### EDUCATIONAL • RESOURCE

Volume 14 Issue 2 2022

DOI: 10.21315/eimj2022.14.2.10

#### **ARTICLE INFO**

Received: 19-11-2021 Accepted: 29-01-2022 Online: 30-06-2022

### Systematic Approach of Using Body Painting Method for Anatomy Teaching and Practical via Online Platform

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**To cite this article:** Choy KW, Hadie SNH. Systematic approach of using body painting method for anatomy teaching and practical via online platform. Education in Medicine Journal. 2022;14(2):125–135. https://doi.org/10.21315/eimj2022.14.2.10

To link to this article: https://doi.org/10.21315/eimj2022.14.2.10

#### ABSTRACT \_

In the context of medical education, body painting refers to the schematic portrayal of internal organs on the body's surface. Body painting session has been reported to be fun and engaging, and it encourages learning through easy visualisation of underlying anatomical structures. Besides improving anatomical knowledge retention, body painting is particularly effective for learning surface anatomy and complementing the teaching of clinical skills and peer assessment procedures such as palpation. Indeed, the clinical relevance of the gross anatomy can be conveyed to students by bringing cadaveric anatomy to life body painting. In educational perspective, the delivery of body painting method is in line with the active learning approach and collaborative learning principle; and its instructional design follows the principles of the cognitive load theory. In this article, we provide a systematic approach for a successful body painting session for anatomy teaching via online platform, which cater for remote learning needs amidst the COVID-19 pandemic.

Keywords: Body painting, Anatomy, Teaching and learning tool

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### INTRODUCTION

Anatomy is one of the most important subjects in the field of medicine and allied health sciences (1). However, learning anatomy is challenging as it requires a good visuospatial ability in translating three-dimensional (3D) relationships of anatomical structures. Cadaveric dissection is arguably the gold standard for teaching anatomy, as dissection provides a clear 3D organisation of human body structures through kinaesthetic experience of human body tissues (2–3). Nevertheless, the emergence of the COVID-19 (4) and the shortage of cadavers in many medical schools are forcing innovative learning and teaching approaches (5–6).

The prevailing factors responsible for efficient learning in anatomy are influenced by the design of teaching and learning methodologies (7).Hence, to ensure effective anatomy learning, teaching methodologies in anatomy should necessitate a combination of memorisation, comprehension and visualisation skills (7). Indeed, anatomy education in the 21st century has revolutionised to incorporate state-of-the-art modalities in order to fulfil the need of the course (2). For instance, living anatomy that involves learning anatomy on living persons, is gaining attention in anatomy education. Living anatomy has even been proposed as an adjunct method for cadaveric-based anatomy pedagogies (8). There are three main modalities of living anatomy that can result in positive learning, namely surface anatomy, medical imaging and surgical procedures (2). However, the transfer of anatomy laboratory knowledge to a living body is often challenging and it frequently takes a lot of effort for students to recall the numerous structures (1, 9).

Op Den Akker et al. (10) had first employed body painting as an innovative approach to teaching anatomy in 1999. Body painting is perceived as a valuable complement to living anatomy, traditional anatomy and clinical skills courses (11). In medical education, body painting is defined as painting internal structures on the surface of the body with a great degree of detail (10). Utilising body painting involves drawing several anatomical features, such as muscles, veins, bones, nerves and internal organs, on live human body to teach anatomy (12). This form of art-based activity serves as an excellent way to promote students' cognitive and psychomotor engagement while learning a dry-content driven subject. Indeed, integrating the body painting activities in the curriculum offers many learning benefits to the students, including consolidation of knowledge, knowledge retention and development of professional behaviours.

In this article, we elaborate on the advantages of body painting activities as a teaching and learning tool in anatomy. We also propose a step-by-step systematic approach in designing and conducting a body painting teaching session via online platform, as to accommodate the needs for remote learning amidst the COVID-19 pandemic. Anticipated challenges to the body painting activities are also elaborated to guide lecturers on the important aspects that they need to consider for ensuring the success of body painting activities.

# ADVANTAGES OF USING BODY PAINTING

Despite scarcity of well-designed studies on the efficacy of body painting as a teaching method (12), the educational benefits of body painting method in anatomy education have been reported in several published journal articles, as elaborated below.

#### Promotes Appreciation of Surface and Clinical Applied Anatomy

Body painting has immediate implications in anatomy education for introducing anatomy and surface complementing the teaching of clinical skills and peer assessment procedures, namely palpation and auscultation (5, 11). The body painting activities allow students to have a vivid experience on body landmark of a living body (11). In order to precisely map out a structure from body painting, identifying bony landmarks is crucial (1). Students need to palpate bony prominences to demarcate the related anatomical components during a body painting session. Palpation allows students to gain a thorough comprehension of the size, location, position and relations of anatomical structures while using body painting during learning (1). Giving the fact that body painting employs multisensory modality of learning (i.e., visual, tactile, and auditory), it serves as a good platform for students to appreciate the body landmark on living anatomy (13).

Likewise, body painting is an excellent tool for bridging the gap between anatomical knowledge and clinical practice (14). Since medical practitioners are most likely to encounter patients as a living individual, it is more practical for medical students to learn living anatomy at the early stage in their curriculum (15). Therefore, students should be encouraged to participate in educational activities that emphasize living anatomy, such as body painting, which stimulates learning of anatomy in the clinical context (16). Indeed, body painting method is a great way to supplement clinical skills and cadaveric-based practical sessions, as students are actively learning anatomy through integration of gross, surface and clinical applied anatomy knowledge (5, 17).

#### **Cost-effective Teaching Method**

The main tools needed for body painting are colourful marker pens or body paints that can be purchased easily for a relatively reasonable price. Body painting may be a viable option for learning surface anatomy when the number of cadavers available for medical education decreases. Indeed, body painting is a low-cost alternative compared to other living anatomy modalities. Despite its minimum cost, body painting has positive impact on students learning experience, and thus making it as a cost-effective learning method in anatomy (18).

## Promotes Understanding and Retention of Knowledge

Body painting permits easy visualisation of anatomical structures through powerful and highly memorable visual impressions of underlying body structures (5, 11, 14, 19). It was proven that visual stimuli such as shapes, colours and tactile painting could aid in up to 90% of the knowledge recall (12, 16). For instance, the use of strong and bright colours in their painting could boost their memory of the painted structures (11). Moreover, the multisensory body painting session utilises all learning approaches simultaneously, such as visualisation (as they see the outcome of body painting), kinaesthetic (as they palpate the underlying structures), auditory (as they listen to instruction), and sensory sensation (as they draw on their own skin) (17).

Furthermore, students are encouraged to photograph their paintings for revision and sentiment, which both are beneficial for memory recall (11, 17). A study showed that body painting promoted lateral thinking by 31%, enhanced knowledge transfer into painting by 63%, and consolidated students' understanding by 92% (20). It was also reported that the design of body painting instruction is underpinned by an instructional design theory called the cognitive load theory, that describes the occurrence of optimal learning when instructional materials are aligned with the human brain function (13, 21). The multisensorial inputs during a body painting session optimise the working memory capacity through the use of the visuospatial sketchpad and phonological loop of the working memory system (22). As a result, comprehension and retention of anatomical knowledge are enhanced, as described by McLachlan and Regan de Bere (23).

## Promotes Active and Collaborative Learning

The kinaesthetic learning element of body painting requires students to be actively involved in palpating the soft tissue and bony prominences, as well as drawing and painting activities on human living body (17). In educational context, this form of activities is known as active learning, whereby students do not only learn by doing, but they learn through reflecting on what they are doing (24). Students are learning in depth as they actively participate in the body painting session, which differ from other didactic teaching pedagogies (11). While doing palpation and identification of bony landmarks, students need to construct mental imagery of the underlying anatomical structures and reflect them with topographical anatomy and surface projections (5, 17). Indirectly,

the body painting activities help students to cognitively and physically engaged with the learning materials, and henceforth, boosts their interest in anatomical studies (25).

Likewise, the use of living subject in body painting activities indicates that students are not learning on their own because the painting is usually done on their peers or simulated patient. The classical faceto-face body painting anatomy classes encourages students to work in groups, whereby they need to discuss, conduct the activities (i.e., palpating, drawing, painting, reflecting and summarising) and present their task (26). Within this collaborative learning environment, students would inevitably encounter conflicts and differences in opinion, which they need to resolve to achieve mutual consensus of their shared goal (27). Through this form of collaborative learning, students would learn on how to be resilient and build their tolerance in resolving differences (28). These abilities are of utmost importance in developing affective learning values as future clinicians (18).

## It Stimulates Interest, Engagement and Motivations

Body painting has been regarded as a fun teaching and learning approach that engages students to the learning activities (11, 29). The use of multimodality approach and stimulation of multisensorial inputs could accommodate various students' personality types and learning styles, and thus motivate them to actively participate in the learning process (12). Given the facts that the art element is used in body painting, students could develop their creative mind while learning complex anatomy content (30). By acknowledging the needs to be precise in the anatomy content, the students would be more focussed and motivated to complete their painting tasks, but in a more relax and enjoyable environment.

#### An Alternative Teaching Method to Cadaveric-based Pedagogies

One of the most significant advantages of employing body painting in anatomy education is that it can be a good substitute to cadaveric dissection. Despite welldocumented benefits of cadaveric dissection in anatomy education (31), there is concern on the feasibility of cadaveric dissection course in modern medical curriculum (12). When dissection time is limited or cadavers are scarce, educators may consider incorporating body painting into their programmes, as it can cater for the attainment of cognitive, psychomotor and affective competencies (32). Although body painting cannot completely replace cadaveric dissection, it is argued to be an effective tool in emphasising the living nature of anatomy (17).

### SYSTEMATIC APPROACH FOR BODY PAINTING TEACHING SESSION

This article outlines a step-by-step guide on designing and conducting a body painting teaching session via online platform to undergraduate medical and allied health sciences students. This guideline also emphasises some considerations that need to be made by anatomists when applying this teaching method for the first time. The delivery of the body painting method in this paper are in accordance with the active and collaborative learning principles in medical education. This guideline also follows the cognitive load theory principles; if the steps are being applied correctly, the total cognitive burden of students could be reduced and consequently, their learning capability would increase (33-34).

There are four steps for preparing and utilising virtual body painting tool in anatomy as illustrated in Figure 1.

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Figure 1: Four steps for preparing and utilising virtual body painting tool in anatomy.

#### Step 1: Conduct an Introductory Session Prior to Body Painting Session

Before the first body painting session begin, an introductory session is done to prepare the students who will be participating in the body painting session. It is recommended to highlight the following information during the introductory session.

## Briefing on the selected topic for body painting session including its learning outcomes

The students are informed about the topic that is selected for body painting session, which enables them to be aware of the body region that will be involved in the body painting. Specific learning outcomes are made explicit to prepare students' mind on what they should achieve at the end of the body painting session.

#### Preparation of equipment

Prior to the body painting session, several equipment needs to be prepared. It is advisable to use water-based and hypoallergenic pens, markers, or paint for drawing. Wipes can be prepared for paint removal. It is also suggested that each student need to prepare at least three pens with different colours. Bold colours are encouraged as it promotes higher retention of knowledge compared to dull colours. In addition, students are requested to prepare and to switch on their webcam during the session so that the session could be more interactive, and the instructor can see the progress of the students during body painting.

#### Attire

Following the introduction, students will be aware of what attire is appropriate. The degree of exposure of body region is determined by the area to be painted. Students are encouraged to dress comfortably in loose clothing.

#### Time

Duration of time per session is critical to ensure that students do not feel rushed during the activity. It is recommended to allocate 1 hour per teaching session, whereby each session covers one anatomical region.

## Step 2: Prepare and Distribute the Instruction Sheet

An instruction sheet, containing a detailed protocol corresponding to the learning outcomes, is prepared and distributed to the students. This instruction sheet contains a list of anatomical structures that need to be drawn and worked examples on how to draw them on the body surface. The sheet may include origins and insertions of muscles, course of nerves or blood vessel, or descriptions on how to locate and palpate the body landmarks. In addition, it is good to incorporate a checklist of activities that are expected to be completed as outlined in the learning outcomes. This checklist could guide the students to complete the objectives-driven tasks within the guided protocol. Figure 2 illustrates an example of descriptions that can be included in the instruction sheet.



Figure 2: Example of descriptions that can be included in the instruction sheet.

#### Step 3: Perform Live Body Painting Demonstration

Live body painting demonstration begins by providing a quick demonstration of surface anatomy palpation. During the session, the instructor can observe the palpation by the students, by zooming them via pin method (Google Meet platform), spotlight function (ZOOM platform), or stage function (WebEx platform). After identifying and palpating important body landmarks, instructors can eventually start painting on a model, or on themselves (Figure 3). Colour coding is required to highlight certain structures. For instance, red colour can be used to draw arteries, blue for veins, green for lymph vessels and nodes, and black for the outline of bones or muscles. While conducting the body painting activities, a running commentary that explains the painted anatomical structures should be carried out simultaneously.

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Figure 3: Two examples of painted anatomical structures generated from this activity.

## Step 4: Conduct Post-session Photography and Reflection

At the end of the body painting session, the instructors and students are encouraged to take pictures of their body paintings (Figure 4). Photograph serves as a great point of reference for revision and help in the retention of knowledge. Apart from that, consented images can also be used to showcase the body painting activities as medical school promotional materials. Students would be motivated to participate in the activity when photographs from previous batches are displayed as promotional materials. Therefore, having memorabilia such as a photograph after the session could be beneficial.

A crucial aspect of the teaching process is being a reflective practitioner. Following body painting sessions, instructors should reflect on the session's positive aspects as well as areas that could be improved in the future. Some of the food for thought includes: Was the amount of time spent on the activity appropriate? Is the session meeting the learning objectives? How involved were the students in the body painting process? Was the comfort of the students preserved? Was there enough instruction and feedback for the students?

Students should also be encouraged to share their thoughts and feedback on the body painting experience. This feedback will provide instructors with opportunity to make any necessary change to the protocols or learning environment prior to next session. The feedback will also provide helpful information on the session's duration, suitability of the selected topics, number of students per group and adequacy of information in the information sheet.



**Figure 4:** Photographs of a painted anatomical region, the cubital fossa.

### CONSIDERATIONS AND CHALLENGES DURING BODY PAINTING VIRTUAL SESSION

#### Number of Students per Group

Although body painting session can be carried out in large group setting using online platform, it is suggested to have a smaller group of less than 20 students so that the view of all the students could fit into a single screen during the practical.

Alternatively, the body painting task can be conducted in several breakout rooms so that the task can be conducted more efficiently. Nonetheless, more tutors are required to monitor the small group activity and discussion.

## Students' Sensitivities and Cultural Differences

Careful consideration is needed particularly to students who are body image conscious, skin sensitive, or students who may not be able to expose certain body parts due to the cultural or religious obligations. In this situation, switching off the web camera during the session is an alternative to these students. Certain body parts are considered as sensitive parts (e.g., female thorax and inguinal regions), and thus may not be so suitable for body painting session. If the body painting was done on life models by the instructor, verbal consent must be obtained and their dignity and comfort must be maintained.

#### **Internet Connection and Electronic Devices**

It is important that the students and tutors have a good internet network connection to avoid interruption during the session. Students should have proper learning devices, preferably laptop or desktop, which has a bigger screen than mobile phone, as this could provide better visualisation of the painted anatomical structures during the demonstration.

Nevertheless, students who do not have the privilege of good internet connection and electronic devices, should not be excluded from the learning activities. To ensure equity in anatomy education, these disadvantaged students should be given an opportunity to observe and conduct body painting activities on their own by providing a recorded video of the session and a complete learning material.

### CONCLUSION

Body painting is a great way to learn anatomy as it utilises living anatomy as a platform to integrate gross, surface and clinical applied anatomy knowledge. Indeed, body painting is an exciting and engaging methods that creates memorable learning as it emphasises on the use of bright colours and creativity in learning complex anatomical structures. Moreover, body painting empowers students to be actively involved in the learning process and guides students to achieve several learning competencies through collaborative learning.

As a result, body painting activities students' consolidates understanding of anatomical structures and long-term knowledge retention. Indeed, this paper provides a practical resolution on how to conduct a systematic body painting approach in anatomy practical amidst the COVID-19 pandemic. The four steps of systemic approach for body painting outlined in this paper are doable, practical, enjoyable and beneficial. If these steps are utilised properly, the body painting activities would be able to enhance students' understanding of the learned topic. Nonetheless, further work needs to be carried out to establish the efficacy of this guideline in anatomy learning.

### ETHICAL APPROVAL

The ethical approval was obtained from the Research Ethics Committee of Universiti Teknologi MARA (UiTM) with reference no. REC/05/2022 (ST/MR/93).

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