Bringing Real-Life Court Cases to the Forensic Classroom: Problem-Based Learning

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Aims of the Work

- Bring real-life crime and court cases to our Forensic Science students
- Develop problem-solving and problem-based learning sessions
- Develop employability skills
- Engage, motivate and challenge the students
- Strengthen professional links and disseminate forensic materials from our collaborator
Problem-Based Learning

- Forensic Science lends itself to the PBL technique
- The ‘problem’ acts as the force driving the learning
- The problem is encountered before the knowledge has been acquired
- Develops a deeper understanding of the subject
- Skills development, use of resources, retention of knowledge, improved approach to learning
- Places the students in a professional role (SOCO, police officer, forensic scientist, toxicologist, expert witness etc)
Problem-Based Learning in Forensic Toxicology

The Collaborator
Professor Robin Braithwaite

Visiting Senior Lecturer at Keele (Forensic Chemistry)

Analytical, clinical and forensic toxicologist for 40 years

170 publications in the field of clinical pharmacology and toxicology

Undergraduate and postgraduate teaching at other institutions

Commissioned to provided Expert Reports in over 150 cases involving drugs, poisons and alcohol (including Beverley Allitt and Harold Shipman)

Keen to share his materials from these cases before his loft collapses under the weight!
Putting PBL in the programme........

Level III ‘Forensic Toxicology’

Two theoretical HEA PBL sessions run for the first time last academic year. Successful and well received. Module otherwise principally lecture-based. Therefore felt PBL was worth developing.

Level III ‘Interpretation, Evaluation and Presentation and Evidence’

New double module for 2009-2010. Takes students from attendance at scene of crime collecting evidence, through the full process to a court-room scenario and cross examination. Felt that some PBL sessions would fit well here too.
The Cases

- Driving under the influence of alcohol/drugs/combination
- Pediatric poisoning
- GHB cases
- DFSA
- Murder through administration of drugs or poisons
- A complex driving/drinking/drugs/surgery/diabetes case!

The Materials

Police and scene of crime reports, witness statements, pathology and autopsy reports, data and reports from analytical laboratories, prosecution and defence statements and court transcripts
The Sessions

- Randomised student groups of 4
- 2 – 3 groups in each session working on the same case
- Explanation of PBL and what the students could expect to ‘take away’
- Release very brief info on the case and first document
- Students have access to computers, books and (information/equation cards and some printed publications)
- Presentation of findings
- Typically 3 hours
Example Case 1: Hip-Flask Defence

A driver is arrested at his fathers house after a car chase, suspected drink driving. He also has no insurance. He claims to have drunk a number of pints over the evening in the pub, and after the chase he drank some brandy, leading to a blood alcohol concentration exceeding the limit for driving.

Information is released to students only as they reach the right decision or as it is requested. Students have to determine which calculations should be performed and what other factors should be taken into account for these complex calculations. The students need information on the beer, the brandy and the brandy glass measurements (all taken by the police). Some practical work!

The students take the role of the police officer, the analyst and the expert witness.
Example Case 2: Alcohol/Drugs Interaction

A driver is stopped and fails to give a breath test. A blood sample is taken at the station and sent for analysis, later indicating she is over the legal limit. The driver claims only 1 glass of wine was drunk but she was also taking Zantac at the time. She claims the drug has altered her blood alcohol concentration.

Information is released to students only as they reach the right decision or as it is requested. Students have access to the internet to research drug-ethanol interactions, ranitidine-ethanol in particular. A number of calculations have to be performed to match this scenario to the examples in the literature.

The students take the role of the police officer, the analyst, and the expert witness.
Problem-Based Learning in Forensic Toxicology
Example Case 3: Drug abuse leading to suicide?

A body is found at the side of a train track. It is evident the corpse has been struck, but is it an accident, suicide or homicide? The last few weeks of the victims life are traced. He has recently split up with his girlfriend and in the past has abused some Class A drugs. However, no drugs are found in his system at the time.

Information is released to students only as they reach the right decision or as it is requested. The autopsy report is available and the toxicology report. Interviews with relatives and his GP. The students have to research the long-term and also withdrawal effects of the drugs detected and put forward a likely cause of death.

The students take the role of the SOCO, pathologist, investigating officer, toxicologist and expert witness.
Problem

Based Learning in Forensic Toxicology
### ANALYSIS OF HAIR FOR DRUGS OF ABUSE

<table>
<thead>
<tr>
<th>Drug</th>
<th>Section 1</th>
<th>Section 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphetamine</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>MDMA</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>MDA</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Cocaine</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>BE (cocaine metabolite)</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>EME (cocaine metabolite)</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Cocaethylene (cocaine with ethanol ingestion)</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Dihydrcodene</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Morphine</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>6-MAM</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Codeine</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Diazepam</td>
<td>Negative</td>
<td>Negative</td>
</tr>
</tbody>
</table>

N.B. 1cm corresponds approximately to 1 month's head hair growth

Section 1 (hair growth closest to the scalp) 3 cm: January - April 2007
Section 2 (continued growth from section 1) 3 cm: October 2006 - January 2007

**Conclusion**

The results of the hair analysis indicate use of MDMA (ecstasy) and cocaine by the deceased over the 6 months prior to death.
What we have achieved

- Students have gained knowledge of the legal aspects of forensic science
- They have a greater understanding of the police investigation
- Taken on the roles of the scientists and other professionals
- Consolidated/expanded/new knowledge on:
  - metabolism & toxicity of alcohol and drugs
  - chemical and analytical procedures
  - data interpretation
Student Feedback

Feedback from students partaking in 1-2 sessions (43) -

Did you find this method of teaching compared to previous experience...........

Enjoyable: 45
Indifferent: 5
Unenjoyable: 0
Student Feedback

Feedback from students partaking in 1-2 sessions (43) -

Did you find this method of teaching compared to previous experience.................

- Very hard
- A challenge
- OK
- Easy

0
5
10
15
20
25
30
35
40
Student Feedback

Feedback from students partaking in 1-2 sessions (43) -

Do you think PBL is a useful method of teaching and has helped your learning/understanding?

- Yes: 35
- No: 5
- Maybe: 3
Student Feedback

Feedback from students partaking in 1-2 sessions (43) -

Would you like more PBL sessions incorporated into your degree course?

- Yes: 25
- No: 1
- Don't mind: 17
Individual student comments

‘Was enjoyable working as a team’
‘Proper hard and I don’t think it should be assessed’
‘New way of learning, I liked finding information for ourselves’
‘We can learn quite thoroughly as a small group’
‘I would like a script to follow’
‘I would prefer PBL to lectures’
‘Group work is not helpful to my learning, staying focused or personal study and revision, I could have spent my time better’
‘I like working through the possibilities of the case’
Student Feedback

Feedback from students partaking in 3-4 sessions (13) –

Responses were the same as for other student group, however, the group were split when further questions were posed……………

PBL should not replace traditional lectures but should be used alongside a range of lectures

PBL should not be assessed, but if it is it should be used alongside existing forms of assessment, not as a replacement

The group agreed that PBL should be introduced at Level II but probably not before

The ‘best’ PBL cases were those with a definitive outcome or where calculations or detailed data interpretation had to be performed
Where to next?

- Firmly embed these PBL sessions into the Level III modules
- Consider assessment
- Bring it into the Level II module ‘Drugs of Abuse’

Level II ‘Drugs of Abuse’
As part of this module, students study ethanol metabolism and carry out BACs (Widmark/Watsons). Some of the drink-driving cases available become highly suitable for PBL in this module

- Determine appropriate cases for Level I?
- Continue to generate all materials electronically, for dissemination
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