



A Day with the Forensic Sciences

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To the general community, forensic science often represents a group of incredibly efficient and dedicated, white-coated super scientific sleuths who can solve the most intricate of crimes from the most minute amounts of material. In a recent television series, a multi skilled forensic pathologist and scientist was also expert in fields such as fingerprints, firearms, document examination and crime scene investigation. With amazing feats of analysis and deduction, he (and increasingly she) always seemed to provide the crucial piece of evidence at the last moment.

These programs give the impression that forensic science is a scientific branch of its own performed by extraordinary individuals to whom the miraculous result is commonplace. Unfortunately, this is mostly stretching the truth. However, the popular nature of forensic science means that it can be used as a tool in the school curriculum to assist in achieving specified learning outcomes.

The purpose of this paper is to describe what forensic science really is, how it operates in Australia, to introduce a number of products and an event which may be used in to achieve learning outcomes specified from the Curriculum Standards Framework.

What is Forensic Science?

Webster's dictionary defines the word 'forensic', from the Latin forensis, meaning public as:

1. belonging to courts of law, used in courts or legal proceedings;
2. pertaining to or fitted for legal or public argumentation.

It follows from this that forensic science means the use or application of science in courts or legal proceedings. Thus any form of science such as medicine, pathology, odontology, biology, chemistry, physics and engineering can, if presented in evidence by a qualified person merit the title 'forensic'.

It is obvious that forensic science is not a discipline or branch of science, but is a catch-all for many distinct disciplines that may be used to help in the determination of a court case, either civil or criminal.

Unlike the fictional television character, the forensic scientist is confined to a particular discipline and often to a specialty within that discipline. Although at times a scientist may contribute the major piece of evidence in a particular case, generally their evidence is contributory, a link in the chain of the total evidence presented to the court from other witnesses, including police investigators.

To assist in conviction of offenders is not the only function of the scientist. In many instances the scientific examinations help to eliminate suspects and establish innocence.

The scientist must be impartial and not an advocate for the defence or prosecution.



Organisation of Forensic Science in Australia

Almost all forensic science that is involved with criminal or coronial proceedings is conducted in the public sector. Although there are federal crime laws, investigated by the Australian Federal Police, the laws governing crime generally are the responsibility of the States and Territories.

Therefore, the various State and Territory governments are responsible for the administration of forensic science. This results in variation of structure and management from State to State.

One can arbitrarily divide forensic science into three broad groups, these are medical, laboratory and field sciences. These are not exclusive divisions and there is overlap. Furthermore, a number of different forensic disciplines may be involved in the investigation of a case depending on the type of evidence detected at, and recovered from the scene.

Field sciences will include, for example, crime scene investigation, which incorporates areas such as fire and explosion scenes and clandestine drug laboratories.

Examples of medical services are pathology, psychiatry, psychology, forensic medicine and odontology (dentistry).

Laboratory sciences include chemistry, biology, toxicology, ballistics, fingerprints, questioned documents and marks and impressions.

In Victoria, there are two organisations responsible for the majority of forensic science work.

The **Victoria Forensic Science Centre** is responsible for crime scene investigation, fingerprint examination, drug analysis, biological examinations including DNA profiling, document examination, trace evidence (paint, glass, fibres etc), fire and explosion investigation, audio and video analysis and some toxicology, ie the Field and some Laboratory sciences

The **Victorian Institute for Forensic Medicine** is responsible for clinical forensic medicine and the investigation of the cause of death by means of autopsy and toxicology and the identification of deceased persons ie Medical services and some Laboratory sciences

As has been previously mentioned, the popular nature of forensic science means that it can be used as a tool in the school curriculum to assist in achieving specified learning outcomes. Forensic science can be used in the following CSF areas: English; Mathematics; Science and Technology and Enterprise.

The National Institute of Forensic Science (NIFS) is aware that a number of schools have already introduced Forensic Science into their studies. We receive a large number of enquires from students and teachers seeking information regard a specific area of Forensic Science, work experience or career information.

NIFS has produced a video on Forensic Science, a career information brochure, and has placed some information on the NIFS website (www.nifs.com.au).



Forensic Science and You

Teaching science through the use of forensic science allows the classroom teacher to approach a broad range of science topics in a way that will engage students. After all most students will prick up their ears at the mention of crime, murder and mayhem. The use of forensic science also helps to put science into a practical and real framework while allowing teachers to cover a range of the learning outcomes in the CSF strands for Science as well as Mathematics, English and Technology (see table below).

In approaching a crime scene, students can be lead through some of the skills we value in scientists, careful observation and recording of facts, proposing and testing of theories and general problem solving ability.

Specific cases can also be used to teach about different concepts. For instance for the Physical science strand of the CSF II, a case involving a shooting may lead into discussions of;

- motion – the path a bullet has taken needs to be determined in order to find were the assailant was standing or the scattering of shot-gun pellets is used to determine how close a victim was to their assailant.
- forces – the indentations on a bullet caused during firing are used to match it to a particular gun.
- gravity and motion – the scattering of blood spots and blood stains from wounds are used to place victim and assailant.

Other concepts in physical science can be brought out when looking at investigation techniques used for different cases. Some other techniques include;

- the examination of sound waves to match noises or clarify tapes,
- the role of pressure in determining the causes of different types of wounds,
- the use of different light sources to enhance documents or prints,
- the use of electrostatics in bringing out indentations in document and
- the role of weight and pressure in examining prints.

Forensic science equally offers itself to the teaching of concepts in the other strands of Biological science and Chemical science. For the more adventurous it can also be applied to the KLAs of Mathematics, English and Information Technology to address some of their learning outcomes (see table below).

The use of the worksheets, on-line resources and interactive CD ROMs being developed by NIFS should help to make the task of teaching forensic science easier for teachers not sure of how to incorporate it into their courses.

Resources from NIFS

In addition to current resources available, in 2001 NIFS is planning to produce a series of resources for teachers, which are linked to the learning outcomes of CSF II areas: English; Mathematics; Science; and Technology (Information).

These resources are:

- After the Fact – Interactive CD ROMs which allows students to investigate a crime scene and solve a crime.
- A series of information sheets each covering a specific forensic discipline
- “A Day with the Forensic Sciences” on 19th September 2001



- Expanded information on forensic science on the NIFS website including careers information, information pages on aspects of forensic science and links to other sources
- On-line activities and works sheets using forensic science for different KLA's and year levels

After the Fact – An interactive CD ROM

NIFS has already produced a range of interactive CD ROMs for the training and assessment of crime scene examiners. It is planned to produce versions of these for use by schools.

The CD ROM utilises virtual reality, still photography and video and allows the student to progress through the program – a virtual crime scene – processing the scene as a crime scene investigator would including making notes, taking photographs, collecting, labelling and packaging exhibits.

A series of relevant questions will be presented to the student allowing for both self assessment and external assessment.

By working through the scene and answering the questions a number of key learning areas may be covered. For example a case concerning a bar room brawl might cover:

Key learning area	Strand	Learning Outcome(s)	Aspect of the crime scene investigation
Science	Biological science	6.5 Structure and function	Determining the identity of the source of bloodstains
	Chemical science	5.3 Chemical reactions 6.3 & 6.4 Chemical reactions	Detection of blood and fingerprints Luminol detection of bloodstains
	Physical science	6.3 & 6.4 Forces and their effects 6.1 Energy and its uses	Blood dynamics and bloodstain pattern analysis Luminol detection of bloodstains
Mathematics	Space	5.1 & 5.6 Space 6.1, 6.4 & 6.7 Shape and space 6.1 & 6.2 Location	Blood dynamics and bloodstain pattern analysis
	Number	5.1, 5.2 & 5.4 Computation and applying number 6.3 Numbers, counting and numeration 6.4 Computation and applying number	Blood dynamics and bloodstain pattern analysis
	Measurement	5.1, 5.2 & 5.3 Measuring and estimating 6.1 & 6.2 Measuring and estimating 6.4 Use trigonometry and Pythagoras' theorem	Blood dynamics and bloodstain pattern analysis



	Chance	All learning out comes in levels 5 & 6 Chance Posing questions and collecting data Summarising and presenting data Interpreting data	Frequency of blood group / DNA data in populations
	Reasoning and strategies	All learning out comes in levels 5 & 6 Mathematical reasoning Strategies for investigation	Blood dynamics and bloodstain pattern analysis
English	Speaking and listening	All learning out comes in levels 5 & 6 Texts Contextual understanding Linguistic structures and features Strategies	Giving oral evidence in a court of law
	Writing	All learning out comes in levels 5 & 6 Texts Contextual understanding Linguistic structures and features Strategies	Preparation of report of the investigation for the investigator and the court
Technology	Information	All learning out comes in levels 5 & 6	Fingerprint and DNA databases
	Systems	All learning out comes in levels 5 & 6	Fingerprint and DNA databases



Information sheets

A range of one or two page information sheets each covering a forensic disciplines which may be used in conjunction with the CD-ROM or in separate activities. The sheets are in the process of being developed and will give cross-reference to CSF II. The information sheets will include:

- Ballistics
- Blood dynamics
- Botany
- Clinical Forensic Medicine
- Crime scene examination
- DNA Profiling
- Document examination
- Drug analysis
- Fibre examination
- Fingerprints
- Fire and explosion investigation
- Forensic anthropology
- Forensic Pathology
- Glass examination
- Hair/fur examinations
- Marks and impressions
- Odontology (dentistry)
- Paint examination
- Psychology/psychiatry
- Toxicology

It is planned to support this material with on-line resources through the NIFS website, www.nifs.com.au.

A Day with the Forensic Sciences

A Day with the Forensic Sciences is designed for senior secondary school students who have an interest in policing, science, medicine or the law, generally and forensic science or medicine in particular.

It will be held in conjunction with the 7th Indo-Pacific Congress on Legal Medicine and Forensic Sciences and will include presentations by national and international experts.

The program will follow the investigations of a serious crime. During the course of the day prominent experts in their fields (police, scientists and medical practitioners) will provide information on the investigation of the crime scene, the examination of items from the scene and finally give evidence in a court of law with the legal experts.

Information regarding careers in policing, science, medicine and the law will be available. If interested please contact NIFS for further details or to register interest (paul@nifs.com.au).