

## [O25] 'From crime scene to classroom': new strategies for teaching using modern technologies

John P. Cassella<sup>1</sup>, Roger Summers<sup>1</sup> and S. Cassella<sup>2</sup>

<sup>1</sup>Department of Forensic Science, Faculty of Science, Staffordshire University

<sup>2</sup>Faculty of Education, Health and Sciences, University of Derby

J.P.Cassella@staffs.ac.uk; R.Summers@staffs.ac.uk; S.Cassella@derby.ac.uk

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### Introduction

In the last 10 years there has been a huge rise in the public interest in Forensic Science and in the number of undergraduate and postgraduate forensic science courses (Mennell, 2006). This has been pedagogically challenging to academic science departments. University forensic departments require staff bases which bring traditional academics, together with forensic practitioners, who are involved in some way, with the development and delivery of forensic science (Mennell, 2006).

From a pedagogic perspective, teaching forensic science can be problematic. Finding sufficient, realistic and informative scenarios for undergraduate teaching is a challenge. This challenge is compounded further in the arena of teaching forensic pathology. Gaining access to *post mortem* images and the details that give them context, is essential for quality pedagogic provision.

In this paper, we describe how the use of *real-life* case material has been used as a tool for learning and assessment. Briefly, working on the principles of *Problem Based Learning*, learners were presented with photographic material from Crime Scenes for analysis. The images were examined in a time constrained environment for information that would suggest the 5 tenets of forensic science: *who, what, where, why and how*. A short report was prepared, for submission, and oral presentation of the information was also made. Feedback was given using MP3 technology.

### Methodology

Five sets of photographs from actual past cases were prepared, and placed within a 'Special Collections' area of the Learning Resource Centre at Staffordshire University. Students studying the module 'Forensic Pathology', accessed each set of photographs sequentially over several weeks. The aspects of pathology covered by the cases were: death by drowning; fire; road traffic incident; shooting and natural disease.

The cases were studied in small groups, under a time constraint of one hour per set of photographs. Sketches were made of each set of photographs, and annotated. The groups were then allowed a period of seven days to access appropriate literature in order to assist their interpretations and provide evidence to support their findings and conclusions. A one page written summary of each group's findings was submitted to the tutors for formative assessment. In addition, one group was selected at random from the cohort to present their findings from each case during a session with the whole class.

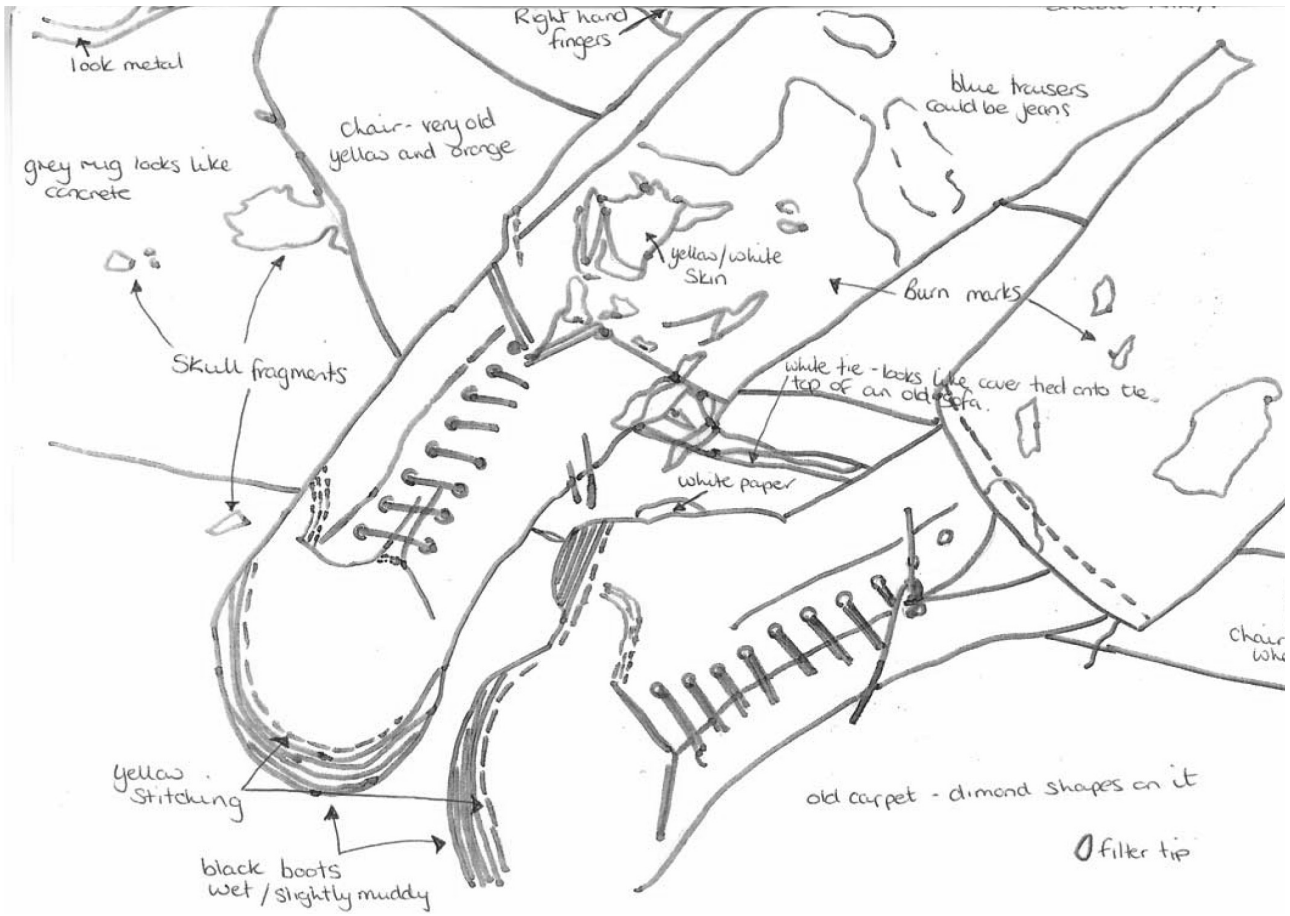
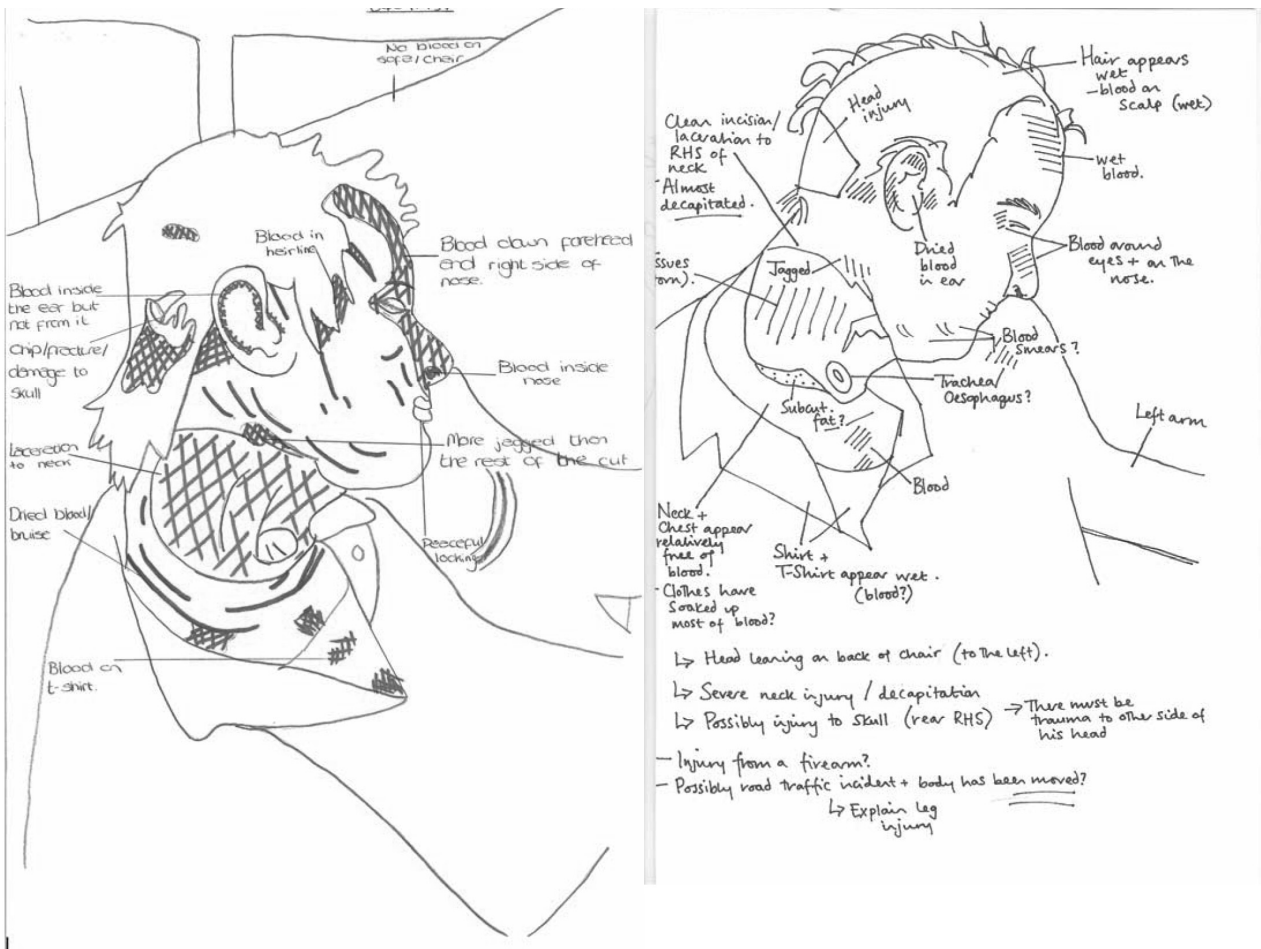


Figure 1



Figure 2



**Figure 3 and Figure 4:** Interpretations of the head injuries

Feedback was offered to learners as 20 minute 'MP3' audio files, which were e-mailed to participants, and placed on the departmental shared access hard drive, so that they could be accessed directly or downloaded to personal MP3 devices.

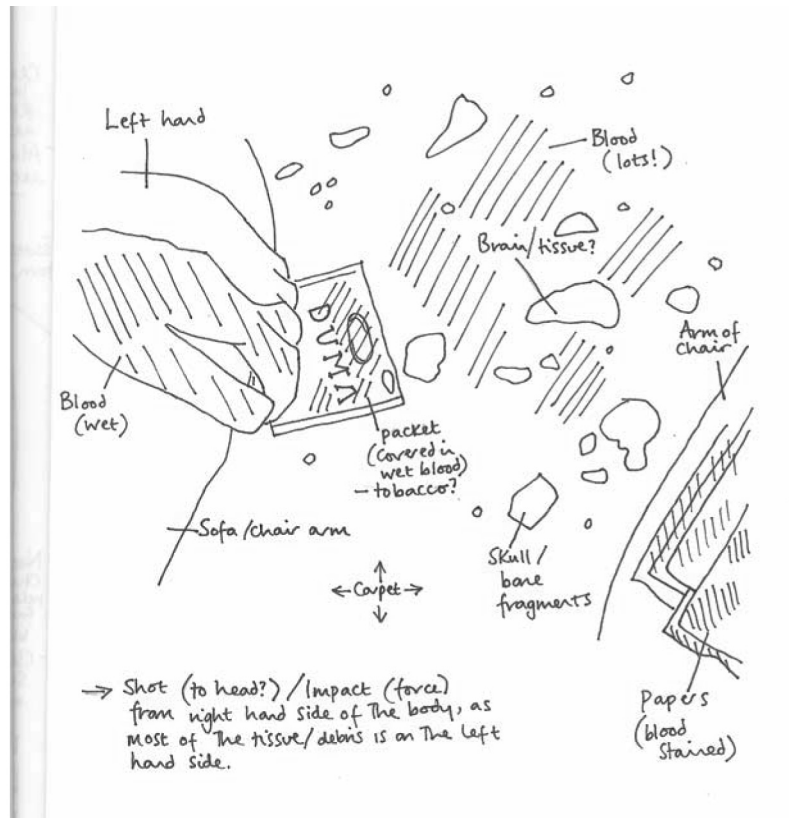
Emphasis was placed on the process of analysis and interpretation of the cases, rather than focussing on the 'correct answer'.

The assessment of this module was via a piece of written work, centred upon a crime scene scenario. In completing this piece of work, learners were required to apply their learning from the five cases covered.

## Outcomes

The majority of learners produced detailed sketches, with good observation and attention to detail. **Figures 1 and 2** show one student's interpretation of one of the photographs; the text on page 153 is the student's interpretation of that information.

**Figures 3 and 4** show how different students interpret the photographs in a similar manner. **Figure 5** shows how a student has interpreted a complicated scene and 'deconstructs it' into useful components.



**Figure 5:** Interpretations of the very confused environment on the floor next to the body

### Student interpretation of Forensic images (please refer to Figures 1-4)

The first image was of the ventral surface of the two distal, inferior lower limbs, wearing dark blue denim trousers and black, ankle boots, 10 holes per boot, and thick, royal blue thick socks. Lying diagonally as though the victim is sitting on an old fashioned, possibly 1970's, patterned, orange covered sofa or chair with the inferior surface of the boots resting on a dirty, dark patterned carpet. Under the right lower limb, beneath the flexed patella region there were two digits, bent at the Metacarpophalangeal articulations and Interphalangeal articulations, displaying the carpals and phalanges of the II and III digits. These appeared to be smeared in blood, possibly indicating a struggle with the assailant or having been wiped or fallen from other injuries.

The soles of the boots appeared wet due to their shiny appearance, possibly with blood, when considering further crime scene photographs. The trouser section covering the right limb in the tibia region was ripped and torn open, revealing the epidermis, with a right-angled flap of material towards the top of this section. The material also appeared to bear dark brown staining possibly blood or more probably charring around this area, although, in this view the epidermis appeared mostly unaffected. It is unclear whether the tear damage occurred prior to the smouldering, possibly due to a struggle with an assailant as there is possibly bruising in the mid tibia region, indicating snagging on a sharp object. A single, white burnt cigarette butt was found positioned on the patterned carpet, to the left of the left foot of the victim.

There are several possible explanations for the appearance in charring, as it was not extensive, bearing no obvious markers for the presence of an accelerant and

*causing little superficial damage to the underlying epidermis (Lennard, C. 2001). The localised burning evidently pointed to the seat of the fire as occurring in the mid-tibia region. Post-mortem exposure to low, radiant heat, in the form of an electromagnetic wave, where there is no contact between the body and source of heat, possibly from an electric bar heater, may cause this type of damage (DiMaio and DiMao, 2001). Upon external heating the extent of damage caused is dependant on the applied temperature, the ability of the body to conduct heat away from the area and the time during which the heat is applied (Saukko and Knight, 2004). As the dermis was covered by a layer of clothing any heat damage to it was delayed due to this thermal protection factor (Ripple et al 1990). In this case heat exposure was long enough to instigate initial smouldering, but not prolonged enough to cause erythema or vesiculation, with possibly only slight reddening, oedema and stretching of the skin (Carvajal et al, 1975). These are indications of only mild first degree thermal burns, and as such was not a factor in the cause of the victim's death (Shepherd, 2003) and (Wang et al 2005).*

*From the appearance of this and other photographs of the scene a conclusion may be drawn that the victim was a smoker, due to the presence of a spent match on the seat of the chair and a used cigarette end, along with a blood covered, tobacco packet to his left. The proximity of the roll-up papers could suggest that the victim was smoking some form of drug or cannabis. The victim, in a dazed, intoxicated state may have inadvertently dropped a red hot piece of burning cannabis, 'Hot rock', from a lit 'joint' whilst smoking (Duckworth, 1996). This could have produced a hole and the scorch marks on the trousers.*

*Also in this view, to the right of the sofa there appeared to be a broad, slightly concave, white coloured material, assuming the appearance of a fragment of the calvarium (Martini, 2004). From comparison with the size of the heal it appeared to be around 8 centimetres in diameter. It was also surrounded by other smaller, some triangular, splinters of skull. This would be conducive with the victim sustaining a craniocerebral trauma and skull fracture, either from high velocity blunt or acceleration-deceleration force (Morrison et al, 1998).*

### **Summary of conclusions**

*In conclusion the death of the victim probably occurred as a result of the massive blunt force trauma impact in the left occipital region of the skull. There could have been a further impact in the right temporal region or one impact with contre-coup fractures, the force exuding further cerebral matter. The severing in the cervical region occurred post mortem, possibly as a means of disposing of the body, and the charring could have occurred as a result of intoxication and cigarette burns ante-mortem or by radiant heat from an electric fire post-mortem.*

Feedback from learners was that they valued receiving feedback in good time to allow reflection on their performance, and to offer guidance on how they could improve for further case studies. A diverse cohort was involved in the module, and all were comfortable with the medium chosen for feedback.

## **Discussion**

Problem based learning is supposed to enhance the integration of student's knowledge. Problems are used as a starting point for the learning process and learners define their own learning objectives in small groups. These learning objectives reflect basic science

disciplines as well as 'specialist' disciplines and both fields are studied concurrently. Because learning takes place in a meaningful and authentic context, using cases, students learn to connect phenomena to underlying basic science concepts (Prince *et al*, 2003).

The learning resources provided should meet the needs of the learner and promote motivation. Problem-based learning is an approach to professional education that stresses the use of real-life problems as a stimulus for learning (Van Berkel and Schmidt, 2000). According to Race (2005), students should be able to directly relate the content to learning outcomes. This allows students to see the relevance of the subject content, and to take ownership of their own learning. The use of 'real' cases seems the ideal way to demonstrate the direct relevance of the subject content. The knowledge that the evidence offered has been taken from a situation that has actually occurred and where a case has been solved, provides a challenge to students, to evaluate the evidence and assess their own ability to 'solve' a crime. This offers greater motivation than a mock scenario. Clearly this has worked for our students who were highly motivated by the realism.

Various studies have demonstrated that traditional methods, such as lecturing, demonstrating techniques and setting repetitive exercises, encourage surface learning. Students taught through such methods have a high reliance on the tutor to assist with problem solving; fail to question information they are given; focus on producing a 'correct answer' rather than understanding issues and prefer to reproduce notes rather than offer a critical analysis or to reflect on relevant issues (Hockings, 2005).

In problem-based learning, students work in small tutorial groups on problems and in the course of discussing them, formulate goals for self directed learning (Van Berkel and Schmidt, 2000). This resulted in the learning achieved from these activities being considered constructive and contextually meaningful. Use of the problem-based learning approach requires students to become actively involved in their own learning, resulting in a movement towards more independent learning (Yeung *et al*, 2003).

Using this system, students worked through 5 cases, encompassing death by drowning, fire, road traffic incident, shooting and natural disease. In this way, students gained knowledge and skills in team-working, crime scene examination, forensic pathology, statement writing and presentation.

The *correct* findings from each Crime Scene were not the important consideration. The student learning centred on complex problems which need not have *one* correct answer. Students worked in a collaborative group to identify what they needed to learn in order to facilitate solving the problem (Hmelo-Silver, 2004). They engaged in self-directed learning and then applied their new knowledge to the problem and reflected on what they had learned and the effectiveness of the strategies employed. In this way we became facilitators to the learning process rather than simple providers of knowledge.

Race (2005) and others suggest that the opportunity for active learning is of paramount importance. Learners need opportunities to try things out and repeat tasks. Including an element of assessment, with timely feedback in our case allowed for such opportunity. In addition, learners should not be rapidly overloaded with information. The introduction of each case in a sequential manner, with timely feedback, allowed for the 'digestion' of information over the course of several weeks.

Jung *et al* (2002) stated that even for adult learners, social interaction with instructors and collaborative interaction with peers are important in enhancing learning. The inclusion of a

presentation element for each case encouraged informal peer assessment and feedback, as well as information sharing between groups.

The use of 'MP3' audio technology allowed for an in-depth feedback of the crime and the forensic pathology associated with it. The asynchronous learning that this 'MP3' technology enabled allowed students to reflect on their performance and listen again, as required, to the feedback and make notes to improve their subsequent performances. Learners can feel comfortable in learning from their own mistakes in privacy.

Recording feedback in this way avoids the time constraints that are inherent in immediate feedback during a contact session, and discourages the domination of the session by a tutor. In this case, reports from all groups were evaluated by the tutors, and generic feedback on strengths and areas for improvement offered. The use of MP3 recordings allowed feedback to be given to the group and to the individual. With a little imagination, feedback can be made entertaining as well as informative. Feedback can be directly linked to learning outcomes, and can help learners to identify the level and depth of analysis that is required of them. Offering aural feedback is highly beneficial for learners with specific individual learning needs, such as visual impairment or dyslexia.

Berglund (2004) states that, 'to take the students' ways of experiencing the learning environment into account offers ways of designing well-functioning course. Changes in course design must be based on the learners' experiences if they are not to be counter-productive to the learning aims'. We routinely seek feedback from our learners relating to all aspects of their learning. Our experience was that learners *wanted* feedback, and were keen to use it constructively. The use of audio recording, allowing use of MP3 technology was valued amongst learners of all ages and backgrounds. The ongoing use of formative feedback, reflection and review empowered learners in their final assessment for the module.

This approach to learning has offered students the opportunity to develop collaborative teamwork skills through deep engagement in evaluating real cases. Learners are accessing professionally relevant experiences, whilst acquiring subject-specific knowledge. Importantly, such an approach encourages the development of desirable graduate qualities, such as competence in problem-solving, teamwork, and communication skills.

This system brings the crime-scene to the class-room and indeed the class-room to the crime-scene. Future developments include the use of 'MP4' technology to add video to this level of asynchronous feedback.

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