

A report on my experiences of a Master in Science degree in Document Analysis, awarded by the University of Central Lancashire, Preston.

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Having studied for and gained the British Institute of Graphologists' Diploma in 2007 following lots of hard studying I found that my brain cells had become stimulated and I needed to continue with this learning process. Not long afterwards I was made aware of Reed Hayes' Handwriting and Document Examination course from a friend, so I decided to "give it a try". Much to my surprise I did very well, enjoyed the course and gained lots of confidence. It seems that the older I get (I'm in my late 50s) the more I am enjoying learning.

Then, during 2009 and 2010 local government boundary changes for Cheshire were implemented which resulted in me and the local County Council parting company after nearly 17 years together. I took this as an opportunity to do something very different from my previous jobs in the Research and Intelligence, Cheshire Fire Brigade, a Further Education College and Children's Services sections of the Council. So I enrolled at the University of Central Lancashire in Preston (65 miles north of my home in Chester) as a full-time student in The School of Forensic and Investigative Sciences. I thought it would be interesting to share my learning from this course with others. My previous work in graphology was accepted as part of my entrance qualifications, although some existing forensic document analysts think it is a disqualification.

The School of Forensic and Investigative Sciences offered four degrees at Masters level: Forensic Anthropology (the grave diggers), Forensic DNA profiling (the test-tube boilers), Forensic Fire Investigation (Trumpton) and last but not least Forensic Document Analysis (the Scribblers). On the Document Analysis course there were ten of us and only four with English as a first language. The scarcity of courses is such that the other students came from as far afield as Pakistan, Sierra Leone, Gambia, Ghana, Greece and Saudi Arabia. As can be seen not only were some of the students studying and writing assignments in a second language, but some had to learn a different alphabet and one also had to become familiar with writing from left to right. Three of the students were already working in an investigative/police environment in their own country and they wanted to consolidate and formalise their training and experiences with an internationally recognised qualification.

I looked forwards to the first semester starting with Handwriting Analysis as I thought this would give me the chance to judge my experience, knowledge and learning speed against the rest of the group who are half my age. I was quite pleased when doing some literature research in the early days when I came across a 'picture' that I thought I understood (Figure 1), containing measurements of height, width, proportions, slant etc. How wrong I was. The measurements were being used by researchers who analyse images and patterns (Figure 2 shows some of the technical terminology) "for information exchange among research works in the pattern recognition field¹". I quickly decided this was something way beyond my experience with computers and put it to one side. However, it was interesting to discover that the analysis of handwriting features is being taken as

¹ Vladimir Pervouchine, Graham Leedham, *Extraction and analysis of forensic document examiner features used for writer identification*, The Journal of Pattern Recognition, 2007, 40, 1004-1013

seriously by "pattern-recognitionophiles"¹¹ and classed with subjects such as space science, biological taxonomy, biometrics and meteorology!

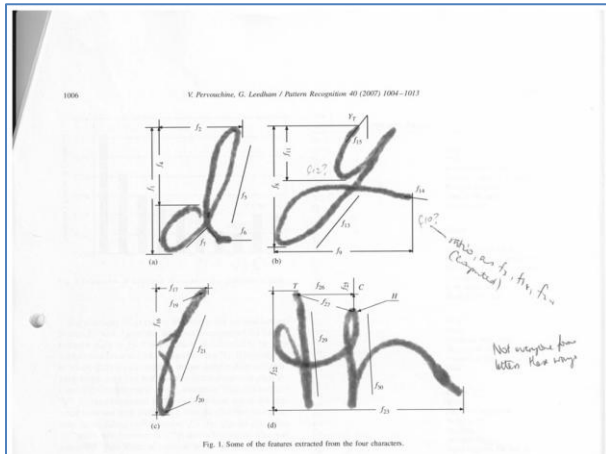


Figure 1 Vladimir Pervouchine, Graham Leedham, *Extraction and analysis of forensic document examiner features used for writer identification*, The Journal of Pattern Recognition, 2007, 40, 1004-1013

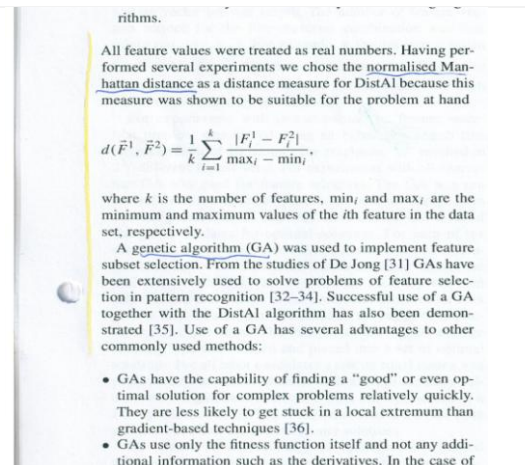


Figure 2 Vladimir Pervouchine, Graham Leedham, *Extraction and analysis of forensic document examiner features used for writer identification*, The Journal of Pattern Recognition, 2007, 40, 1004-1013

Linking with this was our first assignment which was a 3,000 word essay on computer tablets. The computer tablet looks like a cross between the screen of a laptop and an Etch a Sketch toy. The writer uses a special pen-looking tool to 'write' on the surface of the tablet and the computer software calculates the usual features such as size and slant and in addition other features such as speed, pressure and the amount of time the pen is raised off the surface. This can be used in the medical field to take handwriting measurements before and after treatment or medication and to quantify illness recovery or deterioration. In the forensic field it can be used to assess the variation in 'normal' signatures and compare it with 'specimen' signatures. For instance if a bank or employer holds electronic versions of a person's normal signature then when a signature authorisation is required the writer signs on the tablet which will be able to confirm whether the signature is genuine or not. These tablets are also being used in the medical field for medical staff and patients to confirm and authorise treatments and other checks.

Much of my learning on the course was through literature research and the 2,500 word essay on "Ethical codes and behaviour with reference to document examination" was something that I had to consider carefully. Issues such as "what is the truth?", "when to tell the truth?", and "how to tell the truth?" are relevant to graphology as well as document examination. The emphasis within forensic examinations is towards justice and the truth; to the facts revealed by the examination and not to the client. Frequently, potential clients contact me requesting that I examine some handwriting and produce a report to prove someone did (or did not) write some specific text. I have to explain that my report will be my opinion on what I find from the examination, I cannot write a conclusion to suit their specific wishes even if they are paying me.

The other topic covered in the first semester was investigating how documents and the images contained are produced other than by handwriting ie typewriter, rubber stamp, watermark, embossing or the different methods of printing such as ink jet, laser, silk screen, photo gravure, litho etc. This was relevant to forensic document examination as we need to understand how documents are created to ensure forgeries can be identified.

Though the use of typewrites (especially manual) is decreasing in the United Kingdom, some documents for examination might be typewritten either because typewriters are used in the country of origin or perhaps the document is pre-computer age; knowledge of the likely identifying characteristics and typefaces from different typewriters can be essential for this type of forgery examination.

With the availability of highly sophisticated scanning, printing and copying equipment counterfeiters have been able to produce high quality forged currency, identity and legal documents, fake CDs, clothing etc. To deter counterfeiters, since the mid 1990s, Australian banknotes have been made from a polymer material containing a transparent window. This has proved very successful in the fight against crime as counterfeiters find it very difficult to obtain the specific polymer, transparent window and reproduce the currency. Thus they move on to an easier currency to fake. An understanding of the history of paper, inks and the security features incorporated into the production of documents (such as the metallic strip, fluorescent and luminescent inks, heat sensitive inks, watermarks, micro-printing, 3D printing) is useful when undertaking a full forensic examination.

To re-inforce the scientific element of the course we were given basic statistics lessons on a Friday afternoon during this first semester. This involved learning about statistics, learning the programming language of a free statistical package called "R", learning how to input data and then interpreting how results can be used in the forensic analysis. I definitely struggled on this part of the course and I am still looking for help with this as I would like to continue with my research project.

During the second semester we had the opportunity to practice using the laboratory equipment and learn how these could be useful when undertaking a full document examination. We investigated the pigment and dye components of inks in various writing tools. Ballpoint ink analysis was done initially by the cheap, effective and speedy method of thin layer chromatography and then by using some of the more sophisticated laboratory apparatus such as the HPLC (High Performance Liquid Chromatography), gas chromatography–mass spectrometry (GC-MS), Raman spectroscopy, the Foster and Freeman Visual Spectral Comparator (VSC) and other specialist apparatus.

An understanding of how materials and inks have changed over the years, and the various security features that can be incorporated can help with dating a document. For instance development started on a ballpoint pen in the late 19th century but many problems were encountered in ensuring that the ink flow was fluid enough to flow but viscous enough to dry quickly and not smudge and the first ballpoint pens were not commonly available until the mid 1940s. Therefore if a pre-1945 document has been signed with a ballpoint it will immediately raise concerns. Information on the introduction of other writing tools such as roller-ball pens, gel pens, felt pens and the chemical composition of their inks can also assist with dating a document. Our knowledge of ink dating was tested by a 2000 word assignment intended for a "non-scientific reader" on "Ink analysis, interpreting the data and presenting the evidence".

The VSC equipment is useful in that it can use filters to permit different light conditions to illuminate a document thus enabling identification of different ink compositions used in a document. Figure 3 shows the image of a document in the VSC machine with no filters in use. Figure 4 shows how, when varying the lighting conditions, some of the inks are no longer visible and Figure 5 demonstrates how

some inks are more luminescent than others. The VSC can also alter the direction of the light source onto a document which can help identify indentations and raised sections.

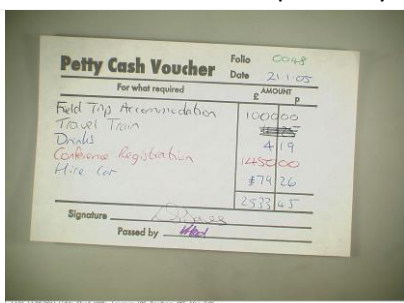


Figure 3 A petty cash voucher completed in different inks under normal lighting conditions.²

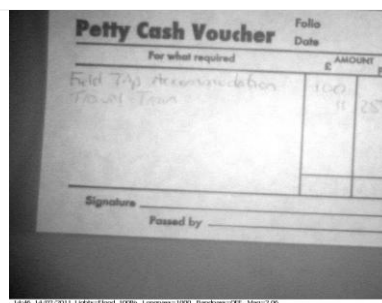


Figure 4 When lighting conditions are changed some inked text is no longer visible

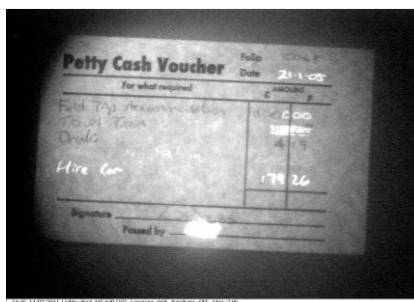


Figure 5 Different lighting conditions illuminate some inks used on the document

The VSC equipment can also be used to identify changes to a document such as the mock cheque below (Figure 6). Many times we are asked to examine a photocopy as an original is not available and Figure 6 represents a photocopy cheque. All the text has been completed by the same writer and at first glance the text appears bone fide. However, using the VSC on the original document it is apparent that additions have been made to the payee, Figure 7. It cannot be assumed that this is fraudulent; all that can be said is that the evidence shows that changes have been made. Perhaps it is fraud or perhaps the signatory realised they had made an error and corrected this with a different blue pen? A document examiner must be objective and report on the evidence.



Figure 6 Image of the mock cheque



Figure 7 Illustration of changes made in a different ink

The Foster and Freeman Electrostatic Detection Apparatus (ESDA) equipment is excellent for revealing indentations or elevated sections of a document. Figure 8 below shows an image of a poison-pen message on a page taken from a spiral-bound notebook and an envelope was found in

² VSC and ESDA images are supplied by the University of Central Lancashire School of Forensic and Investigative Sciences

the home of one of the suspects. When the envelope was opened and the inside of the envelope examined using the ESDA apparatus the indentations revealed the addressee as expected but also other text (Figure 9). On further examination this other text was found to be identical to that of the poison-pen letter. It cannot be assumed that the writer of the envelope wrote the poison-pen letter that would have to be a separate investigation. The process demonstrates that the writer of the poison-pen letter rested on the envelope when composing the letter.

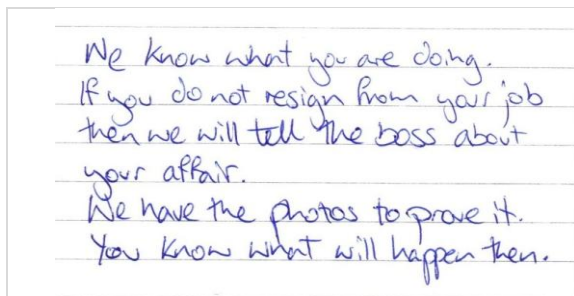


Figure 8 Image of the original poison-pen letter

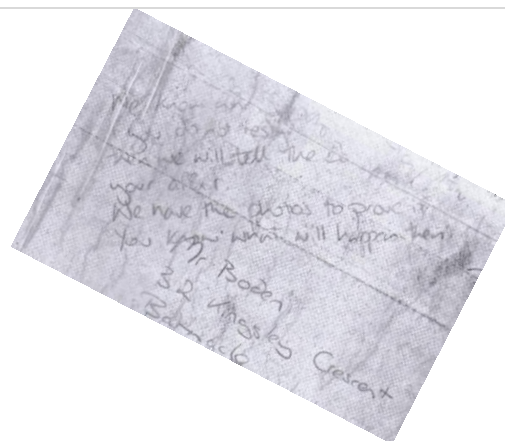


Figure 9 Image of the ESDA results revealing the addressee and also the poison-pen letter text

A piece of relatively inexpensive but very useful equipment is a USB digital microscope. This can be purchased from many of the electrical/electronic supplies shops or from the internet. These offer various degrees of magnification eg 20x and 200x which are far greater than a traditional magnifying glass. The digital microscope also has the advantage of creating a digital image that can be used in report writing. Figures 10 and 11 are images using the digital microscope. Figure 10 shows the "matchstick" effect on the number "1" where the ink flow is reduced just after the ballpoint commences writing. Figure 11 illustrates striations on the ink stroke which are useful indicators of the stroke direction.

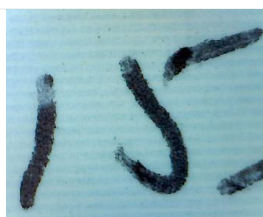


Figure 10 Digital microscope image clearly showing the stroke direction of the "1".



Figure 11 Digital microscope image showing striations and the direction of stroke.

Another project in the second semester was to create a Quality Manual for a hypothetical laboratory. We approached this task in small teams and had to design, create and collate into a large document all the paperwork we felt was necessary to ensure our laboratory produced accurate and consistent results. The Manual contained everything from staff CVs, health and safety procedures, templates for taking request signatures, how to use all the laboratory equipment safely and finished up as over 100 pages in total. The assessment method for this was one that I had not come across previously; we each marked the other two members of the team on how well they had completed the task.

The greatest learning opportunity for me, in this semester, was in understanding the legal aspects of being a forensic expert. The lectures were followed by a 4000 word assignment where we had to "Critically discuss the selection, role and responsibilities of the expert witness in the criminal justice system". This involved a third method of referencing the literature we had read, having already used the Harvard system and the numeric system on other assignments.

In addition to the assignment we had the opportunity to examine some casework documents and write a full report on the process, results and conclusion suitable for Court. This report was then used as our evidence in the Moot Court proceedings (simulated Court proceedings) and we were cross-examined on the evidence and opinions in our report. The barristers were extremely attentive to typing errors or inconsistencies in the report and it felt like a real interrogation process as they tried to find holes in the process, results and conclusion of the report and tried to twist and misinterpret the meaning of my verbal evidence.

During this semester sources of useful formal support such as the Academy of Experts and the Expert Witness Institute were noted. These organisations have guidance on the responsibilities of an expert witness, ethical considerations, current protocols, report templates for civil, criminal and tribunal reports and also updates on relevant legal changes. A recent change is that an expert can now be sued for negligence whereas as previously immunity was available to ensure an expert could speak freely. Formal, "traditional" examinations were at the end of the first and second semesters.

Throughout the course, the need to be scientific was emphasised. In practical terms this entailed making and retaining detailed notes of everything from the initial enquiry to all the elements of the investigation. Often a case does not get to Court for a couple of years and the notes taken during the investigation are essential to remind the examiner of the method, results and conclusion of the investigation. They can also be requested by the court as evidence.

We were also encouraged to use statistics where appropriate and useful. To some extent this is something I have used previously when measuring and deciding whether a questioned measured feature is within the range of the comparison measured features. However the course has shown the need to be more scientific and statistically aware. For instance if the left margin measurements of six writing samples being used for comparison are 20, 28, 19, 16, 19, 19mm and the left margin of the questioned document is 22mm I might previously have said "it is near enough" to the comparison samples. However on carrying out a statistical analysis of the numbers I did not receive the 95% statistical certainty required to say that the 22mm was in the same range. The 22mm margin is in fact statistically significantly different to the other 6 measurements.

Towards the end of the second semester we had to decide on a research project which was to occupy us for the third semester. As my research involved humans, I was asking for handwriting samples, I had to submit my proposal to the university Ethics Committee. The research proposal has to include how I would collect the 'samples' and the relevant paperwork, how they would be anonymised, how they would be stored and for how long and also the contingency plan if the person in charge of handwriting-sample storage left. The university is very thorough in this aspect.

My dissertation was "To investigate whether gender, age group or handedness influence the ability to disguise writing", I wondered whether men or women, older or younger, left or right-handed

persons disguised their writing differently. Auto forgery is found in the forensic world, it is where a writer disguises their own writing or signature and then denies it is theirs, it is very difficult to identify. I had read that auto forgery is more common in times of economic downturn for instance clients taking out a loan, spending the money, then denying the signature is theirs. A non-threatening example is an anonymous Valentine's card however a more threatening situation would be a poison-pen letter.

I do not have the space here to talk about the research project in detail however I have included a couple of hand writing examples of participant's normal writing and disguised writing as a taster. Participants were given an A5 size paper (Figure 12) for the rhyme and a DL size simulated envelope (Figure 13). Of each handwriting pair the one on the left is the normal handwriting and the one on the right is the deliberately disguised sample. These few examples show how easily some people can consciously change their writing and page layout and how difficult others find the same task.

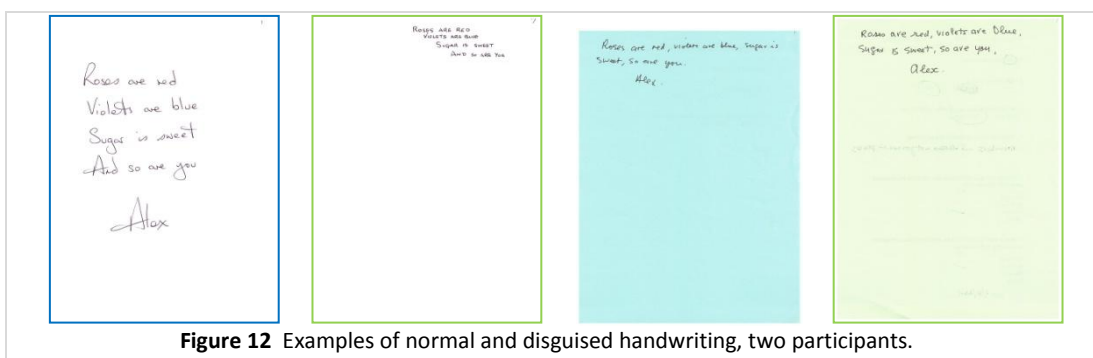


Figure 12 Examples of normal and disguised handwriting, two participants.

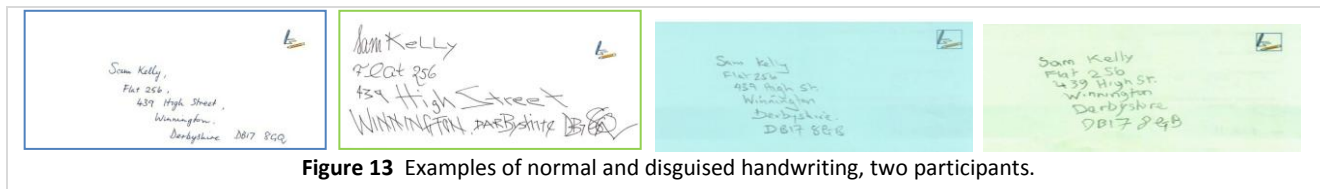


Figure 13 Examples of normal and disguised handwriting, two participants.

In summary, I thoroughly enjoyed the course and felt it worth the money. I found the common factor between forensic handwriting analysis and graphology - observational skills. These are essential to both however my experience is that the forensic examination places more emphasis on a wider, objective investigation of the whole document.

I not only learned a lot about forensic document analysis but also how to continue my learning in this subject as it is essential to keep up to date with research and the legal changes knowing the responsibility that is inherent in this type of work. I'm hoping to continue with the research aspects of document examination.