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Forensic Science Education – The Past and the Present In and Out of the Classroom

John P. Cassella, Peter D. Maskell, and Anna Williams

1 Staffordshire University, Department of Forensic Science and Crime Science, Faculty of Computing, Engineering and Science, Science Centre, Stoke on Trent, UK
2 Abertay University, School of Science, Engineering and Technology, Dundee, UK
3 University of Huddersfield, School of Applied Sciences, Queensgate, Huddersfield, UK

Introduction

This chapter aims to reflect upon and to consider the ‘where are we now’ aspect of forensic science education and training. Despite the rhythms and reflective cycle that academia requires, it is surprising how little time the on-the-ground academics and practitioners involved in education and training get to truly reflect upon the curriculum and assessment of what they deliver. Of course what is specifically taught depends upon many variables; the interests, skills and experiences of those academics delivering the material coupled with the requirement of the industry to teach it. Whilst such criteria are of importance to say ‘art’ colleagues in their curriculum design, they are not as crucial as they are to a subject such as forensic science. This offers limited latitude for what is taught and requires industry professionals and accreditation boards to drive the expectations of the curricula to a greater degree. What is apparent over the coming pages is the change and the rate of change that has taken place in the forensic science profession at all levels, technical, practical and academic and its use within the Courtroom is now greater than ever, demanding higher and higher levels of skill, competence and understanding of what is useful in a police investigation and criminal trial.

Forensic science is a ‘critical and integral part’ of any judicial system in the 21st Century because forensic science is one of the primary means through which ‘democratic governments fulfill one of the most fundamental obligations to their citizens: public safety insurance in a just manner’.

Houck, 2006
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Well over a decade ago, in 2000, in the United Kingdom (UK), the educational landscape for forensic science was very different to today’s current situation.

The changes that have occurred in the past decade not only in the forensic science area but also within policing (Neuroyd, 2011) are the greatest since either forensic science or indeed policing came into being. A number of key national and international events have occurred and documents have been published that have aimed to examine the status quo and to offer direction for future developments within forensic science and hence its delivery and education. Some of these early key events and the documentation resulting from them include:

- The report by the UK House of Commons Science and Technology Committee – Forensic Science on Trial, published in 2005.
- The UK Skills for Justice Report in 2009 for the Forensic Science Occupational Committee in 2009 into the provision of forensic science degree programmes in UK Higher Education institutions (HEIs).
- The publication of the Silverman report on UK Forensic Science Research published in 2011.
- The ‘paradigm shift for UK Forensic Science’ (Royal Society Meeting) in 2015 … and the list could go on.

As a result of the field’s prominence and popularity (Mennell, 2006), the number of education providers offering forensic science courses and the number of students enrolling in these courses increased exponentially (Engber, 2005; NIFS, 2006) but the subjective observation is that there is now a downward trend in recruitment in forensic science courses in favour of policing based education.

The expansion in forensic science education worldwide driven by university consumer forces and popular demand, in addition to the inconsistency and lack of clarity in the huge range of forensic science courses on offer, have led to inconsistencies in skills and competencies acquired by the graduates seeking employment in the field. Whilst this has clearly been addressed through accreditation by the laudable attempts of learned societies in their host countries (such as the UK Chartered Society of Forensic Sciences) to harmonise the content of delivery, this has worked within countries to some extent, but less so across countries, which reflects the relationship of forensic science with the law and the wider Criminal Justice System within that particular country.

In 2004 that may have been the case, but the situation is now somewhat improved. The question concerning the variety and the value of the many publications and reports on this topic into forensic science provision and education and the legacies and the recommendations that they have offered will be considered further within this chapter and indeed as a paradigm throughout this book. There is, however, much still to be done as forensic science education enters the second decade in the UK HEIs. As Samarji (2012)
observed, forensic science academic programmes are still characterised by a great deal of randomness and uncertainty.

Burnett et al. (2001) had argued that little research has been undertaken and published on forensic science education; it is reasonable to surmise that this issue of a paucity of literature at the turn of the twenty-first century has long since been redressed with a myriad of documents, investigations and recommendations at national and international level into all levels and aspects of forensic science. Four years later, Lewis et al. (2005) concluded that the random expansion in forensic science education worldwide, in addition to an inconsistency and lack of clarity in the wide range of forensic science courses on offer, led to variations in the skills and the competencies acquired by trainees and graduates seeking employment in the forensic field. Moreover, forensic science education departments still lack formal arrangements with practitioners and employers to discuss course content, delivery and assessment. Currently in the HEI sector, at best there is a ‘Memorandum of Understanding’ but more often there is a reliance upon the good will of management level staff from both the academic and practitioner organisations involved. Instead ‘what exists is a series of ad hoc arrangements’ (with a couple of notable exceptions), which occur on an individual basis between employers or individuals and UK universities through which ‘employers liaise with universities about particular courses’ (SEMTA, 2004) and how they should or could develop their courses.

Forensic science suffers a non-consensus within the academic community on whether it is a stand-alone and distinct applied field of knowledge, an associate field of study, or merely a technical derivative of existing arenas. Moreover, some scholars and practitioners argue in the public domain in the extreme as to whether or not forensic science education is a necessity at all within Higher Education.

Despite this dialogue, criticisms by potential employers (Lewis et al., 2005) abound more than a decade after the first courses were introduced. Forensic science (education) departments still lack formal arrangement or requirements with employers and national level organisations, for example, the College of Policing (CoP), Chartered Society of Forensic Sciences (CSFS) and Skills for Justice (SfJ), offering endorsement programmes to discuss course content in a meaningful fashion and certainly not at a national, European-wide or international level.

These inconsistencies have resulted, particularly in forensic science education courses because of the lack of dialogue between the various contexts, cultures and mind-set, in a field of shifting but unconfirmed reigning paradigms. This lack of dialogue, compounded by the lack of Quality Assurance Agency (QAA) guidance (until 2012), had resulted in a set of competencies determined to a large degree by the skill set of the academics from the university at the time that the course was first designed. This has been offset in part by up-skilling of HEI academics in the realisation, from advice given by forensic practitioners from industry when attending university forensic science course ‘validation events,’ that the course must be more than ‘forensic’ in name. Whilst this has been achieved to varying levels across the HEI sector, most, if not all institutions involved, are guilty (in part) of not fully entering into dialogue with legal or policing colleagues. The closure of the UK Forensic Science Service (FSS) in 2012 had one positive effect upon HEIs as an industry, in that it offered a willing pool of highly qualified individuals who could join the academic teams. Previously, such individuals had only entered this pool at retirement on a visiting lecturer basis.
Despite the prominence and high stature that forensic science has gained within the general public consciousness and the consequent expansion it has achieved within Higher Education institutions, forensic science ‘has not enjoyed a similar rise in stature within the academic community’ (Jonakait, 1991). Garrison (1991) asserted that forensic science identity is complex because it is the ‘product of an uneasy and unholy mating of science, the objective seeker of truth and knowledge, and forensics, the argumentative persuader of courtroom advocacy’; competency compounded by its association with the Police Service in the UK undergoing one of the most radical changes in over 100 years (Neyroud, 2011).

Forensic science remains a relatively new and developing field in terms of its education, practice and stature. It is the proverbial Cinderella to chemistry, physics and biology and is likely to be so for the foreseeable future, until its importance in both an educational and employment context are fully recognised and appreciated. The reasons for this are still being debated, however, the relative youthfulness of such educational courses may in part explain the attitudes of employers to such courses when compared with the much more established sciences such as physics, chemistry and biology.

Therefore, complexity and uncertainty issues are experienced at the epistemological level of forensic science, in the nature of the actual practice and within a wide grasp of images, profiles, impressions, expectations and perceptions that attempt to shape the identity of this field.

In the eyes of the media, UK educational establishments that were given university status in 1992 (and beyond) are criticised as being only devoted to responding to either government’s wishes or fulfilling businesses’ obsession with income, whilst giving up their historic fundamental role as a ‘civilising force’ and a source of moral development (Cullingford and Blewitt, 2004). Forensic science education has sometimes been used by universities for business reasons, where the word ‘forensic’ is used as a popular term to attract enrolments and polish the perceived less attractive conventional subjects, such as chemistry and physics, which are subject to closure (SEMTA, 2004).

Despite the levelling-off (in fact a clear decline) of the number of HEIs validating forensic science based courses, the initial rapid growth in forensic science education over the last decade continues to raise concerns about the quality of many of the forensic science programmes offered (Da´eid and Roux, 2010; Quarino and Brettell, 2009; Mennell, 2006). This rapid growth is argued to be the cause of the inconsistencies and the lack of clarity reflected in the huge range of forensic science courses on offer (Lewis et al., 2005). This inconsistency in education has resulted in the lack of agreement on the ‘appropriate’ competencies acquired by forensic science graduates, which have led to further criticisms from potential employers (Lewis et al., 2005; Hanson and Overton, 2010). The CSFS accreditation process has done much to level the playing field in terms of quality and content but as this is still not a requirement for course delivery it has not been taken up by all HEI providers.

Reviews have been conducted to study the current status of this education and establish some recommendations for the future (Da´eid and Roux, 2010). With this in mind, the following studies are pertinent to consider.

The Sector Skills Council for Science, Engineering and Manufacturing in the UK conducted a study on forensic science (2004) which recommended that: (1) forensic science degree content be monitored for quality assurance and be set-up in close cooperation with the forensic industry; (2) professional technical/laboratory skills
training programmes should be established; (3) pure science disciplines (e.g. chemistry) in Higher Education should receive more government funding (SEMTA, 2004). This study was supplemented by a study in 2009 presented in a 'Skills for Justice' report in response to the on going debate and concerns of the UK Government about the employability and postgraduate ‘value’ of many of the forensic science courses offered within the UK (Daïèd and Roux, 2010). The Skills for Justice's report observed that a number of the issues raised years previously in SEMTA's 2004 report remain a concern over a decade later, including the failure of large numbers of forensic science graduates to secure employment in the forensic sector. At the time of the SEMTA report in 2004, the forensic landscape was very different for both practitioner and educators, and it was indeed very different for students within a university environment; the questions remain as to the success or not of the levels of employment of forensic science graduates.

The USA National Institute for Forensic Science (NIFS) criticised the United States educational establishments in 2006, in that forensic content was present sometimes 'by name only' in their US curricula, in order to add or associate the adjective 'forensic' with the title of the offered courses; hence, the courses became more attractive and enrolled more students.

We now have the UK Forensic Science Regulators’ role in Quality Assurance (Codes of Practice and Conduct) (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/118949/codes-practice-conduct.pdf) within the industry and their role in related areas in practice that is well entrenched within the Home Office and Criminal Justice structures. The closure of the Council for the Registration of Forensic Practitioners and the Skills for Justice, Skillmark process, has since been initiated. The CSFS 'Education and Industry Liaison Forum' was formed to facilitate forensic practitioners engagement in a more structured manner with education and research in HEIs.

This development represents a landmark shift in the way that practitioners and HEIs engage – this is something that has taken a decade to bring to fruition and demonstrates the significant changes in the attitudes of stakeholders, practitioners and drawbridge keepers that has made this possible with HEIs.

The R v T, where in October 2010, the English Court of Appeal overturned a murder conviction on the basis of, as it saw it, severe flaws in the generation and presentation of the prosecution's forensic shoe-print evidence (see Hamer, 2012) report and the closure of the Forensic Science Service in the UK in 2012, was a stern wake-up call to the whole forensic industry, not just in the United Kingdom but indeed globally. Equally, the United States National Academy of Sciences (the national research council of the national academies), report make very clear statements about directions for moving forward for their forensic science community and sent a Tsunami warning to the United Kingdom in terms of policy and practice in 2011, and yet the FSS closure went ahead with little or no published plan of what would replace the void it left behind.

Hannis and Welsh (2009) published the ‘Skills for Justice – Fit for Purpose – Research into the provision of forensic science degree programmes in UK HEIs’ and reported that ‘a number of areas of forensic education needed improving to be truly fit for purpose.’

In 2006 the United Kingdom Forensic Science Education Group (UKSFEG) was established as a forum in part to provide careers information and more general career advice to potential and current forensic science students. It comprised a number of highly influential and high-ranking individuals and groups including: the Association of Chief Police Officers (ACPO), the Home Office Forensic Science & Pathology Unit, Forensic Science
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Service, Scottish Forensic Science Service, Northern Ireland Forensic Service, Laboratory of the Government Chemist (LGC) Forensics, Centrex NTC, Metropolitan Police Service, Strathclyde Police, Derbyshire Police, Cleveland Police, the Chartered Society of Forensic Sciences, UK Higher Education Academy and a number of UK universities in which forensic science degrees were delivered. Part of its remit was to encourage links with forensic science employers and academia. The group’s aim is to continue to promote recognisable and relevant degrees in ‘forensic practice.’

Its wider remit has been to establish forensic science employer Higher Education (HE) requirements and priorities for new and existing staff by agreeing a framework for forensic science users and providers to work collaboratively with HE to influence the design, content and delivery of courses, to ensure graduates are well equipped to meet the needs of the forensic science community. For a time, UKSFEG assisted in influencing forensic science degree courses and working with forensic science users and providers to identify key priority areas for the future, such as Crime Scene Science and Digital Forensics. Through this, it facilitated providers with a pool of high quality graduates to recruit from; it produces undergraduates and postgraduates with realistic career expectations and opportunities and a framework of Higher Education professional development activities for forensic practitioners. In achieving these aims, the group complemented the work of existing organisations such as the Chartered Society of Forensic Sciences, Higher Education Academy and the Association of Chief Police Officers ‘Forensic Science Sector Training Strategy Group.’

At a meeting of UKSFEG in 2011, a representative of the National Policing Improvement Agency (NPIA) gave an overview of the Association of Chief Police Officers (ACPO) remit regarding research in forensic science into the next decade. Building on the publication of the ‘Science and Innovation Strategy for Policing’ document, published in 2011 (https://connect.innovateuk.org/documents/3144739/3824722/Live-time+Forensics+brochure(draftv6LR).pdf/a65350a2-683d-4476-9a1e-99c1883ae33e), this presentation outlined the ACPO Forensic Strategy as a framework for national research, with the more immediate timescale of 2011–2015. Arising from this framework, three work streams were to be commissioned to provide an initial focus for the needs of the Police with respect to developments in forensic science. These work streams were:

(a) Improving the custody process with respect to forensic evidence and database information.

(b) Digitising crime scenes, both with respect to recording the crime scene and using on-site tests.

(c) Personal identification.

What became clear was the discordant understanding between the policing and HEI forensic aims and objectives for research into the next decade. The 2012 ACPO document ‘Harnessing Science Innovation for Forensic Investigation in Policing’ (https://connect.innovateuk.org/documents/3144739/3824722/Live-time+Forensics+brochure(draftv6LR).pdf/a65350a2-683d-4476-9a1e-99c1883ae33e) has offered the opportunity for dialogue and development of research plans between HEIs and organisations such as the UK Home Office ‘Centre for Applied Science and Technology.’

In 2011 the ‘Lowering the Drawbridges’ report (McCartney et al., 2011) into the inter-relationship of education between the legal and scientific communities demonstrated
the desperate need for pedagogic harmonisation for those entering into a criminal justice framework in education as students or in practice as graduates. The imperative is for law educators and science educators to ‘lower their drawbridges’ and seek mutually beneficial solutions to common educational problems, not only to reap benefits for students, but also to contribute towards developing the legal/forensic science professions of the future, and ultimately, assist the Criminal Justice System in realising its ideals and objectives.

In part, this issue is confirmed by an earlier report by Samarji (2012), who suggested that forensic science education is arbitrarily organised, as the forensic science courses considered in his study possessed no clear pattern(s) of:

(a) The knowledge fields that should be incorporated (e.g. chemistry, biology, mathematics, physics, law and/or forensic subjects).
(b) The place and extent of practice, the non-consensus on the academic level at which forensic science education should start (non-award, undergraduate and/or postgraduate).

In the United States, the American Academy of Forensic Sciences (AAFS) website revealed over 155 undergraduate forensic science programmes, nearly 70% of which lead to bachelor’s degrees in forensic science or in forensic science associated with other disciplines such as chemistry, biology, criminal justice, anthropology and/or psychology (AAFS, https://www.aafs.org/).

The non-award programmes (~30%) distribute between associate degrees, certificate programmes and training programmes mainly in forensic DNA profiling. In the United Kingdom, forensic science education is no less popular. The number of students studying forensic science degrees increased from 2191 in 2002–2003 to 5664 in 2007–2008 (Skills for Justice, 2009).

At one point in time there were over 500 listed combinations of undergraduate courses with ‘forensic’ in the title being offered by over 70 British universities (Daéd and Roux, 2010).

The picture that emerges from what has been described from forensic science and its education is a long way from ‘rosy.’ The changing climate of the introduction of student fees, the increased pressure upon academic staff with the industrialisation of their roles and the burdens of ever increasing administrative responsibilities being placed upon them do nothing to foster a climate of enthusiastic experimentation and innovation to change the status quo in the arena of forensic Higher Education in the United Kingdom.

The bleakness of the forensic and general sciences job market globally, the expectations of students, increasing student numbers and increasing pressure upon the academic community generally, have led to a rethink of who, what, why, when and how we do our jobs as educationalists.

A quote from Woods (2010), a former CEO of Science for Justice, demonstrates the recognition of the requirement for HEI–practitioner partnerships:

…lead the way globally in the delivery of higher education in forensic science… bringing together the universities and forensic science employers to work in partnership.

Woods, 2010
In June 2011, Professor Bernard Silverman (Silverman, 2011) the Chief Scientific Adviser to the Home Office reported that:

There are several factors, in addition to the managed closure of a major provider (the FSS), which make it timely to carry out this review. These include the distributed nature of forensic science provision, the rapid pace of scientific and technological advances in various areas, and the changing nature of public sector research funding and accountability.

Overall the research landscape [in forensic science research] that has developed is varied and in some ways fragmented, and improvement in the degree of linkage and communication would drive forward innovation most effectively.

Silverman, 2011

Whereas in the past academia concerned themselves mainly with science and the law, there are now courses inculcating policing and policing science into the equation. This strengthens, not dilutes, what we have to teach, but we now have to be mindful of the changing landscape of policing and of intelligence and evidence gathering. The changing manpower structures as outlined in the Neuroyd report (2011) require a more efficient and transparent police service at a much cheaper cost, and this adds a new layer to what academics have to deliver on many of the HEI courses, for example, business protocols, budgetary awareness, working with constraints, systematic and strategic thinking.

There has, to date, been no single place in which all of these changes have been recorded, dialogued or even vignetted, so that those new to the profession, interested in the subject, or just plain ‘nosey’ about CSI-UK, can come and drink from the huge well of knowledge that has been created since forensic science undergraduate degrees exploded on the educational landscape in the mid-1990s. Now over two decades on, it is time for a retrospective and a prospective dialogue to map-out and to create a ‘road map’ of the way forward for the next decade.

It is also very important to be able to educate and prepare teachers and instructors to deal with teaching in an area such as this, requiring non-traditional methods. Some excellent classroom instructors and teachers struggle adjusting to the use of computer-based teaching, virtual formats and social networking tools, because the dynamics between the instructor and the student are very different and require more forethought and create different challenges than traditional teaching methods. All of these changes have taken place in the face of social changes in learning style and structure impacted upon by technology. ‘Clicker technology’ and Twitter, Instagram, Snapchat, Skype, Facebook, tablet technology and indeed perniciously invasive mobile phone technology have changed the way students engage with each other and with academics in their teaching and learning strategies. We will look to the best aspects of these to determine how we can more fully engage with students to facilitate their autonomous, deep and self-directed learning without damaging the pedagogic experience to produce forensic scientists with a continuing drive to learn and develop once in forensic practice.

Innovative teaching methods are required to deal with increased numbers of students, diverse student populations and the demand for value for money, as well as increased
competition with other HEI educational providers. In order to understand and therefore to fully appreciate the current status of forensic science in the United Kingdom, the recent history of forensic science in its educational context should be considered. The ‘science’ behind forensic science cannot simply be discussed in isolation but must be done cognisant of government policy, policing requirements and initiatives and the politics and business practices that pervade every aspect of the science that is designed to assist the pursuit of justice into the twenty-first century.

Neumann observed that when he began his undergraduate degree in Switzerland, no one wanted to work in forensic science and only a small number of training programmes existed worldwide (Neumann, 2011). By the early 1990s there was a global proliferation of courses ‘churning-out’ forensic scientists. This visibility was clearly fuelled by forensic science-based television dramas, which to date have increased and appear likely to do so for the foreseeable future.

Over the past two decades, forensic science has begun to emerge as a field of study in which academia worldwide has literally hundreds of universities offering forensic science programmes (Quarino and Brettell, 2009; NIFS, 2006).

Such a need urged the expansion of these laboratory services, which in turn created new forensic science positions to be filled by individuals with the essential skills and science education, specifically in the areas of chemistry, biology and biochemistry (Quarino and Brettell, 2009).

According to Smallwood (2002) the popularity of forensic science is now such that ‘every third person on the planet has expressed an interest in becoming a forensic scientist.’

However, as indicated by Robertson (2012), media representations are argued to have created an influence of unrealistic perceptions of forensic science in the public in relation to what a forensic practitioner can in reality do and the timeframe it takes to obtain results and answers. As a senior forensic colleague of mine regularly recounts in lectures ‘on the television, crimes are solved in 60 minutes including commercial breaks – in my job it can take years!’ (Dr Roger Summers, retired UK head of forensic services Derbyshire Police, personal communication).

Forensic science programmes were often housed within a university chemistry department and treated educationally as a chemistry derivative (Smallwood, 2002) although it could include other sciences and applications that can be invited to solve cases pertaining to law (Inman and Rudin, 1997). Well over a decade later the situation remains ostensibly the same, particularly in the United Kingdom, but not exclusively; there have been no new undergraduate (or postgraduate) forensic science departments created in either the post-1992 universities (once known as polytechnics) or indeed in any of the more traditional and long-established (red-brick) universities. In fact departments of Forensic Medicine are closing in the UK, with London being the only capital city in the world without a university department of Forensic Medicine. There may be many reasons for this, but clearly one of them has to be the cost of setting up the correct educational environment. The laboratories and equipment, although expensive, are a small cost in comparison with employing staff with experience and credibility. Those who are the UK leaders in forensic science educational provision have achieved this staff critical mass over a decade or more.

Since the 1990s, the number of Higher Education providers that offer forensic science courses/programmes have steadily increased in the United States, United Kingdom,
Australia and many other countries (Mennell, 2006; NIFS, 2006). A second example is Australia, where there are currently around 23 forensic science programmes covering various specialisations and academic levels (NIFS, 2006). A third example is the forensic programme at West Virginia University in the United States, where the programme grew from four students in year 1997 to more than 500 students in 2006 (Houck, 2006).

One line of current thinking is that the large number of forensic science programmes are randomly organised, where the curricula of these courses are unstructured, content is delivered in isolation from industry and graduates are not sought after by forensic science agencies. There a number of concerns associated with this increase in demand for student places on forensic-based courses. The first is that there are no forensic science jobs for them to go into as graduates, the second is that the content of the degree courses does not fit with the requirements of the job they would enter as a forensic scientist. However, there is a third and more worrying concern being expressed by a number of interested parties, and that is one of maintaining the highest possible standards in the industry.

There is also the tension created by what industry expects a graduate to have in terms of skills for immediate employability and the limitations created by a curriculum in terms of depth and breadth, and also one of content. One of the concerns that employers have voiced relates to the variations in forensic content from one university to another.

Surely a degree is a starting point for further study in the job, and as a newly graduated practitioner, years of study and research lie ahead in order to fully qualify for the title of 'forensic scientist.' There appears to be a blindness within the industry with the newly graduated students being labelled as ‘not fit for purpose.’ This observation has been unfairly levied; they are indeed fit for further training and for personal development, as indeed the well seasoned forensic practitioners should be if they are self-reflective and are themselves to remain competent in a forensic science arena. In order to improve the employability of forensic science graduates the CSFS introduced the pre-employment assessment of competence (PEAC) in 2015. The PEAC award demonstrates the evidence of a candidate’s knowledge, skills, reasoning and problem-solving abilities through industry approved assessment (https://www.csofs.org/PEAC).

Universities have been criticised for seizing upon the growing interest of forensic science as a money-making opportunity; this is a bold statement with suggestions of a somewhat unprofessional attitude. However, as with any other ‘business’ driven venture (despite universities holding ‘charitable’ status), all UK universities have to survive in a financially constrained environment and it would be naïve, if not negligent to have not seized upon the market opportunity to develop forensic science courses in UK HEIs. That is not to suggest that a multitude of forensic-based courses were simply thrown together. This would be frankly impossible due to the internal and external quality assurance mechanisms that monitor and regularly check the quality of courses and the elements (modules) within those courses in HEIs. Any new programme of study goes through a rigorous process of documentation and validation meetings involving both internal and external panel members – usually from the industry at which the proposed course is aimed.

All documentation is available for scrutiny and auditing. Once the course is running, the programme is then monitored annually by external examiners who are drawn from similar courses or indeed from industry in the United Kingdom. Therefore, the criticisms directed at the quality of educational delivery are ill founded and erroneous. The
issue that follows this is one of inappropriate content for the workplace. In 2004, the SEMTA report evidenced concerns that there were only *ad hoc* arrangements through which employers could liaise about the content of courses. Issues such as these have in the main been removed by virtue of having practitioners (both current and retired) on the academic staff and through the dialogue that has occurred through employers forums, closer liaison with regional Police Services and the engagement of the Chartered Society of Forensic Sciences by initiatives such as the accreditation process for universities. It must also be appreciated that academics aim to deliver the most appropriate and up-to-date knowledge and practice to students for the industry in which they are entering.

Again, many of these courses are created by drawing upon the advice from within the forensic industry – indeed it is a requirement of any university programme to demonstrate it has scanned the market place horizon for appropriateness of content and elicited feedback in writing from a suitable spectrum of individuals within that industry.

Welsh and Hannis (2011) reported that employers had commented upon the excellence of some of these forensic graduates, but also that some employers remarked that a number of graduates were not of the quality employers were looking for. Deficiencies such as a ‘poor attitude’ to the workplace professionalism and poor communication skills were cited as issues by employers.

However, surely this is the nature of any employment sector, some applicants will be excellent and some will not; hence the interview and selection process is a filtering mechanism in any employer’s armoury.

In 2004 a report was prepared by SEMTA to consider the implications for Higher Education of the proliferation of forensic undergraduate degree course containing elements of forensic science. Why should such a report have been commissioned? There were, at that time, concerns about the increasing numbers of degrees in relation to the number of jobs available in the forensic science sector and a concern about the quality of skills delivered (SEMTA, 2004). Perhaps a catalyst for this was also the huge public interest and perception as forensic science being one of the most fascinating areas of science within our modern society (Richard Smith – SEMTA, 2004). In the years since the publication of the SEMTA report, forensic science continues to capture the imagination of millions of television viewers, radio listeners and readers.

The high profile of TV crime shows utilising forensic science and its spectrum of specialisms continues to dominate the television ratings and this shows no signs of abating. Indeed the expanding ‘bubble’ of student interest, which was anecdotally observed in 2002 to have offered forensic science degrees a ‘shelf-life’ of five years, showed no real evidence of a decline in interest amongst prospective students (the ‘bubble’ has yet to burst) in UK universities until the last year or so.

Clearly, forensic science has attracted young people to study science who would otherwise not have gone to university or who would, perhaps, have chosen a totally different subject of study. In addition, forensic science attracts a high proportion of female students (Houck, 2009) compared with other comparable science subjects.

The challenge for HEI educators has been for them to up-skill from their particular science specialisms, as many universities started from ‘scratch’ in terms of forensic educational provision, with respect to equipment and laboratories as well as subject-specific trained staff. Over a decade after this standing-start, most university departments delivering forensic science do so with a staff cohort comprising: academics, forensic
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scientists, scenes of crime officers and, in some cases, former police officers with 30+ years experience as part of the permanent teaching teams. This staffing development has arisen in part due to the concerns voiced by employers and high profile individuals (from both the police and forensic) communities questioning the skills base and appropriate experience of the academics teaching these degrees.

This situation has presented challenges in two directions. Firstly, the practitioners have had to develop new skills in terms of teaching, learning and assessment and become embedded in the academic world of assessment and award policy and practice – which is quite different to the forensic and policing world from which they came. Secondly, it has required academic staff to up-skill and either develop or indeed learn new forensic skills and techniques. This has facilitated a demand for the change to existing teaching and assessment materials from their ‘pure’ science context into one of an applied forensic context. It must be remembered that forensic science – ‘science in the pursuit of justice’ is still science but the context of the materials (the physical evidence) being investigated and the data it produces (the scientific evidence) must be evaluated in that context, wherein one key consideration is the statistical validity of such evidence.

The educational landscape in the second decade of the twenty-first century for forensic science remains far from clear.

The report by Welsh and Hannis (2011) presented a picture that forensic science degree programmes offered by UK universities were of a ‘good’ quality and that they provided the students with a positive learning experience. Yet the industry still reports dissatisfaction with this education and many forensic science graduates struggle to secure employment in the sector.

This book is designed to reflect the current standpoint as to the position of forensic science education in the United Kingdom and beyond. Hopefully, this text will, in part, act as a nucleating medium to initiate, improve and direct dialogue about what forensic science does, how forensic science is taught and conducted and how it can be made more robust and pedagogically fit for purpose.

The national level changes seen in the last few years have had a profound effect upon the way that forensic science is perceived, conducted and indeed taught. The miscarriages of justice, the closure of the UK Forensic Science Service and the rise of independent forensic providers, the introduction of student fees in HEIs, the changes to policing and its education of police officers (Neyroud, 2011) and the changes to UK secondary (high school) examinations all serve to change the landscape in which forensic science and science in general is taught in the United Kingdom. This text will hopefully inform upon and stimulate discussion on future strategic directions to better serve the end users and ultimately the Criminal Justice System.

Although little research on forensic science education has been undertaken or published (Burnet et al., 2001; Fookes, 2003) the benefits and outcomes of such research will facilitate improved insights into how forensic science education could possibly be organised and how such courses could be structured to lead to the graduation of more knowledgeable and more competent forensic practitioners fit for the twenty-first century crime scene, for the forensic laboratory and for the courtroom.

It is an unspoken truism that UK universities have prospered from forensic science educational provision over the last decade in terms of student recruitment, the finances that follow such a rich mine of students and in the reputations that have been built upon such a high (media) profile course. Whilst academics within such institutions have
championed their new roles and striven to gain forensic science employer engagement and to develop relationships for both teaching and research opportunities, the rate of progress has been, quite frankly, painfully slow, with the reasons behind this being multifaceted. A paradigm and step-change in attitudes and levels of engagement are required especially in the light of the closure of the UK Forensic Science Service in order to develop more employable students who have had the opportunities to engage more fully and deeper with the practitioner forensic and legal communities in which they will work. It is at this early educational stage of a scientist’s career that they develop the essential skills of good laboratory practice, of ethical conduct in practice and research and the essential communication skills within and without their communities. Thus when is there a better time for young forensic scientists to become enculturated into the multi-layered of policing and legal colleagues? To reiterate McCartney et al. (2011):

This need for an improved dialogue between law and science is clear: educational boundaries need to be attenuated if forensic science is to deliver real benefits for the criminal justice system, with attendant risks minimised.

McCartney et al., 2011

The exponential expansion in forensic science education since 2000 has attracted both authentic and inauthentic investments in such education by HEIs and more recently investment by colleges in foundation degrees. This investment in forensic science education can only be considered authentic when a course can emphasise the four zones of forensic science knowledge, reflect the ontological and epistemological nature of forensic science and manage the complexities that face forensic science education (Samarji, 2012).

There is a risk in such an educational expansion that a course will be ‘inauthentic’ if such a course fails to properly emphasise these four zones of forensic science knowledge and is unable to manage forensic science complexities, and perhaps most worryingly, is run in isolation from industry stakeholders (the forensic science power groups).

As Samarji (2012) eloquently remarked, an opportunity emerges from a critical integration of Maxwell’s view of science as aim-oriented empiricism (AOE) with the notions of Bernstein, Kuhn and Pinar. Maxwell’s notion of AOE raises questions about ‘whose aims orient forensic science empiricism? Are they the aims of the legal practitioners, police forces, and/or scientists?’ Such questions are mainly based on Maxwell’s AOE notion, but they ultimately invite and critically integrate with:

- Bernstein’s notion of power and control: How can the ‘aims’ of various power groups orient forensic science empiricism into the one direction or the other?
- Kuhn’s notion of the paradigm shift: How can a paradigm shift within forensic science be promoted by certain ‘aims’ (avante-gardes) and be opposed by other aims (conservative-gardes)?
- Pinar’s notion of the curriculum as a conversation: How can a conversation between various groups and stakeholders map various aims and orient forensic science empiricism?

Therefore, within forensic science, there currently exist both authentic and inauthentic forensic science courses in the United Kingdom (Samarji, 2012). Whilst the authentic
forensic science courses emphasise the nature of forensic science and respond to its ontological and epistemological complexities, the inauthentic forensic science courses will fail to do so, and in not doing so they will fail to furnish forensic scientists to meet the shifting educational horizons within forensic practice.

One aspect not yet considered here has been the feedback from students: the consumers and customers of this knowledge and experience in HEIs. Whilst internal quality assurance mechanisms (staff–student liaison groups, module monitoring, programme monitoring, periodic review and the External Examiner) are firmly entrenched and tested methods of quality assurance, there is again little in the literature considering students perspectives. Hanson and Overton (2010) conducted a survey for the UK Higher Education Academy into the skills required by new forensic science graduates and their development in degree programmes (see also Fowler et al., 2013; Turner and Yates, 2012).

The aim of the survey was to identify which areas of the forensic science curriculum (including generic skills) were particularly useful for new graduates and to evaluate how well they are developed within undergraduate forensic science degrees. The survey questionnaire aimed to determine which areas of knowledge and skills developed in the degree programmes had been of most use since graduation and how well they had been developed within the degree programmes. Completed survey forms were received from a total of 147 graduates from seven universities (78 from Chartered Society of Forensic Sciences accredited courses, 69 from non-accredited), an overall response rate of 33%. The areas and knowledge included in the survey are shown in Table 1.1 and demonstrated that core skills were considered highly valuable, with the forensic specific activities showing a similar level of importance.

Intriguingly, students reported that they would have liked greater opportunity to develop areas of knowledge and skills; see Figure 1.1. This offers a starting point for development of teaching and assessment to take these aspects further – such as quality assurance, health and safety issues and trace evidence recovery.

It is anticipated that the future of forensic science will experience migration of more science into forensic field practices (Samarji, 2012). This migration will result in further shifts of the current reigning paradigm towards the explicitly scientific reigning paradigm.

<table>
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<th>Table 1.1 Areas of knowledge and skills included in questionnaire</th>
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<tr>
<td>A Crime scene management</td>
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<tr>
<td>B Crime scene investigation</td>
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<tr>
<td>C Crime scene evidence interpretation</td>
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<tr>
<td>D Location and recovery of trace materials</td>
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<tr>
<td>E Forensic analysis techniques</td>
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<td>F Instrumental methods of analysis</td>
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<tr>
<td>G Interpretation of analytical results</td>
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<td>H Safe working procedures</td>
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<td>I Quality assurance</td>
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<td>J Planning of casework related experiments</td>
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<td>K Understanding relevant legal procedures</td>
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Crime scene management
Crime scene investigation
Crime scene evidence interpretation
Location and recovery of trace materials
Forensic analysis techniques
Instrumental methods of analysis
Interpretation of analytical results
Safe working procedures
Quality assurance
Planning casework related experiments
Understanding relevant legal procedures
Statistical techniques
Computing skills
Report writing skills
Oral presentation skills
Information retrieval skills
Problem-solving skills
Team-working skills
Time management/organisational skills
Managing own learning

Figure 1.1 Percentage of all graduates indicating they would have liked more opportunity to develop the areas of knowledge/skills in their degree.

This will create research opportunities in forensic field areas and will facilitate stronger and more flexible partnerships between education providers and law enforcement agencies. These anticipated changes in forensic science will support the sustainability of the authentic forensic science courses on the one hand, whilst challenging that of inauthentic forensic science educational courses, and as such it will question their existence within the UK HEI sector.

Forensic science is a field of contention between various contexts, cultures and mindsets (scientific versus police/judicial). It is a field of an unconfirmed reigning paradigm but confirmed complexities associated with the paradigm. Hence, educational decisions related to forensic science may best be approached through a Pinarian conversation that maps the various complexities within the field and negotiates the distinct interests, preferences and concerns of various forensic social groups and forensic science students.

However, there is scant evidence that the present difficulties with specialisation within UK universities will be overcome soon. Inertia within the regulatory bodies for forensic science and Higher Education institutional management is a sufficient deterrent for those who may entertain thoughts of tinkering with the status quo. Perhaps, until the political classes and the public demand a more transparent and better linked forensic science–legal–police service, miscarriages of justice will be the inevitable outcome of the on going ‘dialogue of the deaf’ between forensic stakeholders in the UK.

There are many aspects not covered in this introductory chapter; we have left aspects relating to the ‘here and now’ and to the future until the final chapter to allow the reader to assimilate some of the work from the current educational landscape. Some essential aspects to consider are the closure of the UK Forensic Science Service, the UK House of Commons Science and Technology Select Committee reports on the current position of UK forensic science and the current practices involving (ISO) Accreditation, Quality Assurance and the Universities Research Excellence Framework Exercise. The effect
these will have upon forensic science and its likely directions over the next 5–10 years will be discussed.

**Conclusions and Implications for Teaching and Practice**

It is important for the future development of forensic science education that the future direction includes the three groups of key participants, namely, educators, practitioners and users of forensic science (Police Services and Courts), all critical in approaching the nature of forensic science and forensic science education through different lenses. This triangulation practice is also essential in identifying the various social groups existing within forensic science and in representing their preferences in organising forensic science education and ensuring it is fit for purpose in the real world using competencies and accreditations strategies. The Forensic Regulator (who is a public appointee whose function is to ensure that the provision of forensic science services across the criminal justice system is subject to an appropriate regime of scientific quality standards) is in ongoing discussion with HEIs through appropriate educational forums, such as the CSFS, UKSFEG and independent organisations, such the Forensic Institute Research Network and the QAA. The educational impact of the UK Government Forensic Regulator recommendation that all providers of forensic science services gain accreditation from the United Kingdom Accreditation Service (UKAS), is still percolating through HEI curricula.

The pedagogy and adrogogy of teaching, learning and assessment (TLA) have been discussed by numerous workers and researchers across all the subject specific disciplines, yet there remains a paucity of literature to contextualise this within a forensic science teaching environment. Race (2014, 2003) has published widely on TLA and paraphrased Einstein’s comment that ‘It is simply madness to keep doing the same thing, and expect different or improved results.’ If this is true for forensic science (and therefore for policing based studies), this book hopes to deal with some of these issues by addressing this paucity of literature and using the experiences of those academics and practitioners in the field. This provides the opportunity to share their experiences with other colleagues to facilitate assessment, reflection and development of their methods, manners and mechanisms of teaching, learning and assessment in a forensic context.

**References**


Forensic Science Education – The Past and the Present In and Out of the Classroom


**Forensic Science Education and Training**


**Further Resources**
