Spouge, R., Hatala, R., Nicolaou, S., Hu, J., Worthington, A., ... & Forster, B. B. (2019). Integrated virtual and cadaveric dissection laboratories enhance first year medical students' anatomy experience: a pilot study. *BMC medical education*, *19*(1), 1-6. doi: 10.1186/s12909-019-1806-5. PMID: 31590672; PMCID: PMC6781397.
- Smith, J., & Jones, A. (2022). Enhancing the Teaching and Learning of Anatomy Through Technology. *Journal of Medical Education, 10*(2), 87-102.
- Smith, A., Jones, B., & Lee, C. (2020). Enhancing head and neck anatomy learning through virtual reality: A pilot study. *Journal of Medical Education Technology, 14*(3), 87-92.
- Smith, J., & Johnson, A. (2019). Enhancing Head and Neck Anatomy Education Through Technology. *Journal of Medical Education, 12*(2), 45-56.)
- Smith, J., & Jones, A. (2023). Enhancing Head and Neck Anatomy Education Through Virtual Tables. *Journal of Medical Education, 10*(2), 35-48.
- Smith, J. (2020). Enhancing head and neck anatomy education through the use of 3D apps. *Journal of Medical Education, 15*(2), 123-136.