

Experiments and Simulations in the University Forensic Laboratory

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Abstract

During the time, I initiated a series of tests – from lab applications to experiments and simulations. The way of assimilating the delivered knowledge makes the students reproduce the analysis procedures specific to various domains of the forensic investigation.

The experiments includes tests for essential aspects as: crime scene investigation, fingerprints, footwear impressions, traces of burglary, fire weapons, handwriting expertise and forgeries in documents, identifying a person according to the exterior description. Some themes join together several experiments or stages casually connected to each other, as in the case of: sampling and taking the incriminated traces; obtaining traces for comparison; comparative examination and identification of the generating object.

Key Words: Forensic Science, Experiments, Simulation, Students, Instructor/Professor

Introduction

Each exercise is so conceived as to be performed during a seminar, except for outdoor experiments. We would like to point out that every theme in the basic course is fit for lab practical applications, for instance the tactical hearing rules. Experiments, as learning method, have, in our opinion, *a cognitive value* in se. By getting directly involved, the student familiarizes himself with the practical working techniques. By playing the role of a homicide expert, the student feels he is involved and even responsible in the process. Intrinsic study of material evidence (fingerprints, graphism, physical and chemical properties etc.) helps him find their defining characteristics – general and individual – after which, by comparing them, the student establishes identity or non-identity by himself.

The fact is worth mentioning that what we have previously called “cognitive value” of experiments has an autonomous character vis-à-vis the information received during the course, seminars, case study presentations, survey reports, documentary and scientific films. Lab tests are *something else*, namely complementary modalities of initiation in forensics. Another aspect is significant in this context. The visits to forensic institutes and laboratories prove to be highly useful; but no matter how interested the student is watching people using specialized equipment, due to the circumstances, he is *passive*, contemplative, even when he asks questions. By contrast, during the tests and experiments performed at the faculty he is active, he works himself and understands better what he was taught (Buzatu and Ionescu, 2010).

Exercises can be extended to other subjects as well. As far as we are concerned, we only intend to illustrate the subjects we consider fundamental in homicide identification and investigation. The way exercises are performed depends on the person – generically called “instructor” – who organizes and ensures the course of the experiment. Competence, rigor and, last but not least, imagination will ensure the efficiency and the presence of the students.

Next, we will present a number of experiments and simulations performed in the forensic laboratory of the “Dimitrie Cantemir” Christian University.

I. Dactyloscopy

I.1. Fingerprints

Experiment purpose

Students will learn how to identify, preserve, obtain and lift fingerprint impressions, using adhesive folio, from the crime scene or from various items of interest for the investigation. Each student will take his own finger and hand print impressions on the dactyloscopic card. Each student will study and describe his fingerprint impressions, according to the dactyloscopic system presented at the course.

Procedures:

§1. Obtaining and lifting incriminated impressions

1. Setting up workshops made up of 4-6 students.
2. The instructor explains the modalities of obtaining fingerprints and makes a demonstration.
3. Students leave prints by placing their fingers on glass or a flat item (for instance the lab tables) or by seizing a glass object.
4. If the finger leaves no impression being too dry, the student tries again after he touches the posterior side of his ear lobe.
5. The impression is obtained by powder dusting.
6. Depending on the color of the printed item, a power in a contrasting colour should be selected (white for a dark surface and vice versa). Fluorescent powders, fit for flat surfaces (windowpanes, mirrors, crockery, furniture etc.) should be used for lab experiments. Powders of various origins shall not be used concomitantly.
7. The brush in the forensic kit is loaded with powder. The print is dusted with circular, one sense movements, until it becomes visible.
8. Abundant dusting and/or excessive pressure of the brush can ruin the print. No matter how simple this operation may seem at first sight, obtaining a fingerprint by powder dusting requires dexterity and practice, hence relatively frequent “student failures”.
9. When the impression is clearly visible, the excess powder is removed by shaking or blowing.
10. The print thus obtained is photographed by positioning the light source under various angles. When fluorescent powder is used, the photograph is made in ultraviolet radiation environment.
11. Adhesive films are used to lift fingerprint impressions:
 - a) the transparent folio is removed and the adhesive sheet is placed over the print obtained

- b) it is pressed with the finger until it adheres to the impression
- c) the adhesive sheet on which the print was transferred is carefully detached
- d) the sheet is covered with the transparent folio, protecting the print from alterations (scratches, wiping, contamination).

12. An operating protocol is drafted, mentioning whether the lifted print represents a positive or a negative image, black ridges on a light background or white/yellow ridges on dark background.

§2. Taking impressions of certain origin

1. The instructor distributes the ten-print cards, magnifying glasses and sampling materials.

2. Students write their names, year, group, identification number and date of the experiment on the card.

3. The instructor explains the modality and succession of operations.

4. Students take their own fingerprints as follows:

- Applying ink on each finger by rolling it on the ink pad. Other special colorless substances designed for forensic use can be utilized.

- Applying and rolling each finger on the ten-print dactyloscopic card in the corresponding box (thumb, index, middle, ring and little).

- Taking the right hand print impression in the same manner.

- When the print is clogged by too much ink, or when it is poorly visible due to insufficient ink or light pressure, the operation shall be repeated until satisfactory results are obtained, in keeping with the indications of the instructor, who checks the accuracy of the impressions.

5. The cards will be kept by each student for the subsequent experiment on fingerprint classification.

§3. Fingerprint defining and classification

1. Each student examines the ten fingerprints on his card using the magnifying glass.

2. To define each impression according the dactyloscopic classification, the student can use the explicative images in the course, the lab boards, drawings projected on the screen etc.

3. The **deltas** are to be searched for each of the ten impressions and highlighted with a marker.

4. The fingerprint type will be determined based on the existence of deltas, on their number and position (left – right), associated with the core form (arches, loops, circles, whorls etc.).

5. The student will write their type and subtype, as well as their name on the card, next to each impression.

I.2 Dactyloscopic identification

Purpose:

Students learn to identify the person that left the fingerprint of unknown origin (to establish the “author”).

Procedures:

1. Cards are distributed to students.
2. The student examines the “incriminated” fingerprint on the one-print card and, separately, the fingerprints of known origin on the ten-print card.
3. He determines the type and subtype of each fingerprint.
4. He compares the fingerprints and keeps only the similar ones, of the same type as the incriminated fingerprint (*generic identification*).
5. He continues the selection with the help of the delta-central line (Galton’s line) and retains only the print with the same number of intersected ridges; implicitly, the other fingerprints are excluded.
6. The details (minutiae) of the incriminated fingerprint and of the fingerprint of the person still to be discussed are established.
7. Each detail is marked by a needle puncture, by ink roller pointing or by a numbered arrow. The name of the detail is written next to the number: for example, 1) bifurcation, 2) buttonhole, 3) spur, 4) ridge ending etc.
8. The identity of the compared fingerprints will be established by means of comparative examination of the details, while the protocol will conclude that the incriminated fingerprint was left by the person wherefrom the prints of certain origin were obtained (*individual identification*).
9. For demonstration sake, the points can be united the result being a geometric shape identical for both fingerprints; the identity is verified by overlapping the shapes.
10. At the end of the experiment, the instructor will check each student’s worksheet and make the required observations.

Final discussion:

A collective discussion will focus on the probative value of fingerprints according to the *12 Point Rule* formulated by Balthazard. The concept of probability estimation in dactyloscopy will be explained in point of quantity (minimum number needed for an accurate identity) and in point of quality (frequency of type of detail and the probability of their overall combination).

Eventually, conclusions on dactyloscopic identification will be drawn (Ionescu, 2007).

II. Questioned document examination. Handwriting examination

Purpose:

Students learn about two of the possible modalities of forging handwriting:

1. **Self-forgery:** disguise of the handwriting in order to hide the identity of the writer (ex. anonymous letters) or of one’s own signature (ex. to be denied later).
2. **Altro-forgery:** counterfeiting another person’s signature.

Procedures:

§1. Disguise

1. Students are requested to write down a text distributed by the instructor (specimen 1), dictated or projected on screen. Each student will write down his name and the group number on the worksheet.

2. On the same sheet, the student will rewrite the text received (specimen 2) altering the graphic characteristics in a freely chosen modality (“as he thinks fit”), for instance:

- distortion of graphic shapes;
- simulation of an inferior type of handwriting (infantile, trembling and incoherent characteristic of elderly people etc.);
- left hand writing;
- combined methods.

3. Students will exchange sheets.

4. Each student examines the sheet received from his colleague and tries to determine, by means of comparison, which are the changes made to the natural/original handwriting (specimen 1) following disguise (specimen 2).

5. Disguised graphic characteristics:

- Evolution degree, respectively simulation of an inferior degree of movement coordination (de ex. clumsy, slow, rigid, abrupt).
 - Handwriting shape (ex. replacement of round and festooned strokes with angular-pointed and arched strokes).
 - Letter structure and details (letter morphology); checking whether the same letter is changed throughout the text or only “from time to time”.
 - Handwriting size (ex. large instead of small, superscript instead of subscript).
 - Handwriting speed (ex. slow instead of fast, regressive instead of progressive).
 - Stroke slant (ex. left slant instead of right slant).
 - Stroke pressure (ex. hard instead of “light”).
 - Connection between letters (ex. replacement of continuous writing with abrupt, letter by letter or grouped writing).
 - Handwriting spacing (ex. cramped instead of normal or dispelled).
 - Line angle and shape (ex. upward/downward or straight/convex/concave).
6. On the same sheet or on a separate one, the student that examined his colleague’s handwriting specimens – normal and disguised – will note down the changes seen, usually the most obvious ones.
7. For this purpose, he can use a standard card which comprises the graphic elements that make the object of disguise.

§2. Signature forgery

1. Each student will be asked to write their own signature several times on an A4 sheet of paper. Signatures shall be written vertically, one under another. If he has several signature variants (literal, shortened, monogram, illegible etc.) he will write 2-3 signatures of each type.

2. Students exchange the sheets among them. The receiving student will be asked to reproduce his colleague’s signature. The “forgeries” will be written on another sheet than that with the specimens.

3. Attempts will be made to reproduce the original signature, resorting to the methods taught during the course:

- **Direct copying:** a) the sheet with the original signature will be placed under a blank sheet; b) both are placed on a windowpane providing the transparency needed to see the

model signature; c) the letters of the signature are copied one by one; d) during this operation, for control and checking sake, the upper sheet can be lifted without being moved.

- **Indirect copying:** a) the sheet with the original signature is placed on the blank sheet; b) the model is overwritten with a sharp instrument; c) due to pressure, the contour of the signature is imprinted, as furrows, on the bottom sheet; d) the furrows are filled in with a ballpoint pen, fountainpen or pen, obtaining a replica of the original signature.

- **Servile imitation:** a) the student places the sheet with the original signature in front of him; b) stroke after stroke, he reproduces the signature looking at the model.

- **Free hand imitation:** a) the student writes the original signature several times in order to learn it by heart; b) he reproduces the signature from memory, as spontaneously and as quickly as possible; c) practice is allowed and even recommended.

4. The sheets with the signatures obtained using the four methods will be exchanged again. The holder of the original signatures will get back the sheet with his signatures and the sheet with the signatures “forged” by his colleague (whose name is written at the top of the sheet).

5. Analysing and comparing the signatures, the students will try to determine the formal similarities and the basic differences, typical forgery indicators: slow execution, lacking spontaneity, showing stops, some retracing, differences in size and slant, mistakes in reproducing letter constructions and connectors etc. (Buzatu, 2013).

Final discussion:

The instructor will select one or several worksheets and will make comments. He will stress the major aspects related to the forensic analysis of signatures. In that context, he will explain the absolute value of the axiom according to which no person can sign twice identically. Therefore, when two signatures match perfectly, at least one is false, being copied after the other. The hypothesis should not be excluded that both identical signatures had been copied after an authentic signature, respectively a third one.

Students will be explained that the hypothesis is not purely theoretical. In practice, it often happens that during a penal or civil lawsuit, the very original signature, which served as a model, is added to the file as a comparison exhibit!

The discussion can also be extended to the issue of original scripts that must be placed at the disposal of the forensic handwriting expert for comparative tests: specimens written in front of legal staff, pre-existing writings and documents in the lawsuit file.

III. Spoken portait

Purpose:

a) Students learn how to describe a person usually seen fugitively in circumstances of forensic importance.

b) Students learn which are the exterior signalments and how, based on them, a person is recognized, hence identified.

Procedures:

1. The seminar begins with an impartial discussion vis-à-vis the subject of the experiment such as the recapitulation of the previous seminar, preparation of the graduate thesis etc.

2. Unexpectedly, a person opens the lab door, enters the room taking a few steps, under a certain pretext, such as:

- a student enquires about a certain course;
- a person claims to be from the administrative department and asks whether the fire extinguisher has been re-filled within the validity period;
- a person "from the Rector's Office" announces an official visit or an event in the university lecture hall;
- a student enquires about a professor for a discussion about the graduate thesis;
- any other plausible scenario.

3. The "actor" person will behave as naturally as possible not to arouse suspicions.

The conversation should last 1-3 minutes, the person discreetly changing position to facilitate observation from the front (frontal plan), from one side (lateral plan) and even from behind (while leaving). In keeping with the directions given by the instructor, a few gestures (tics) will be simulated, most commonly using the hands.

4. Clothes should draw attention by colour, cut, length etc.; this is also valid for the other worn items (jewels, purse, scarf, cell phone etc.).

5. After about ten minutes, the instructor will ask every student to describe the characteristics seen. The observations shall be written down.

6. Complementary, a signalment card can be used, prepared in accordance with the criteria of the "Spoken portrait" method, selected and reduced to the essential ones for students' use. The situations noted in keeping with personal perception and assessment will be **circled** on the card.

Final discussion:

If possible, the person that made the object of the experiment will be called back, students' "impressions" being confronted with reality.

The instructor will talk about the factors which, in real cases (events of forensic importance), influence the perception of signalments and their memorizing:

- observation duration and distance;
- place and reciprocal position;
- visibility (light, weather conditions);
- sight and hearing acuity;
- sense of observation;
- the circumstance of the observation process and the degree of interest and attention, respectively (acts of violence, traffic accident, altercation etc.);
- memorizing process: the observer's capacity to memorize the person and describe the perceived characteristics (incoherently, clearly, nuanced);
- passing states: emotion, stress, fatigue, fear (especially in the case of the victim), surprise, revolt and others.

At the end, the instructor will stress that the presence of conjectural factors with value of "negative stimuli" can lead to false assessments, involuntary distorted interpretations. A long time interval can play a not at all negligible role, which can contribute to the distortion of the memorized images.

Conclusions

The proposed experiments, deliberately limited to a semester period, are only suggestions, with no pretense to serve as guide to lab practical activity, although they could be considered so.

Experience shows that students are actually attracted by the simulation of forensic investigative activities where they play the leading role. Without realizing it, they learn what many people practicing law do not know or are not interested to know: technical evidence management in full awareness. The mentality is quite widely spread that, if there are the institution of analysis and experts, the magistrate does not need expert scientific knowledge. What about the advised formulation of the object of the analyses, the correct interpretation of experts' conclusions?

A subsidiary purpose of this paper is to provide a potential model to those teaching Criminology. To prepare and perform experiments is not an easy task. The teachers that were or are professionally involved in forensic activities, forensic analysis in particular, can consider themselves privileged and could make the most of it.

In consideration of the above, we express our wish and readiness to anytime exchange ideas on the approached theme, which we consider an example of creativity in academic learning.

References

1. Buzatu, N.-E. (2013). *Criminalistics*, Pro Universitaria Publishing House, Bucharest.
2. Buzatu, N.-E.; Ionescu, L. (2010). *Experiments and Simulations in the Forensic Laboratory*, C.H. Beck, Publishing House, Bucharest.
3. Ionescu, L. (2007). *Criminalistics*, Pro Universitaria Publishing House, Bucharest.