

Gamifying anatomy education: Insights from the anatomy cup

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 Claudia M. Diaz

Faculty of Science and Health, Charles Sturt University, Albury, N.S.W., 2640, Australia.
Email: cdiaz@csu.edu.au

ABSTRACT

The introduction of innovative experiential teaching approaches has been reported to improve student engagement and learning outcomes. The use of drawing, whiteboarding, Play Doh, movement and surface anatomy, including body painting encouraged student creativity and life-long learning of anatomy. An extra-curricular, inter-program anatomy competition called The Anatomy Cup, using innovative approaches, was introduced at the end of the first year of university. This friendly, fun and stimulating competition involved medical and health profession students, and staff, and involved a series of challenges based on “hand-on” activities such as assembling torso models, identifying bones, “whiteboarding”, building structures with play doh, body painting, art and anatomical song and dance. The Anatomy Cup was a creative and novel event that offered students the opportunity to showcase the new innovative learning skills that they mastered in their first year of University, while also testing their anatomical practical skills and knowledge. This competition was a valuable tool for celebrating a successful year of anatomy learning for anatomy students and was a game-changer in maintaining high morale, satisfaction and engagement. It provided positive publicity for the universities and became an important event on the university calendar.

Keywords: *Anatomy, Body painting, Competition, Engagement, Gamification, Innovation.*

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Highlights of this paper

- Innovative approaches to teach anatomy can be complemented with an annual inter-program competition – The Anatomy Cup.
- The Anatomy Cup offers students a creative opportunity to showcase the innovative learning skills that they mastered in their first year of University, while also testing their anatomical practical skills and knowledge.
- The Anatomy Cup was a game-changer in maintaining high morale, satisfaction and engagement and positive publicity for the university.

1. INTRODUCTION

Recently, the use and popularity of games as an innovative pedagogical approach to improve learning experiences and outcomes in anatomy education have been explored (Al Habsi et al., 2025; Cale & McNulty, 2025; Lee et al., 2025; Perumal et al., 2022). There is an online website (www.anatomyarcade.com) that offers educational games such as jigsaws, crosswords, word-search and matching. Most games to learn anatomy are online and allow the integration of digital technologies that suit the learning preferences of some students. Artificial intelligence has also been incorporated to personalize learning experiences for medical students (Castellano et al., 2024).

However, despite the popularity of online games for anatomy education, the use of innovative experiential teaching approaches that result in high student engagement, with an improvement in student grades and learning outcomes have been reported (Diaz, 2013; Diaz et al., 2021; Diaz & Woolley, 2015). This innovative learning consisted of hands-on, learning approaches including drawing, whiteboarding, building anatomical structures out of Play Doh, learning through movement including singing and dancing and the study of surface anatomy using body painting, all of which encouraged creativity. These innovative approaches were proactive and non-didactic and encouraged students to aim for deep rather than superficial rote learning. Their delivery by a passionate, skilled and enthusiastic teacher were observed to have a lasting impact on student engagement (Diaz et al., 2021). The teacher was not there to teach students anatomical names and facts, but rather to teach them “how to learn anatomy” through innovative, self-directed, life-long learning skills. Student perception was that these approaches improved their understanding and long-term retention of anatomy (Diaz & Woolley, 2015) and were meaningful, consistent with engagement theory (Kearsley & Shneiderman, 1998; Kift, 2009).

The aim of this study was to demonstrate how the implementation of an annual inter-program anatomy competition, The Anatomy Cup, could supplement the innovative learning approaches and offer students the opportunity to showcase the learning skills that they mastered in their first year of university.

2. METHODS

The Anatomy Cup was run at two Australian universities, James Cook University in Queensland and RMIT University in Victoria. The competition was run in the anatomy laboratory initially but later moved to the university gymnasium when it became larger. Preparation for the competition involved organising materials, finding suitable judges and promotion. Materials needed were tables (One for each team plus extras for some events), bones, blindfolds, torsos (2-3), timers, whiteboards on wheels, Play Doh, microphones and speakers, computer, large whiteboard for scoreboard, and team name signs for each table. Catering was also organized for the end of competition celebration. Coloured sashes with gold writing for each event winner and two trophies (One students, one staff) were purchased each year, and one shield (Where winners were engraved each year) was also purchased.

Promotion occurred mostly through face-to-face lectures and information on the learning management system. A press release was also prepared for the university Media Department. All students of Anatomy were eligible to

compete. Participants were required to register and to have an anatomical name for their team. Spectators and cheer squads were also encouraged to attend. Although ethical approval was not required for this extra-curricular competition, media and communications release forms for use of photos and videos, were signed by all competitors and spectators before entry to the venue.

The Anatomy Cup competition consisted of eight events over 3 hours Table 1. All events were judged by three judges, usually staff from anatomy or similar disciplines. Faculty Deans and university leaders were invited to attend The Anatomy Cup. All scores were recorded on a large scoreboard and a sash was awarded to the winner of each event. The student team with the highest score was awarded the Anatomy Cup trophy and the names of the team members were later engraved on a shield that would hang outside the anatomy laboratory. A second trophy was awarded to the staff team with the most points. The Anatomy Cup was followed with a social event with pizza and drinks.

Table 1. The anatomy cup events.

	Event name	Description	SASH
1	Torso assembly	Organs were placed on the bench and students were required to assemble correctly. This was a timed event. Winner: assembled the torso in the quickest time.	Body Building Champions
2	Bone Identification	Students identified the name and side of 10 different bones, while wearing a blindfold. This was a timed event. Winner: completed the task correctly in the quickest time.	Bone Masters Champions
3	Whiteboarding	Two topics were provided, the teams had 20 mins to prepare their topic on a whiteboard. Winner: judged on completeness, originality and creativity.	Whiteboarding Champions
4	Play Doh	Two topics were provided and the teams had 20 mins to prepare their work using Play Doh. Winners: judged on correctness, visual appeal and creativity.	Michelangelo Sculpting Champions
5	Body Painting	This was an open topic, and the teams had 30 mins to complete their body painting. Winners: judged on correctness, visual appeal and creativity.	Body Painting Champions
6	Art	Teams were required to prepare an artwork before the day and to bring it to the venue for display. Art could be of any chosen part of the body, system or anatomical theme. Winners: judged on creativity, visual appeal and correctness. Artwork was required to be original.	Modern Day da Vincis Champions
7	Anatomy Song and dance	Teams were required to prepare a song and/or dance and perform it at the competition. This could relate to a body part, a system or to anatomy itself. Winners: judged on creativity and entertainment value.	Anatomy Idols Champions
Events 1-7: First place - awarded 500 points			
Second place - awarded 300 points			
Third place - awarded 100 points			
8	Quick Answer Questions	Ten quick answer anatomy questions were read out – 100 points awarded for a correct answer.	

3. RESULTS

The Anatomy Cup was a valuable competition that attracted students studying first year medicine, biomedical science, physiotherapy, occupational therapy, osteopathy, chiropractic, Chinese Medicine, Exercise and sports science at two Australian universities. On several occasions teams were a combination of two programs. We also had staff teams compete at every competition, including anatomy, pharmacy, medical radiation, anatomy laboratory, medical, administrative staff and the Head of radiology and radiology staff from the local hospital. Students and

staff often prepared team costumes which helped to create an enthusiastic and enjoyable atmosphere amongst peers
Figure 1.



Figure 1. Anatomy cup teams.

Note: Student (A, B) and staff (C, D) teams wearing team costumes for the competition.

Team names over the years were both original and humorous. Students were generally young, and their names are often related to current musicians; the Justin Femurs (Justin Beibers), One Erection (One Direction) or movies; Womb with a view (Room with a view), Thoracic Park (Jurassic Park), Back to the Suture (Back to the future), Wristy Business (Risky business). Some names were clever; Tibia or not tibia (To be or not to be), We like it aspera (We like it rough), Very naughty harry (Tom, dick and very, very naughty harry to learn structures behind the medial malleolus). Some were just amusing anatomical names; Zygopophyseals, The Quads, The Sphincters, Funny Bones, Fat Pads, Cerebellion, We Palpate, Flex Me Crew, Breast Friends, Greater Tutor-cles (tutor team), Anal triangles, Chiroprachial plexus, Silly sesamoids, Biomedicus Maximus, Snuffbox Pulses, Tibial Tuberosities, Drugs and Rays (medical radiation/pharmacy staff). Students appreciated the opportunity to be creative in their team's name choice. It was important to allow student and staff creativity, and no censorship was used.

Students were very engaged in preparation for the Anatomy Cup; many teams attended the anatomy laboratory to practice identifying bones with a blindfold on and assembling the torso against the stopwatch. Identifying bones with a blindfold on was more difficult than initially thought, and there was a clear advantage for students who has practiced in the anatomy laboratory beforehand (Figure 2A-C). The most remarkable result was seen with the torso assembly event (Figure 2D, E). Some student teams practised assembling the torso consistently, and although many teams completed this with one-two minutes, the record for this event was three seconds. The successful teams were

seen to assemble quickly by having one organ in each team members hands, then placing them all on at the same time when the stopwatch started.



Figure 2. Anatomy cup events - bones and torso.

Note: The bone identification was a timed event where student (A, C) and staff (B) competitors identified bones with a blindfold on. The torso assembly event was also timed, and student (E) and staff (D) competitors assembled a torso.

During the whiteboarding event (Figure 3A, B) students were able to show their learning skills by summarizing and synthesizing the information in an original and creative manner as taught during the year for effective mind-mapping. Similarly, the Play Doh creations (Figure 3C, D) demonstrated the skills and knowledge that students acquired during their first year of learning anatomy. Offering the body painting as an open topic event worked well as this allowed each team to body paint an area of the body that they were comfortable with (Figure 4A-C). This was particularly important for the Muslim students for example, who were very enthusiastic and appreciated being able to paint their chosen area (Figure 4A).



Figure 3. Anatomy cup events - whiteboarding and play doh.

Note: Student teams picked one of two topics for the whiteboarding event (A, B) and one of two topics for the competition building anatomical structures out of Play Doh; students (C) and staff (D).



Figure 4. Anatomy cup - body painting.

Note: Body painting was a popular event in the Anatomy Cup. Both student (A, C) and staff (B, C) teams completed their work within 30 minutes.

The art contributions for this competition showed a wide range of media. There were drawings, paintings, digital artwork, models, tapestry, embroidery, painted dolls, cakes and desserts (Figure 5). The Anatomy singing and dancing event (“Anatomy Idols”) was a popular event and both students and staff were proud and enthusiastic to perform their songs (Figure 6A, B). Most songs had lyrics that demonstrated anatomy knowledge, while being both humorous and entertaining. The quick answer questions (Figure 6C) were answered by team members and the points for each correct answer made a clear difference to the final tally (Figure 6D).

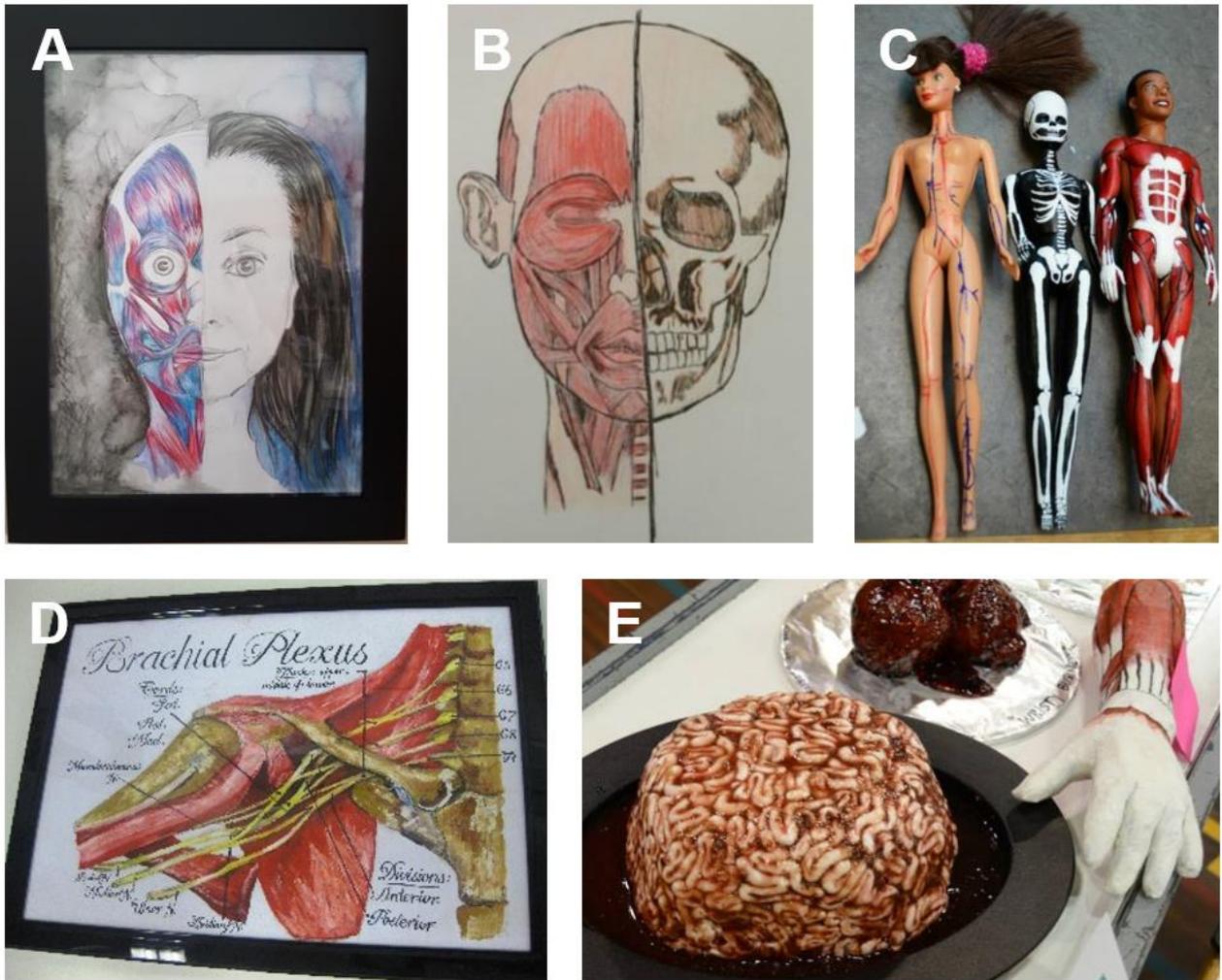


Figure 5. Anatomy cup - art competition.

Note: The art contributions for the Anatomy Cup were very creative and consisted of drawings (A, B) , painting (D), painted dolls (C), embroidery, tapestry, photographs, cakes and desserts (E).

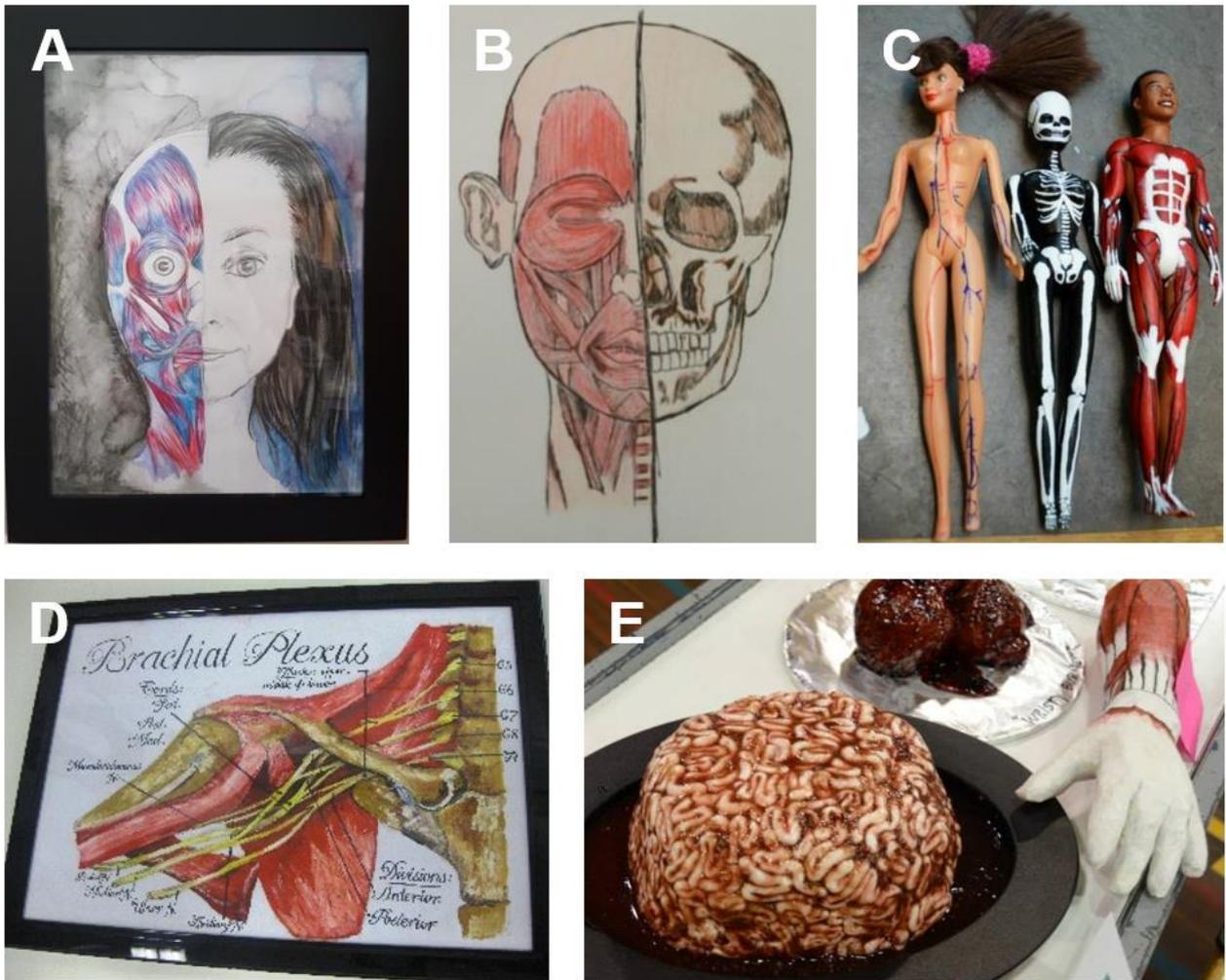


Figure 6. "Anatomy idols" singing competition.

Note: "Anatomy Idols" was the singing and dancing competition of the Anatomy Cup. Both students (A) and staff (B) performed entertaining anatomical songs. The competition was finalised with quick answer questions (C) and an example of the final scoreboard is displayed in D.

Over the years, the Anatomy Cup winners included physiotherapy, medicine, sports & exercise science, biomedical science, Chinese Medicine, osteopathy and chiropractic twice (Figure 7). In Queensland, the Anatomy Cup was named after a 22-year-old student from the university that donated his body to the anatomy laboratory after passing away due to leukemia; the "Liam Clair Anatomy Cup" made the event more meaningful to students and staff. In Melbourne, the Anatomy Cup was named in honour of a distinguished Anatomy Professor, "The Peter Reichenbach Anatomy Cup". The Anatomy Cup was reported in local newspapers (Figure 8), on a television news report, university Facebook pages and on YouTube (<https://www.youtube.com/watch?v=fHIy0oZ3y78>).



Figure 7. Anatomy Cup Winners.

Note: The winning teams of the Anatomy Cup received a trophy (A, B, C) and their names were engraved on a plaque (A). Winners of individual events were awarded sashes (D).



Figure 8. Anatomy Cup Publicity.

Note: The Anatomy Cup provided good promotion for the anatomy department and the university and was published in local newspapers in Townsville and Melbourne, Australia.

4. DISCUSSION

The Anatomy Cup was an extra-curricular competition that was an engaging and enjoyable opportunity for students to celebrate and showcase the innovative learning skills that they had mastered during their first years of Anatomy at university. For staff it was a great opportunity to see the innovative learning approaches in action, providing a great deal of professional satisfaction. This event was a wonderful way to finish off a year of amazing learning by anatomy students and a great opportunity for revision as it was run several weeks before the final exam. The competition gave students an enjoyable chance to test their anatomical practical skills and knowledge. More importantly, many students in their end of subject feedback reported that The Anatomy Cup was the highlight of their first year at university, a game-changer, and that they were proud to participate.

This event was inclusive; all students were encouraged to participate, and we found that all cultures were keen to take part. Furthermore, participation from staff allowed them to act as good role models for students, and students were often highly amused to see their teachers competing against them at this event. The Anatomy Cup was a celebration of anatomy and resulted in high morale, engagement and satisfaction not only for participating students but also for student spectators, staff and visitors.

The Anatomy Cup was a popular event that provided good promotion for the anatomy department and the university. It became an important event on the Anatomy and University calendar and the opportunity to name The

Anatomy Cup after a significant person at each university also gave the competition more meaning to both students and staff.

“It is paradoxical that many educators and parents still differentiate between a time for learning and a time for play without seeing the vital connection between them.” (Felice Leonardo Buscaglia).

This event could be a valuable addition to the anatomy program at other universities.

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