# Hospital Heist – Forensics Day

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# Overview of Hospital Heist by Gemma Hortop

## Introduction

The aim of this small project is to introduce Key Stage 3 Science students to the work of Forensic Scientists. The main thrust of the scheme is for students to focus on their analytical skills in both the experimentation and solving the crime.

The project has been divided into 5 one hour lesson with additional material to provide and introduction and summing up of the work completed. The project begins with a news bulletin explaining about the theft of a valuable piece of art work from the Chief Executive’s Office. Police have narrowed down the field down to 8 suspects – all of who work in Southampton Hospital. Students are charged with helping the police to investigate the clues provided.

The project is then divided into 4 separate investigations which can be completed in any order. If the work is being undertaken with an average sized teaching class, it is recommended that students are placed into group of 4-5 persons. This will allow all students to access the materials and experiments.

Prior to starting the project, it is essential that the student workbook is ready as well as all worksheets and equipment. It is recommended that the pictures of the 8 suspects are visible in the room to set the scene.

## Lesson 1 - Finger prints

Fingerprints are obviously a key part of forensic work and this lesson supports students in examining their own finger prints as well as attempting to lift some of a microscope slide. Students will then study a high-resolution image of a print found at the scene and compare this with finger prints of the suspects.

**Advisory note – this practical can become very messy without close supervision. It is advised that the powder is kept in one place in the room and that this area is closely monitored by a supervising adult.**

**Lesson Procedure:**

* Use the power point to introduce the ideas behind analyzing fingerprints at crime scenes.
* Discuss the idea of fingerprint patterns and then ask students to produce prints of their own hands in their student book.
* Students then collate fingerprint patterns for their group and compare these with worldwide trends.
* Students should then wash their hands and try to make a print of their own finger on a glass slide.
* They then need to try dusting it and lifting it off with sellotape to place in their workbook.
* If there is sufficient time students can try to use three different types of powder to see which one works best.
* Students then need to study the fingerprints of all the suspects and decide if it could be a match to any of them.
* Group work: Comparison of suspect fingerprints with crime scene image and analysis of group fingerprint patterns.
* Individual work: Describing their own fingerprint patterns.

|  |  |
| --- | --- |
| Suspect | Fingerprints at scene |
| A  AMANDA | N |
| B  ANDREA | Y? |
| C  JANICE | N |
| D  TOM | N |
| E  CATHERINE | Y? |
| F  NORMAN | N |
| G  REGAN | N |
| H  BALFOUR | Y? |

## Lesson 2 – Fibre analysis

Students will gain an insight into the different types of fibres which can be found at a crime scene and how this can be used to provide supporting evidence in a criminal trial. Students will firstly study a strand of their own hair under a microscope. They will then study the three animal hair samples found at the crime scene and compare these with a reference set to try and determine what animals they have come from.

To support this the students will also have the opportunity to study some high resolution images taken using an electron microscope at Southampton Hospital.

**Lesson Procedure:**

* Use the power point to introduce the idea of fibres being either natural or synthetic.
* Review the structure of a hair follicle and the different information that forensic scientists can extract from a single hair fibre.
* Students then try and gently pull or shake their hair to extract one hair to examine under the microscope. They should use the workbook to draw their hair under high power and make a comment about any damage etc…
* **Students should then wash their hands prior to starting the next activity.**
* Go through the list of suspects and who has been identified has having been near an animal/owns a pet.
* Students then need to examine the three different fixed animal hair slides found at the crime scene. They should use a reference sheet to see if they can identify the three animals. To support this, they can then look at the three sample picture that were taken using an electron microscope.
* Group work: Comparison of hair samples and discussion of crime scene samples.
* Individual work: Drawing images of the samples in the workbook

|  |  |
| --- | --- |
| Suspect | Hair/Fur |
| A  AMANDA | NO PET |
| B  ANDREA | Y – CAT OWNER |
| C  JANICE | N – WORKS WITH MICE |
| D  TOM | N – FERRET OWNER |
| E  CATHERINE | Y – CAT OWNER |
| F  NORMAN | Y – SHOOTS RABBITS AND DOG OWNER |
| G  REGAN | NO PET |
| H  BALFOUR | Y – RABBIT OWNER |

## Lesson 3 – Document Analysis

Advisory note: Please check that the school network can support Photoshop or a, free to download, software package called GIMP (GNU Image Manipulation Package).

A laser printed map of Southampton Hospital has been found at the crime scene and students need to use a computer software package to produce a high resolution image of the dot patterned found hidden on every laser print out. They will then compare this pattern with sets already produced from the four laser printers used by the suspects.

The students then have to compare the paper quality from each printer with the quality of the printed crime scene map. They do this by calculating the gsm using masses to tear a small strip of paper from each printer.

**Lesson Procedure:**

* Use the power point to introduce the laser printed map that wa found crumpled out the CEO’s office..
* Discuss the idea, like finger prints, every laser printer in the World leaves its own specific marking on a printed piece of paper.
* Students should then use the software program to view the image and identify the specific pattern of dots hidden under the image. They should print of sufficient copies for their group to examine.
* Students should then compare the pattern repeat on the map with those from the 4 laser printers used by the suspects. Can they identify the pattern repeat on each and see if there is a match?
* Use the powerpoint to then introduce of paper being produced of different qualities and that this relates to strength
* Students then can then strength test a strip of each paper from the four laser printers used by the suspects. They can also use a single sheet from each to calculate the gsm and compare then with the 100gsm of the paper map from the crime scene.
* Group work: Testing paper strength and identification of pattern repeats on laser printed pages.
* Individual work: Calculation of paper quality using measurements and mathematical skills.

|  |  |  |
| --- | --- | --- |
| Suspect | Laser Printer | Paper quality |
| A  AMANDA | N – LF57 | N |
| B  ANDREA | Y – LB62 | Y |
| C  JANICE | N –LB72 | N |
| D  TOM | N – LF57 | N |
| E  CATHERINE | Y – LB62 | Y |
| F  NORMAN | Y – LB62 | Y |
| G  REGAN | N-AB74 | N |
| H  BALFOUR | NO ACCESS | N |

## Lesson 4 – Ballistics

The scene works well if 8 sets of appropriate clothing can be hung around the room prior to the start of this lesson. Students are provided with some information that gun residue and a casing were found at the scene. Some suspects have access to different types of gun and students will use high resolution images to match up the casing with that found at the scene. They will them perform a simple chemical test to determine if any of the suspect clothing produces a positive for gun residue.

**Lesson Procedure:**

* Use the power point to introduce the idea that a bullet casing was found at the crime scene.
* Discuss the idea of impressions and marking patterns being left on a casing which are gun specific.
* Students should then be given the muddled up jigsaw pieces for the three casings owned by suspects. Students should then draw the markings in their booklets
* They then need to compare their drawn images with a high resolution picture of the casing found at the crime scene,
* Use the powerpoint to then introduce the idea of gun residue and how it penetrates clothing.
* Students then need to wear goggles and aprons (if possible) to complete a chemical test of each swab taking from the suspects.
* Students simply need to add a few drops of lead nitrate to the cotton bud tip. A positive result will be bright yellow. Results can be written in the booklet
* Group work: Comparison of suspect gun cartridges with one found at crime scene and chemical analysis of clothing swabs
* Individual work: Drawing rifling marks of the casing in booklets.

|  |  |  |
| --- | --- | --- |
| Suspect | Gun access | Gunshot residue |
| A  AMANDA | Y – STARTER PISTOL | N |
| B  ANDREA | N | N |
| C  JANICE | Y – HUMAN KILLER | N |
| D  TOM | Y – STARTER PISTOL | Y – USED STARTER PISTOL |
| E  CATHERINE | Y – STARTER PISTOL | Y – USED STARTER PISTOL |
| F  NORMAN | Y | Y – VERMIN CONTROL AT HOME |
| G  REGAN | Y – STARTER PISTOL | Y – USED STARTER PISTOL |
| H  BALFOUR | N | N |

## Lesson 5 – Summing up

Students will then need to look back through the booklet to determine who did and, importantly, did not commit the crime. It is suggested that each group produced a poster or presentation to sum up their findings. Certificates have been included as a resource if appropriate.

Students should then be shown the second news bulletin which announces who was arrested on suspicion of burglary and a possible motive for committing the crime.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Suspect | Laser Printer | Paper quality | Fingerprints at scene | Hair/Fur | Gun access | Gunshot residue |
| A  AMANDA | N – LF57 | N | N | NO PET | Y – STARTER PISTOL | N |
| B  ANDREA | Y – LB62 | Y | Y? | Y – CAT OWNER | N | N |
| C  JANICE | N –LB72 | N | N | N – WORKS WITH MICE | Y – HUMAN KILLER | N |
| D  TOM | N – LF57 | N | N | N – FERRET OWNER | Y – STARTER PISTOL | Y – USED STARTER PISTOL |
| E  CATHERINE | Y – LB62 | Y | Y? | Y – CAT OWNER | Y – STARTER PISTOL | Y – USED STARTER PISTOL |
| F  NORMAN | Y – LB62 | Y | N | Y – SHOOTS RABBITS AND DOG OWNER | Y | Y – VERMIN CONTROL AT HOME |
| G  REGAN | N-AB74 | N | N | NO PET | Y – STARTER PISTOL | Y – USED STARTER PISTOL |
| H  BALFOUR | NO ACCESS | N | Y? | Y – RABBIT OWNER | N | N |