

# Society of Nuclear Medicine 57<sup>th</sup> Annual Meeting

Evolving new approaches to the development of nuclear medicine education, workforce development & advanced practice

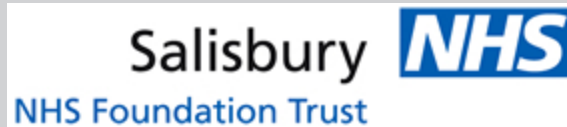
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University of the  
West of England



**better**together

# Background

- Post Graduate programme delivered at UWE, Bristol for fourteen years
- Strong experience with delivering traditional based learning, teaching & assessment approaches
- Developing role of nuclear medicine practitioner (NMP) evident in the United Kingdom
- **Technology** + **Patient centred care pathways** + **emerging techniques** = Greater demands placed on clinical service

# Nuclear Medicine in Context



How can the 21<sup>st</sup> century workforce be supported?

# Evolving core Competencies

## **Technical expertise & knowledge:**

- Optimal & competent operation of the gamma camera
- Operation of additional equipment (e.g. CT component)
- Performance of quality control procedures
- Problem solving abilities / aware of own limitations
- Ability to reflect / critically evaluate own practice

## **Radiation protection & safe working practice**

- Undertake examination in a safe and competent manner
- Prepare and administer radiopharmaceuticals with minimal dose to patients
- Appreciation and concern for own personal dose levels & colleagues
- Competent injection technique
- Communication, organisation and workload management / planning

## **Patient care and technique optimisation:**

- Professional and competent
- Care of the patient, empathy & ethical awareness
- Optimisation of techniques & ability to adapt protocols where appropriate
- Ability to undertake a wide range of examinations & demonstrate best practice
- Understanding patients needs
- Personal development (research and audit)

# National Drivers

- Department of Health (DH)
  - 2004 *“Working together, learning together”*
  - 2004 *“The NHS knowledge and skills framework and the development review process”*
  - 2008 *“High Quality Care for All: NHS Next Stage Review Final Report”*
- Society & College of Radiographers (SCoR)
  - 2009 *“Scope of Radiographic Practice”*
- Modernising Scientific Careers Report
  - 2010 *“The UK Way forward”*
- Service improvement:
  - 2006 “Skills for Health” Drive
  - Service enhancement & Quality, Innovation, Productivity & Performance

# Research: Consultation phase

- Student & practitioner evaluation of traditional educational methods:
  - On-line questionnaire (Google Documents)
  - Proposed models for future pedagogies also provided
- Mapping of initial findings against DH Workforce development (*Skills for Health*)
- Mapping exercise completed in summer 2009

# Sample of feedback (1)

*“Traditional methods of learning are fine, however my role is changing & I need to be equipped as a practitioner, researcher & innovator”*

*“The educational programme has equipped me for current clinical practice, however we seem to be in a constant flux of change”*

## Sample of feedback (2)

*“More practical based learning outside of the clinical department would be useful”*

*“The use of case studies during the programme was great, we should have more evidence / problem based learning”*

*“I really value peer learning / support: Could this be increased in the programme?”*



## Sample of feedback (3)

*“BlackBoard is capable of so much more.....”*

*“Sometimes there is an over-reliance on  
PowerPoint”*

# Focus Group findings

- Feedback from students discussed at a focus group with key involvement from:

- Experienced clinical practitioners
- Representative from the strategic health authority
- Student representation
- Industry partners

- Development of new learning and assessment paradigms



# New Learning Paradigms

# Problem / Enquiry based learning: Example one

- Enquiry based learning using BlackBoard:
  - Student were involved in the evaluation of working practice relating to the management of “radioactive spillages”\*
- Peer learning / support & sharing of good practice established
- Contact teaching was supported with discussion forums on Blackboard

\*Infection control soap mixed with water and spillage area monitored using U/V light

# How does Problem Based learning Impact on the Ongoing Development of Nuclear Medicine Practitioners? An Investigation Into Safe Working Practice.

Clark V., Nuclear Medicine, University Hospitals Bristol NHS Foundation Trust

Dawson G., Nuclear Medicine, Salisbury District General Hospital, Salisbury

Griffiths M., Faculty of Health & Life Sciences, University of the West of England, Bristol

To highlight the importance of having comprehensive knowledge regarding radioactive spillages, the cohort was split into 3 groups and each given a scenario that involved a spillage of varying types. Although the subject matter related to clinical practice, the PBL approach helped the cohort bond and provided a peer support mechanism

The groups were each provided with a typical departmental radioactive spillage kit (figure one) and provided with scenarios and some general guidelines from the programme facilitators. Prompts were used to direct the groups and facilitate a scenario based approach. Other group members could also provide help and guidance during the scenario runs and provided critical feedback at the end of each scenario



Figure one – Radioactive Spillage Kit

The spillages simulated clinical practice by utilising using a special liquid in the water, which illuminated with the use of ultraviolet light conditions. This learning approach is conventionally associated with hand washing techniques for infection control purposes.

## Problem Based learning

Problem based learning (PBL) is a student centred style of learning that involves small groups and a facilitator.<sup>1</sup> It was defined by Barrows and Tamblyn in 1980<sup>2</sup> as "The learning which results from the process of working towards the understanding of, or resolution of, a problem. The problem is encountered first in the learning process." This learning approach is crucial for developing the critical thinking skills of nuclear medicine practitioners in modern clinical practice

By reflecting upon the student's own clinical experiences and the experience gained within the practical based session, it has given confidence regarding the safe handling of a radioactive spillage situation. The PBL and EBL approach has also enabled the student to revisit their own individual local rules to discover whether there are details which they felt had been omitted, or could be improved upon for future working practice and further develop professional skills

The students linked the scenarios to key radiation protection legislation & used non-participant observational analysis to document a logical account of each scenario.<sup>3</sup> Students continued to reflect on the clinical scenarios using on-line discussion forums (BlackBoard), using enquiry based learning (EBL) approaches to explore their own clinical spillage kits and protocols



Figure three – Scenario scene

### Scenario 1

You are undertaking a dynamic renal scan. A student passes you a syringe with 80MBq of Tc99m MAG3 but drops it before any is injected. At least half of the radiopharmaceutical is split from the syringe.

### Scenario 2

A patient is undergoing a skeletal scanning procedure. The patient has a catheter bag that he finds difficult to empty. On returning to the department 3 hours post injection, the catheter bag spills out on to the floor of the waiting room (figure two & three), which is also occupied by other patients.

### Scenario 3

A radioactive vial which contains enough Tc99m for four myocardial perfusion scans is dropped in the radio pharmacy lab. Radioactive liquid and glass fragments are visible. A member of staff has also walked in and walked through the spillage but remains within the radiopharmacy.



Figure two –Scenario scene

# Problem / Enquiry based learning: Example Two

- Investigation of students clinical IV injection protocols
- Turning Point™ (Interactive voting system) & video scenarios used to evaluate student practice
- Peer learning / support & sharing of good practice established
- Contact teaching was supported with discussion forums on Blackboard



# Using experimental learning methods to develop the injecting skills of Nuclear Medicine practitioners

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 Dawson G., Nuclear Medicine, Salisbury District General Hospital, Salisbury

Student feedback from the practical session and reflective on-line discussion forum considered the learning approaches and content beneficial to clinical practice. Feedback was obtained during the practical session using TurningPoint software & provided instant graphical group feedback. Using TurningPoint helped re-inforce the students learning and provide empowerment to critically evaluate their individual SOP's with regards injecting in nuclear medicine. Reflecting on practice is integral to staff development, especially with areas such as PET radiopharmaceuticals becoming increasingly used and new legislations and guidelines are being produced

The role of online e-learning and interprofessional communication has long been an integral part of medical and nursing education<sup>5</sup>, but has been lacking within nuclear medicine field. The practical session allowed a wide variety of administration techniques to be demonstrated and discussed within the cohort, with individuals encouraged to synthesise the techniques used by colleagues<sup>6</sup> and using this information to critically evaluate each step within their own administration technique

Students were actively encouraged to review their departments Systems of Practice' (SOP) and discuss the relative merits and de-merits on Blackboard. This encouragement of reflective practice allows the student to fully engage with the immediate situation, demonstrating a working knowledge relevant to their specific department and clinical protocols



**Figure One: Practical based environment where students and course facilitators can discuss the relative merits and drawbacks of specific IV techniques**

Following the practical session, an on-line discussion forum was established (Blackboard) permitting asynchronous communication between students to continue over wide geographical areas and around the students working lives<sup>1</sup>. E-Learning also offers the ability to disseminate, share and collaborate between individuals and external organisations.<sup>2,3</sup> The topics discussed on Blackboard were directed at recreating an environment in which students reflected on their work within the practical session, encouraging personal experiences and critically evaluating their individual practices in the clinical scenarios<sup>4</sup>

Administration of radiopharmaceuticals is a heavily legislated practice, however there is little written directive regarding the administration technique. As such many centres perform 'in house' training, where staff deemed 'acceptable' are allowed to administer under the direction of the ARSAC licence holder'

There is a wide variety of intravenous (IV) administration techniques, equipment and departmental policies used in a variety of differing clinical settings. The challenge to the educational community is to deliver a service providing understanding and evaluation of this wide range of techniques within the context of 'good practice'. Evaluating the definition of "good practice" was explored by the students and facilitators during a practical based session at the academic institute

During the practical based IV session the students discussed the legislation governing administration of radioactive pharmaceuticals, and were then encouraged to simulate cannulation techniques using manikin arms (figure one) and a range of additional equipment. The practical session was performed in small groups, permitting peer support, evaluation of the individual techniques and an exploration of common injecting issues within clinical practice



# Clinical scenarios

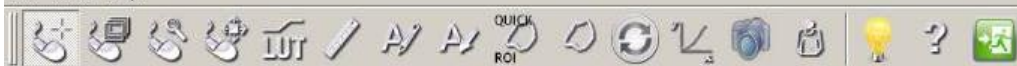
- Use of clinical scenarios to reinforce the students learning
- Based upon practitioners experiences
- Students critically evaluated clinical scenarios developing:
  - **Reflective skills**
  - **Analytical skills**
  - **Critical thinking skills**
  - **Problem solving abilities**

# Example of clinical scenarios



# Data manipulation / processing skills

- TeleHERMES\* software installed in May 2009
- Initial architecture developed as a teaching tool at UWE
- Vision to develop a virtual image manipulation & processing platform remote from the academic environment
- Initial findings promising and on-going developments taking place with industry colleagues



# Blended learning

- Structured learning utilising BlackBoard
- Blocks of educational material released to the students
- Interwoven with discussion board threads & staged self-directed study
- Science assessments related to practice & supported using a web-based resource (virtual lab)

# BlackBoard

All lecture materials were made available to allow students to concentrate on engaging with the lectures, rather than struggling to make notes as the lecturer spoke.

This is also an excellent revision resource.

Developed students analytical and reflective abilities

The screenshot displays a BlackBoard course interface. At the top, the course title is 'UZYSRKU-20-M - Science and instrumentation of nuclear medicine' with a sub-header '09oct\_1\_j10'. A navigation menu on the left lists: Home Page, Course Documents, Announcements, Course Materials, Discussion Board, Tools, Contact Us, and Assessment. Below this is a 'COURSE MANAGEMENT' section with a 'Control Panel' and sub-items for 'Course Tools', 'Course Links', and 'Evaluation'. The main content area is titled 'Course Materials' and features buttons for 'Create Item', 'Build', 'Evaluate', and 'Collaborate'. A list of course materials follows, including folders for 'Block 6 - March 2010', 'Block Five - February 2010', 'Block Four - January 2010', 'Block 3 Dec 2009', and 'Block 2 Nov 2009', each with a 'Statistics Tracking' status. A document icon for 'Radioactivity' is also listed with 'Statistics Tracking' enabled.

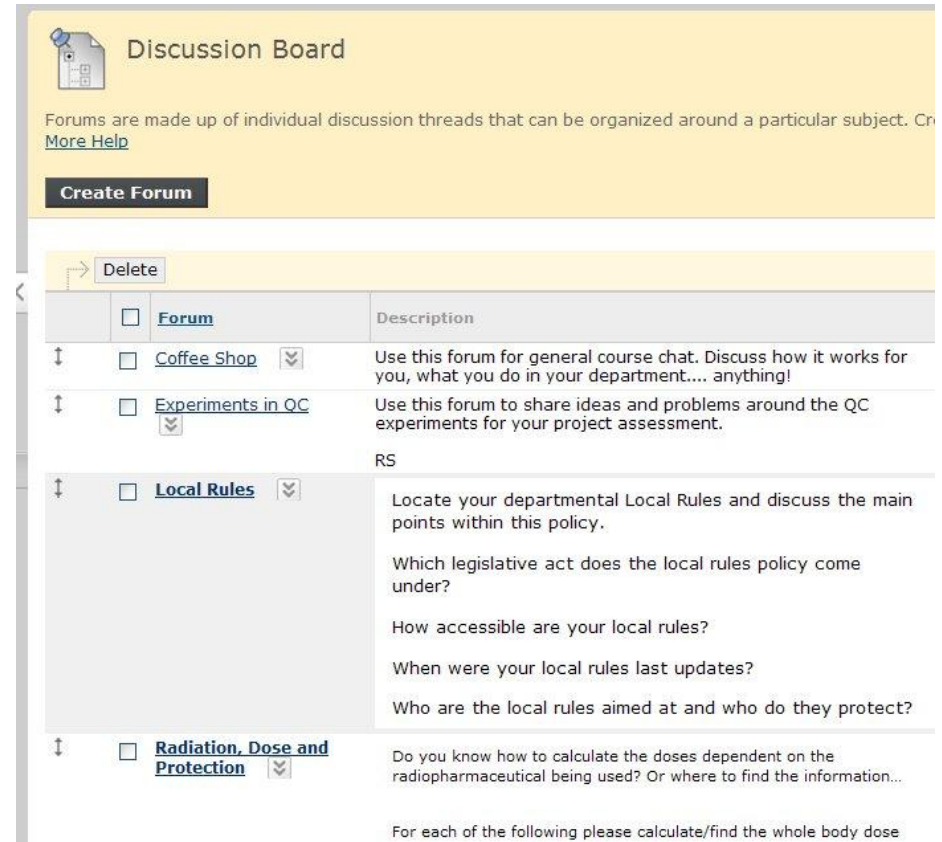


# Discussion Boards

Use was made of the discussion boards to allow students to query their understanding on current issues. This elicited feedback from staff and their own peers.

This strongly re-enforced working relationships and made some students very much aware of just how much knowledge they actually had.

The boards were also used to set work out of class and allowed asynchronous study to take place.



Discussion Board

Forums are made up of individual discussion threads that can be organized around a particular subject. [More Help](#)

**Create Forum**

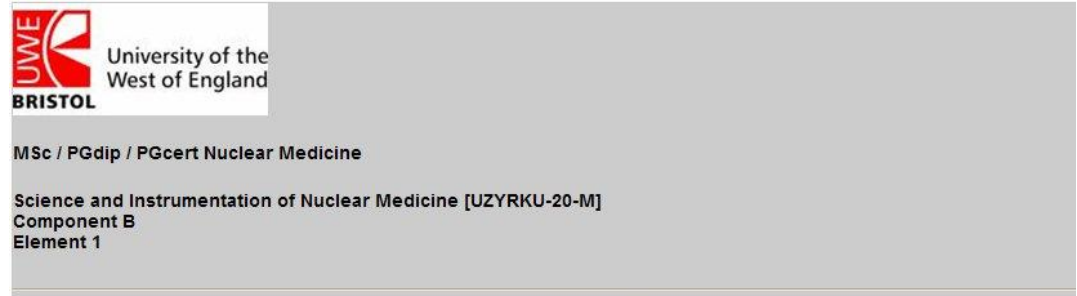
Delete

<input type="checkbox"/>	Forum	Description
↑ ↓	<input type="checkbox"/> <a href="#">Coffee Shop</a> ↓	Use this forum for general course chat. Discuss how it works for you, what you do in your department.... anything!
↑ ↓	<input type="checkbox"/> <a href="#">Experiments in QC</a> ↓	Use this forum to share ideas and problems around the QC experiments for your project assessment.
RS		
↑ ↓	<input type="checkbox"/> <a href="#">Local Rules</a> ↓	Locate your departmental Local Rules and discuss the main points within this policy.  Which legislative act does the local rules policy come under?  How accessible are your local rules?  When were your local rules last updates?  Who are the local rules aimed at and who do they protect?
↑ ↓	<input type="checkbox"/> <a href="#">Radiation, Dose and Protection</a> ↓	Do you know how to calculate the doses dependent on the radiopharmaceutical being used? Or where to find the information...  For each of the following please calculate/find the whole body dose

# Web-based resource

The main experimental component of the module was made available via the BlackBoard interface, but also on a stand-alone web site.

This site was complete with data that could be used if local results were not available. Hyperlinks allowed access to further and complementary information to assist in completing the experiments and also engage in the learning intended



**UWE**  
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MSc / PGdip / PGcert Nuclear Medicine

Science and Instrumentation of Nuclear Medicine [UZYRKU-20-M]  
Component B  
Element 1

This website provides fundamental information related to the quality control experiments for the science and instrumentation of nuclear medicine module. Please review all the available information to ensure you have understood the nature of the experiment and the results obtained.

Each experiment has been categorised below and contains still images from the actual procedure, information related to the acquisition parameters and results / images obtained. The images obtained are presented in a high quality format. You can either download a copy of the images by simply right clicking on the image, or choose to download a stand-alone version of this virtual lab by clicking on the link in the final box below.

		
<a href="#">Basic Gamma Camera &amp; quality control equipment information</a>	<a href="#">Assignment briefing [html]</a> <a href="#">View/download assignment briefing [pdf]</a>	
<a href="#">Incorrect isotope photopeak on energy setting</a>	<a href="#">The practical effects of scatter on system resolution</a>	<a href="#">The practical effects of collimator type on system resolution</a>
<a href="#">The practical effects of distance on system resolution</a>	<a href="#">The practical effects of counts system resolution</a>	<a href="#">Download a stand-alone version of the virtual laboratory</a>



# e-OSCE assessments

- Opportunity to provide assessment environment which reflects clinical practice
- Students access a number of virtual cases which include some decision making processes:
  - Care of the patient
  - Administration of radiopharmaceutical agents & dose limits
  - Acquisition parameters
  - Image quality / artefacts

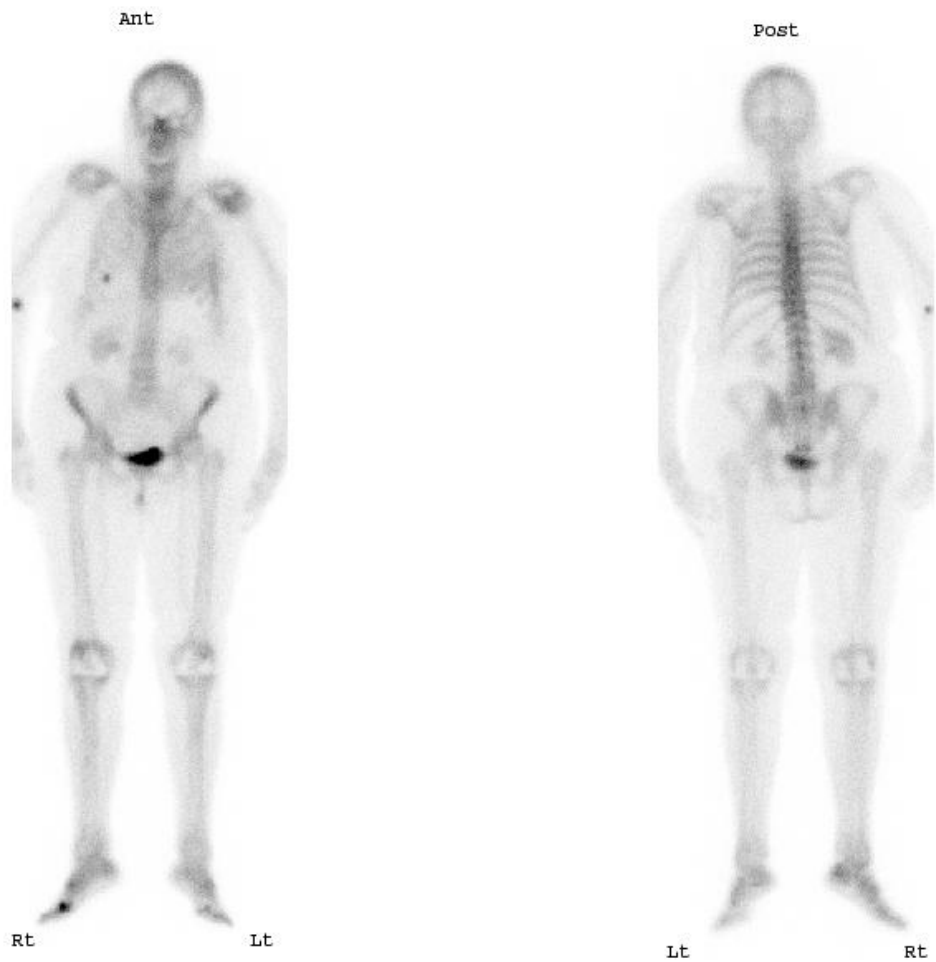
#### Question Four

A 74 year old female patient presents for a skeletal examination, querying metastases. The patient has previously undergone surgery, has reduced mobility and difficulty laying supine for long periods. A whole body bone scan was undertaken and the practitioner carefully administered the appropriate radiopharmaceutical.

Click here to review the [radiopharmaceutical details](#)

Click here to review the [acquisition parameters](#)

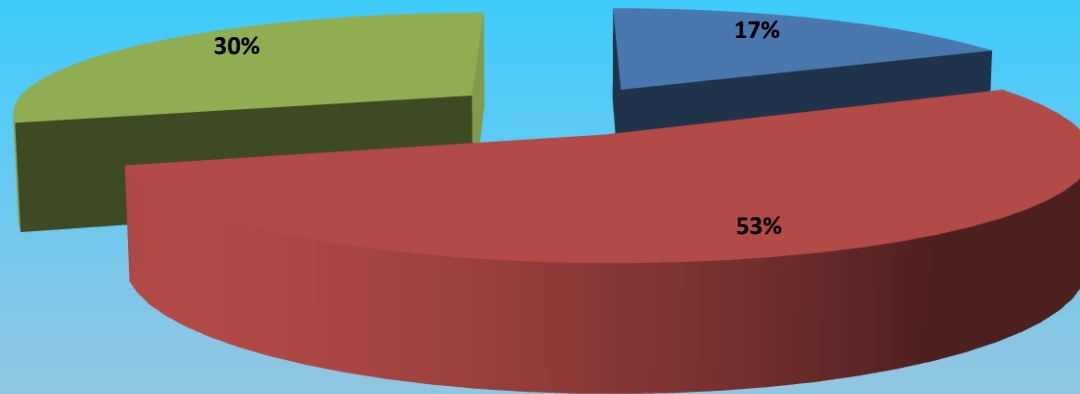
[Click here](#) to launch the magnifying glass application



# Capturing the students feedback

- Essential to evaluate the implementation of new learning paradigms
- TurningPoint™ technology used to capture data
- Digital recording of students qualitative responses
- E-mail communication / Google Documents to obtain extra feedback

# How would you rate your overall access to BlackBoard during the course?



■ Excellent    ■ Very good    ■ Satisfactory  
■ Limited    ■ Poor

# Additional comments

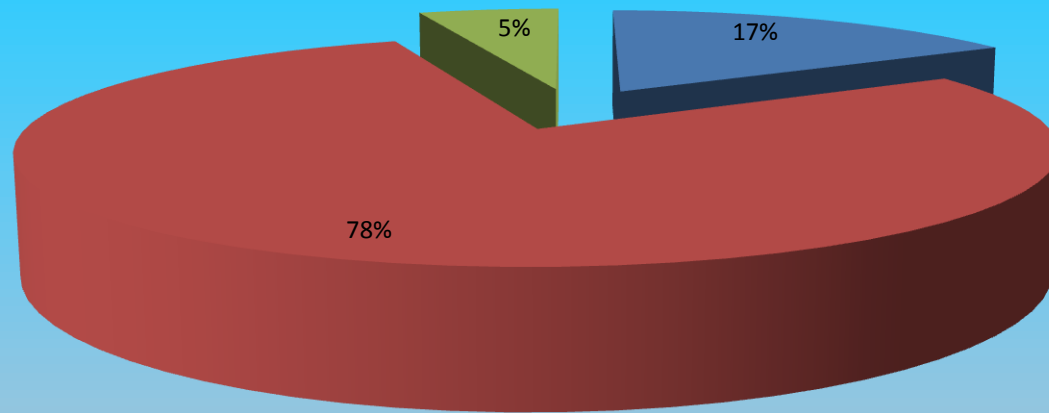
*“Easy to access from work, no firewall problems”*

*“Useful to access the lecture notes / clinical scenarios”*

*“Provides an additional learning in between academic blocks”*

*“Block release fits in with my learning style and suits my department”*

Has the use of the discussion forums within BlackBoard been useful in term of your learning?



■ Definitely

■ In certain circumstances

■ Not really

■ Very limited value

■ Definitely not

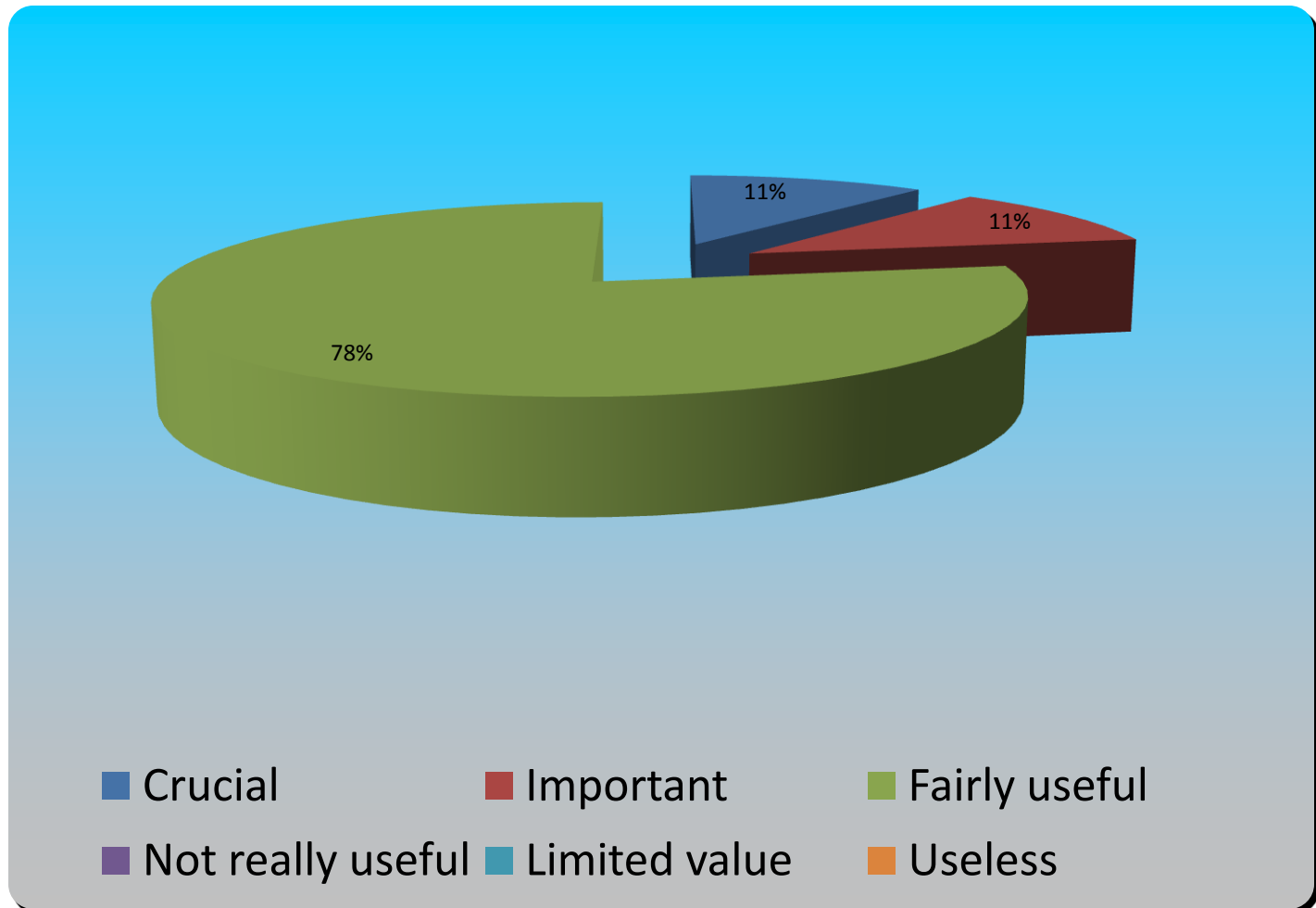
# Additional comments

*“Face to face interaction still essential, however BlackBoard allows you to go back and review knowledge base”*

*“It’s helped develop my links with other students on the course and share good practice”*

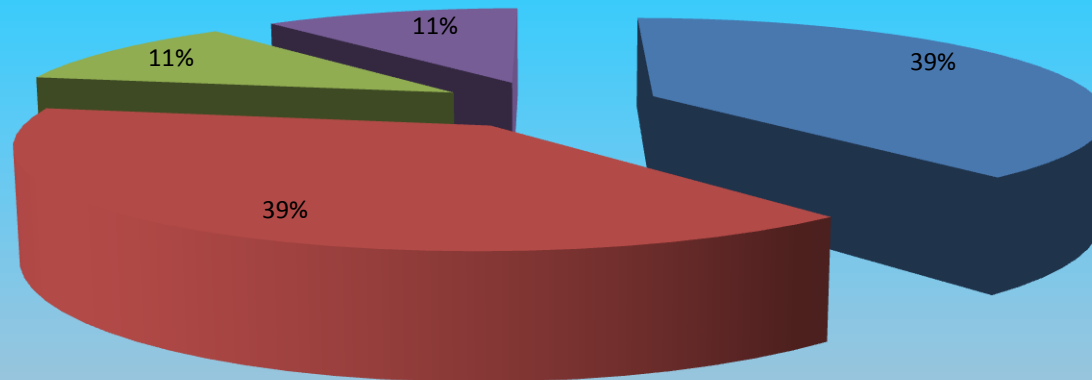
*“Allowed me to compare my own practice with others on the course”*

From your own personal learning perspective, how important has BlackBoard been within the Nuclear Medicine programme?





Has your ability to learn / reflect using web-based methods improved as a result of this module?



■ Definitely    ■ Probably    ■ Not sure  
■ Probably not    ■ Definitely not

# Additional comments

*“The face to face learning is more practical based & further supported by on-line material ”*

*“A great revision tool and the interactive discussion boards helped my fundamental understanding”*

*“Sometimes the discussion boards were a bit overwhelming & not easy to navigate”*

# Additional considerations

- For certain areas on-line learning is great
- However the cohort really valued:

- Face to face learning
- Group interaction / peer support
- Sense of a “community” / “belonging”
- Dedicated protected time away from the workplace

*“I need to be equipped as a practitioner....”*

“I need to innovate....”

“I need to be a researcher....”

# Conclusions

- Feedback from students generally positive
- There is a role for blended learning and e-based education within nuclear medicine
- Web based learning / assessment in the workplace appears to develop peer support, review and encourage networking
- Sharing of good practice is also encouraged

# Future developments

- Webinar technology (OCS / Skype™)
- Inclusion of discussion board threads within the students clinical portfolios of evidence
- Critical engagement with clinical stakeholders to develop short courses / focused skilled development
- Continue to work in partnership with clinical departments to engage in on-going service improvement
- Formulation of a clinical mentorship framework

# References

- Department of Health (2001) *Working together – learning together*, [online] available from [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/documents/digitalasset/dh\\_4058896.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_4058896.pdf) [accessed on 01/02/10]
- Department of Health (2004a) The NHS knowledge and skills framework and the development review process. DoH Publications. Available from [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_4090843](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4090843) [Accessed on 18 March 2010]
- Department of Health (2008) *High Quality Care for All: NHS Next Stage Review Final Report*, [online] available from [http://www.dh.gov.uk/prod\\_consum\\_dh/groups/dh\\_digitalassets/@dh/@en/documents/digitalasset/dh\\_085828.pdf](http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/documents/digitalasset/dh_085828.pdf) [accessed on 11/09/09]
- Griffiths M., King S., Stewart R., Dawson G., (2010) Evaluating the Fundamental Qualities of a Nuclear Medicine Radiographer for the Provision of an Optimal Clinical Service, *Radiography*, doi:10.1016/j.radi.2009.12.005
- Price. R., Edwards, H., Heasman, F., Herbland, A., Le Masurier, S., Miller, L., Todd, A., & Vosper, M. (2008) *Scope of Radiographic Practice 2008*. Hatfield: University of Hertfordshire. Available from <http://doc-lib.sor.org/scope-radiographic-practice-2008> [Accessed on 21 March 2010]
- Skills for Health (2006) *Delivering a flexible workforce to support better health and health services – The case for change*. Bristol: Skills for Health. Available from [http://www.skillsforhealth.org.uk/~media/Resource-Library/PDF/SSA\\_for\\_Health\\_Executive\\_Summary\\_Scotland.ashx](http://www.skillsforhealth.org.uk/~media/Resource-Library/PDF/SSA_for_Health_Executive_Summary_Scotland.ashx) [Accessed on 27 March 2010]