

IT innovation in histopathology recruitment, training and research

The introduction of national recruitment and cohort training in histopathology in England has produced significant challenges and highlighted opportunities for development. Innovative information technology solutions have been deployed to facilitate recruitment and enhance education provision and research.

The development of three innovative senior house officer (SHO) schools in histopathology in 2001 was perceived to be a successful and efficient means of delivering introductory postgraduate education in histopathology to large numbers of trainees (Gallagher et al, 2003). The numbers of schools increased over subsequent years until in 2005 stand-alone SHO posts no longer exist and all year 1 training was in one of the 11 schools.

Recruitment is nationally organized, presenting significant logistical problems. To facilitate this process, a web-based solution has been developed to promote the speciality and training programme, disseminate recruitment information and deliver application documents.

Once in post, trainees receive a formal educational programme. Part of the advantage of the 'cohort' educational process is the pooling of educational resources. A virtual managed learning environment has been developed to maximize the use and dissemination of learning resources and to allow the introduction of innovative teaching and learning opportunities.

Having a large coordinated cohort of trainees facilitates research into teaching and learning in postgraduate histopathology. A web-delivered package has been developed that investigates trainees' ability to appreciate and synthesize histopathological variables and thereby classify histological images. It is hoped that this project will shed light on the process of learning diagnostic histopathology and may be a future means of assessing aptitude for the speciality.

E-recruitment in histopathology

The National Histopathology Training Schools (NHTS) adopted a completely web-based platform to highlight the profession and centralize communication and applications to 11 national training schools in England for the 2005 recruitment round.

Medical students and junior doctors may not always be exposed to diagnostic career pathways, with integrated undergraduate courses and teaching predominantly occurring in clinical areas. This may impact on speciality career choices. Doctors are increasingly turning to the internet to apply, learn, understand and make important career decisions about the specialties they enter.

The website (www.nhshistopathology.com), developed and maintained in Leeds, was launched in September 2004. It aims to promote the speciality by providing information and by bringing together prospective and current trainees in a global discussion forum (Figure 1). The forum also allows communication with trainers and the national schools administrator. The site features schools' information and virtual tours, demonstration of future practice such as virtual microscopy, up-to-date news headlines and links to on-line training resources.

Figure 1. Screen shot of home page of www.nhshistopathology.com.



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Recruitment paperwork, including application forms, are available for download and applicants are encouraged to submit their completed application electronically. Information about the scoring of application forms is provided and applicants are able to self-audit their applications before submission. Traffic on the website is constantly monitored to inform recruitment strategies and website content development.

The site was the main information source for the 2005 recruitment round, with no paper promotional material being available. This means of information distribution was very successful, with 606 applications, up 104% over the previous year. Applicants were of similar calibre, judged by short listing and interview scores, to previous recruitment rounds using more traditional approaches. Of applicants, 94% were happy to submit their applications electronically with only 6% choosing to post paper copies. Applications were distributed to those short listing on CD, with very significant savings in postage costs. The markers were then able to score applications on screen and return electronic copies of their score sheets to the administrator.

In 10 months, the site has had 800 000 visitors, and the website received an internet traffic rating in Alexa (www.alexa.com) as high as 39 000 out of 40 million websites globally. This traffic compares favourably with the site of the College of American Pathologists and has exceeded that of the Royal College of Pathologists. Many applicants met each other on-line before pre-interview visits and before beginning their appointments in August. This approach has proven to be a very cost-effective and efficient means of promotion and recruitment.

NHTS applicants have been canvassed by questionnaire to assess their views of the site and investigate other aspects of their on-line behaviour, and these data are being used to optimize the site for future recruitment rounds.

E-learning in histopathology

The training schools are supported by a dedicated on-line learning environment (www.pathnet.org.uk). This has been developed using open source software called Moodle (www.moodle.org) which is designed to support distributed course management (Figure 2). Through this the usual range of resources is provided such as lecture notes, PowerPoint presentations and access to collaborative tools such as discussion boards and e-mail groups. Each school has its own dedicated area and can opt to restrict resources to their own school or to share them with others. Because of the nature of some of the teaching material used in pathology the system is not open access but requires a password and log-in.

Two additional specific modules have been created to support the course. The first, TAPIR (Teaching Archive of Pathology Image Resources), is an extensive database of pathology cases with linked images of both macroscopic and microscopic pathology. These can be searched and are organized by key words based upon the medical

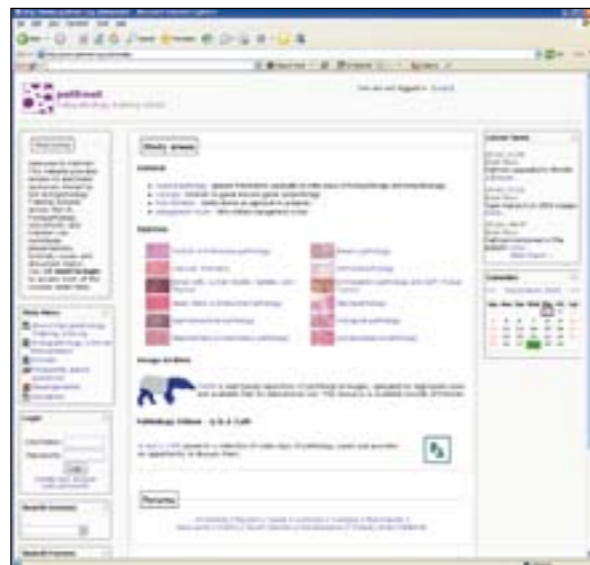


Figure 2. Screen shot of the home page of the on-line learning environment, www.pathnet.org.uk.

subject headings. TAPIR provides a background resource to support the general learning across the course.

The second specific module is Q&A Café, which was originally developed for use by students on the Cambridge clinical course. Q&A Café allows teachers to post questions based on images or videos for the trainees to answer and allocate a finite time period in which they must answer the questions. Once a trainee has submitted his/her own answers they can see the anonymized contributions of all those who have already submitted answers, thereby increasing group learning. The teachers can then grade each submission on-line and post a final model answer once the round is closed. There is also the option to post further supplementary questions on the same topic. Q&A questions can be set in advance and then go live automatically at a later date so that teaching can be coordinated with other events, even if the lecturer is unavailable.

All the schools contribute to the educational content and upload their lecture notes and handouts given during the teaching sessions. A rota for weekly contributions of individual cases by trainees from across the schools has been introduced, and will develop into a collection of core cases for basic training.

The environment is well used with many hundreds of log-ins each week and is becoming an integral resource for the distributed teaching across the training schools. It is a cost-effective way of delivering educational material and the heavy emphasis on visual recognition in histopathology is well supported by current web technologies.

E-research in histopathology teaching and learning

Diagnoses for histopathologists are a combination of either macroscopic and/or microscopic features. For some diagnoses the appearances are straightforward and pathognomic, while others are subtler, require assimila-

tion of several features that are then grouped together into the final diagnosis. This is particularly important in dysplasia where recognizing both architectural and cytological variation allows the tissue to be grouped (or classified) into low or high grade changes. The Department of Health has funded a collaborative study between the Newcastle School and the University of Coventry over the next 12 months to understand whether the recognition of patterns in microscopy is innate or learnt.

This web-based study uses a small number of computer images from a simple model in two test situations. The investigation will allow the separation of 'low level' features such as boundaries, colour and texture which are understood by the computer and more 'high level' descriptive features as would be used by pathologists such as nuclear crowding, branching of glands and dysplasia.

In the forced choice test, two images of colonic mucosa are displayed. The images range from normal through dysplasia to cancer. By clicking a button underneath one of the images a decision is made as to which is more atypical. The results of the initial pilot study showed that with training of less than a year, SHO's can accurately define normal, dysplasia and cancer with a high degree of reproducibility (Shuttleworth et al, 2005).

The understanding of the more subtle changes of dysplasia (classifying into mild, moderate and severe or low and high grade) is being investigated using a similarity test. In this, the similarity of a pair of images is given a numerical score between 1 (low) and 100 (high). The data for each of the pairs are recorded anonymously in a database. The pilot study showed that classification was different between a complete novice and someone

Figure 3. Dendrogram from an untrained novice, indicating inability to separate diagnostic groups.

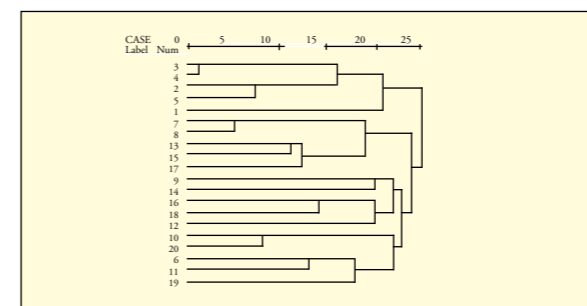
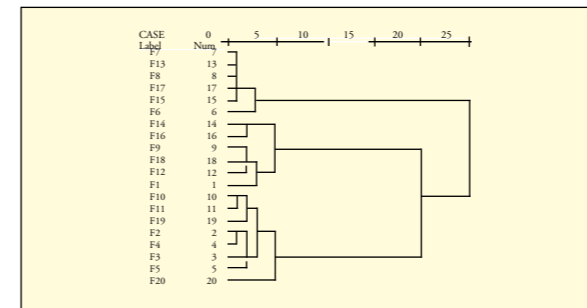


Figure 4. Dendrogram from histopathologist after some training, showing ability to resolve three diagnostic groups.



who had started their training (Todman et al, 2002). These two dendrograms illustrate these differences: the novice (Figure 3) is unable to group the series of images while the trainee (Figure 4) clearly is able to identify three groups.

Such findings suggest that histopathology is not instinctive and that microscopic diagnosis can be learnt. The greatest potential use for such computer models would be in training as it would allow trainees, wanting to specialize, to test their skills against a known databank of images.

Conclusions

The establishment of national coordinated cohort training of year 1 trainees in histopathology in England has provided the opportunity to develop innovative IT solutions. Speciality promotion and recruitment has been successfully achieved by a dedicated NHTS website. A purpose designed on-line learning environment maximizes use of educational resources throughout the country and allows new approaches to training. The existence of a large cohort of trainees has allowed the development and delivery of on-line research tools to investigate learning of the histopathological diagnostic process. The lessons learned in histopathology are clearly applicable in other specialities. **BJHM**

Conflict of interest: none.

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KEY POINTS

- Cohort training has been successfully initiated with all year 1 histopathology training posts in England in schools.
- National recruitment has been successfully supported with the National Histopathology Training Schools (NHTS) website as the principal means of information distribution.
- NHTS have a dedicated on-line learning environment to maximize use of teaching and learning resources.
- The on-line environment allows innovative educational resources such as Q&A Café.
- A large coordinated cohort of trainees facilitates teaching and learning research.
- An on-line resource has been developed to assess aspects of the development of diagnostic ability.