



OPTIMAX 2016

Optimising image quality for medical imaging

University of Salford, Salford, Greater Manchester, UK

Edited by: Peter Hogg, Robert Hogg – Thompson, Carst Buissink

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How to create your own OPTIMAX

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Introduction

OPTIMAX is recognised internationally as a valuable experience which exposes novice researchers, particularly BSc Radiography students, to a fairly complete journey through team-based multicultural and multi-professional research, from conception to dissemination. Whilst the primary focus of OPTIMAX is on radiography, disciplines such as physics, engineering, computer science and others participate. Today research is no longer seen as a local activity involving isolated researchers and this philosophy is reflected in OPTIMAX. Contemporary quality research is multi-professional, multi-national and multi-cultural^{1,2,3}. Recognising the value of OPTIMAX and the need for others to consider offering similar learning experiences this chapter outlines the details of what to do to recreate a similar learning experience in anticipation that similar schemes might develop around the world.

This chapter is broken down into time frames, commencing immediately after an OPTIMAX summer school has finished (end of August). The period of activities leading up to, during and beyond an OPTIMAX summer school continue for 18 months, the culmination of which is the production of an open access⁴ text book which is based upon the OPTIMAX activities within the residential summer school. Normally we run OPTIMAX summer schools on an annual basis and because of this there is a 6-month overlap of activities between two successive OPTIMAX events; the overlap period exists between September and February during the book writing period. From an organisational point of view, regular communication is essential and this is achieved through monthly meetings using via Skype; Skype is helpful as it achieves basic communication requirements whilst minimising cost.

September-October

Items to address

1. Establish a steering committee with representation from each partner organisation
2. Review what is required, in terms of actions and timescales, throughout the OPTIMAX planning and delivery cycle
3. Identify the university which will host OPTIMAX for the following year
4. For the steering committee member from the host, they should convene a local organising committee as there is too much work for one person to do
5. Agree the dates for the three-week residential summer school
6. Confirm the official language requirements
7. Agree the main tasks and who will be responsible for what on the OPTIMAX steering committee
8. Identify the student inclusion criteria
9. Identify the tutor inclusion criteria
10. The costing model should be agreed, to include all aspects
 - a. General principles
 - b. Transport
 - c. Accommodation
 - d. Subsistence
 - e. Registration fee, which might include costs associated with socio-cultural events

The steering committee would comprise of one person from each partner organisation. Each person should be acknowledged within their organisation as the 'go to person' for all things OPTIMAX. Within their organisation they would play a key liaison and communication role between their staff and students. During the first steering group meeting a list of actions and timescales should be drawn up and the actions should be distributed amongst steering committee members. The official language requirement is important to confirm, for OPTIMAX it is English. The level expected from all participants is that they must have a good level of conversational competence and have a reasonable ability to write in English. Writing is not as important as talking because support and advice about English grammar (writing) is always available within the OPTIMAX residential weeks.

Agreeing the dates for the three residential weeks is never an easy task as many factors need to be taken into account. This becomes even more complex when more partners are involved. For the students, re-sit examination dates should be avoided. For OPTIMAX we have always opted, as best we can, for holiday periods, such that students would give up a proportion of their holidays to attend it. We selected this approach to minimise the impact on their own individual programmes of study. OPTIMAX therefore has its residential component in August. For the tutors this has implications too, in that August is traditionally

a holiday period and for the host particularly the week prior to and the week after is normally used for OPTIMAX-related activities and also catch up after the three-week duration residential component. This has implications for the rest of the academic year, as tutors participating in the whole three weeks may find themselves having to take holidays at non-traditional times, perhaps within teaching weeks. Tutors should therefore negotiate with their university colleagues to ensure they receive a fair allocation of holidays and workload.

We have always had wide inclusion criteria for students; we accept BSc students at any level as well as masters and PhD students. A multi-professional approach is encouraged. Additionally, we have always given an opportunity for a 17-year-old college student to attend too. Students must attend all three weeks of the residential component, as activities are planned for each day and a team approach is used. Failure of an individual to contribute effectively could jeopardise the team effort. Students are warned that OPTIMAX is hard work and that 100% effort is required; this might involve the need to work during some evenings and also for part of the weekends. However, to counterbalance this they are informed that the socio-cultural programme is always fun and of great value and interest.

Tutors have the option to attend all of the residential component or part of it. However, for continuity enough tutors need to attend all of the residential component such that the same tutor is present with each team throughout the entire period. Additionally, a further one or two tutors will be responsible for organising the residential component to ensure its organisation is smooth and also to provide scientific advice to the teams. For the tutors who only attend part of the residential component they usually attend one or two 'complete weeks'. They join one team and play an active role within it, alongside the students and the tutors who are there for the full three weeks. Similar to students, the inclusion criteria for tutors is wide and a multi-professional approach is encouraged.

The costing model should be agreed early on. This is important for all concerned. For the first two years of OPTIMAX we won substantial grants from the European Union. However, grant funding for this sort of activity tends to be short-lived and the funders are always keen to see the activities continue after the grant funding has ceased. So far OPTIMAX has continued for two years beyond the grant funding and another summer school is being planned. This year the University of Salford hosted OPTIMAX and the following cost model was adopted:

- Some tutors used Erasmus (EU) funds to meet part of the travel, residential and subsistence costs. The remainder of the costs were underwritten by their own university, the tutor themselves or a mixture of the two.
- Tutors and students each paid a £90.00 registration fee. This covered the cost of food and drinks for the welcome event, farewell event and lunches each day throughout the summer school. It also paid for a cultural day out (coach trip to Wales) and heavily subsidised a meal out too in Manchester. The entire registration fee was spent on those who paid it; no profit was made.
- In order to minimise costs all students and some tutors stayed in university student residences. These were self-catered. Some tutors also did apartment shares in the centre of Manchester.
- Each steering committee member should work towards conducting a cost estimation, to include transport to and from the host, accommodation, subsistence costs and registration fee. This will become important later on when advertising OPTIMAX to potential students (and tutors) in their own university.

November to January

Items to address

1. Define and agree the research questions
2. Student liaison and recruitment
 - a. Marketing to students (BSc, MSc, PhD)
 - b. Agree on how many students in total can attend and how many from each country
 - c. Create a list of interested students
 - d. Advise students about OPTIMAX and what is to be expected from their point of view
 - e. Deciding which socio-cultural events will be organised

The core values of OPTIMAX should be considered together with the resources available within the host organisation when agreeing the research questions. OPTIMAX is intended to be a *learning and development experience* for BSc, MSc and PhD students, consequently the research questions should have direct value to these students. They should be pitched at a level which is attainable yet at the same time stretch the participants, presenting them with opportunities to problem solve and develop new knowledge and skills. A further core value surrounds the topic of research, primarily image quality and radiation dose optimisation; however, resource opportunities have and will continue to over-ride this ambition and limit options as what is available locally within the host organisation will restrict what research can be done. Finally resource available within the

host organisation will play a major part in the decision making. To supplement any resource deficiency, we have found it beneficial to involve commercial partners, as they have happily lent equipment for the duration of the summer school.

When the research questions have been written a decision needs to be made on whether ethical approval will be required. If the research involves humans or animals then ethical approval will be likely, if unsure then an Ethical Committee Chair should be approached for advice. The ethical principles and practices followed should be consistent with internationally agreed standards⁵ along with national/local requirements. The latter might have legal and/or professional⁶ backing. If ethical approval is required, then appropriate documentation should be prepared well in advance of the summer school so that time is available if any revision to the documents is necessary for approval to be granted. Once approval is granted then the research should be conducted in accordance with the approved documentation; if changes are required then the ethical committee should be approached with amended documentation for their approval.

The total number of students who can attend is dependent upon three key factors: the number of tutors who can attend OPTIMAX; the facilities / resources available for the research itself; the quality and quantity of student accommodation available and its price. Previously we have never exceeded 50 students, and normally the number ranges between 38 and 50.

Different approaches to marketing exist and no one answer is correct. Some of us have found that being proactive is important, such that new students are made aware of OPTIMAX in their induction week. At the University of Salford a research seminar is organised for previous participants of OPTIMAX, in which they present their research papers. All other students are invited to attend, making them aware of research outcomes and the opportunities provided by OPTIMAX. In some instances an email is sent to students to raise awareness and interested parties are requested to respond. In some instances those organisations on the OPTIMAX steering committee have partnerships with other universities (e.g. Groningen has a relationship with a South African University). In such cases the partner organisations should be included in marketing activities. Whatever approach is taken a list of interested students is compiled and then a meeting is arranged to talk to them about OPTIMAX. Points covered often include:

- Start and end dates for the summer school
- Approximate cost to individual students
- The use of a virtual learning environment (usually Blackboard)
- Facebook
- The need to create a PowerPoint slide set about 'your own country, where you are studying and also individual slides to let everybody in the summer school know about you (hobbies etc)
- A clear indication is given about the volume of work that all are expected to do (it's not a holiday), with days starting around 8.30 and finishing between 4.30 and 6pm.
- An explanation will be given about the nature of learning – in teams of 8-10 people; there are few lectures
- Socio-cultural activities – a review of the previous year is given as an indication of the type of activities which are likely to be organised in the coming year
- Sundays are always free, but often on at least one Saturday a cultural event is organised
- For the host a request is often made to ask if host students can assist in organising some socio-cultural events

February to March

Items to address

1. Liaise with lead tutors from each country about how many students and tutors will be attending OPTIMAX
2. Lead tutor from each country to organise all aspects for their students and also liaise with host, as required, for all arrangements e.g.
 - a. Accommodation
 - b. Transport
 - c. Travel / holiday insurance
3. Start preparation of socio-cultural activities and lunches, e.g.
 - a. Welcome event
 - b. Farewell event
 - c. Cultural visit on a Saturday
 - d. Arrange catering for weekday lunches
4. Book teaching and laboratory rooms

Within this time period the final numbers for tutors and students is agreed and booking arrangements can commence. We have found that travelling together as a group is beneficial because some students might be unfamiliar with international travel.

The host starts to prepare the socio-cultural activities. What is organised is largely down to the host themselves however in the past four years we have always had specific ones (3.a.-3.d., as above) as they add to the cohesion and experience of tutors and students.

The welcome event is held on the Sunday evening, prior to formal commencement on the Monday morning. This will be the first time that the students meet face to face and ice-breakers will be required. We always place them into their research teams for this activity. Ice breakers should allow for socialisation within the teams and also throughout all OPTIMAX participants. Tutors and students must all be involved. An evening meal is always provided. The farewell event is generally easier to organise than the welcome event because everybody knows one another and opinion can be solicited throughout the three week residential component about what form the event should take. We have always had a meal and often provision for dancing is made. In the farewell event a speech is always made, to reflect on the last three weeks, award certificates and look forwards to 'what next'. 'What next' includes announcing where the next OPTIMAX summer school might be held and also on whether abstracts, based on the summer school research, will be submitted to the European Congress of Radiology.

We have always offered one cultural visit on a Saturday and this typically involves a coach trip outside the host city. The decision on where to go is decided by the host, and factors like cost, distance and 'what there is to do and see' at the destination all play a part. Normally all the students and many of the tutors attend and the outings are always well received.

We normally organise lunch for the students and tutors during weekdays (Monday-Friday). This encourages cohesion and also it keeps us in control of timings throughout the three weeks. Given that OPTIMAX is intensive we always find that time is short and we cannot afford for tutors or students to leave the university complex to find their own lunch. Also, given OPTIMAX runs in the summer standard catering facilities within our universities are often closed so special arrangements need to be made.

May to July

Items to address

1. Produce student handbook, including the timetable and circulate it in advance of the residential component
2. Create outline research questions
3. Produce tutor notes / tutor handbook
4. Assignments
5. Invite lecturers to present and brief them
6. Book lecture and laboratory rooms
7. Create a list of tutor and student participants and assign them to research teams / research questions
8. Identify lead tutor and other tutors for each research team and inform them who is in their group, so they can make contact with their students in advance of the residential component
9. Create daily registers for tutors and students
10. Ensure all tutors and students have Eduroam enabled on their mobile / laptop devices to permit wifi access whilst at the host university; if Eduroam is not available then the host needs to be informed so temporary computer use accounts can be created
11. Create Blackboard and upload documents ready for the residential component; enrol students and tutors into Blackboard
12. Create Facebook and ask students and tutors to 'like it'

13. Ensure all technical equipment is operational and quality controlled ready for the experimental work
14. Preparation of the cultural presentation given by all participating countries

The handbook contains all the necessary information required by the students, this includes academic, social and emergency matters. The second page of our handbook indicates who to ring and what to do in an emergency; we always provide the mobile phone number of the lead host tutor just in case. Directions are important, from airport to accommodation and accommodation to venues (e.g. welcome event, farewell event, classrooms); also it is important to have maps to supermarkets which are close to student/tutor accommodation. The handbook should also contain other information directly related to the residential component and its content would be consistent with many university student programme handbooks. A sample timetable is illustrated below:

| Date | Time | Activity | Building/Room |
|--------------------------------|-------------------|--|----------------------------|
| Sunday 31 st July | 6:00 pm – 9:00 pm | Welcome event and team building activity. | |
| Monday 1 st August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 9:30am | Formal start; welcome and overview | Mary Seacole Building 2.43 |
| | 9:30am – 10:30am | Team working with Dr Leslie Robinson | |
| | 10:30am – 11:00am | BREAK | |
| | 11:00am – 12:00pm | Team working continued... | Mary Seacole Building 2.43 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 |
| | 1:00pm – 3:00pm | Lecture - Research methods (Dr Lucy Walton) | Mary Seacole Building 2.43 |
| | 3:00pm – 3:30pm | BREAK | |
| | 3:30pm – 4:30pm | Groups meet to discuss their research focus | Mary Seacole Building 2.43 |
| | 4:30pm | Presentation on the UK | |
| Tuesday 2 nd August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 09:10am | Radiation Protection in the Laboratory (Prof Peter Hogg) | Mary Seacole Building 2.43 |
| | 09:10am – 10:30am | Project Management (Dr Leslie Robinson) | |
| | 10:30am – 11:00am | BREAK | |
| | 11:00am – 12:00pm | Group work – 'Define team roles' | Mary Seacole Building 2.43 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 |
| | 1:00pm – 3:00pm | All groups to continue with group work | Mary Seacole Building 2.43 |
| | 3:00pm – 4:15pm | Reflection on team working | |
| | 4:15pm – 5:15pm | Presentation on Vietnam Presentation on Sweden | |
| | 4:45pm | END OF DAY | |

| Date | Time | Activity | Building/Room |
|----------------------------------|------------------|---|--|
| Wednesday 3 rd August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 |
| | 1:00pm – 3:00pm | Statistics by Audun | Mary Seacole Building MS 2.71 |
| | 3:00pm – 3:30pm | BREAK | |
| | 3:30pm – 4:00pm | Group work | Mary Seacole Building MS 2.71 |
| | 4:00pm – 4:30pm | Reflection on team working | |
| | 4:30pm – 5:00pm | Presentation about The Netherlands | |
| | 5:00pm | END OF DAY | |
| Thursday 4 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00pm – 1:00pm | LUNCH | L609 & L627 |
| | 1:00pm – 3:30pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 3:30pm – 4:00pm | Reflection on team work | Mary Seacole Building MS 2.71 |
| | 4:00pm – 4:30pm | Presentation about Brazil | |
| | 4:30pm | END OF DAY | |

| Date | Time | Activity | Building/Room |
|---------------------------------|------------------|---|--|
| Friday 5 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00 – 1:00pm | LUNCH <i>Masterclass – confidence in public speaking, by Leslie Robinson</i> | Allerton L609 & L627 |
| | 1:00pm – 3:30pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 3:30pm – 4:00pm | Reflection on team working | Mary Seacole Building |
| | 4:00pm – 4:30pm | Presentation about South Africa | MS 2.71 |
| | 7:30pm - late | Social Activity – ‘A night out in Manchester’ | |
| Saturday 6 th August | | BBQ and social event at Peter’s house. To be confirmed. | |
| Sunday 7 th August | | DAY OFF | |
| Monday 8 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00 – 1:00pm | LUNCH | Allerton L609 |
| | 1:00pm – 3:30pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 3:30pm – 4:00pm | Reflection on team working | Mary Seacole Building |
| | 4:00pm – 4:30pm | Presentation about Ireland | MS 2.43 |

| Date | Time | Activity | Building/Room |
|-----------------------------------|------------------|--|--|
| Tuesday 9 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00 – 1:00pm | LUNCH <i>Masterclass – poster design by Claire Mercer</i> | Allerton L609 & L627 |
| | 1:00pm – 3:30pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 3:30pm – 4:00pm | Reflection on team working | Mary Seacole Building |
| | 4:00pm – 4:30pm | Presentation about Portugal | MS 2.43 |
| Wednesday 10 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 9:30am | Possible lecture by peter Hogg about conference preseenting? (its in the OPTIMAX ebook 2015) | Mary Seacole Building MS 2.43 |
| | 9:30am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 |
| | 1:00pm – 4:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 4:00pm – 4:30pm | Presentation about Switzerland | Mary Seacole Building MS 2.43 |
| Thursday 11 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 |
| | 1:00pm – 4:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 4:00pm – 4:30pm | Presentation about Norway | Mary Seacole Building MS 2.43 |

| Date | Time | Activity | Building/Room | | | | |
|-----------------------------------|------------------|--|----------------------|-----------|-----------|-----------|-----------|
| Friday 12 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 | | | | |
| | 9:00am – 12:00pm | Group work | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 | | | | |
| | 1:00pm – 4:00pm | Group work | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |
| | 4.00-4.30 | Presentation about Iraq | | | | | |
| Saturday 13 th August | | Maybe an outing by coach? To be confirmed | | | | | |
| Sunday 14 th August | | DAY OFF | | | | | |
| Monday 15 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 | | | | |
| | 9:00am – 12:00pm | Group work | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 | | | | |
| | 1:00pm – 5:00pm | Group work | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |
| Tuesday 16 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 | | | | |
| | 8:30 – 4:30pm | Group work all day (make sure PowerPoint presentations, posters and articles are well on the way to completion) | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 | | | | |
| Wednesday 17 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 | | | | |
| | 9:00am – 12:00pm | Group work | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 | | | | |
| | 1:00pm | Posters emailed to Peter | | | | | |
| | 1:00pm – 4:30pm | Group work | Gp1 MS160 | Gp2 MS273 | Gp3 MS132 | Gp4 MS175 | Gp5 MS260 |

| Date | Time | Activity | Building/Room |
|----------------------------------|-------------------|---|--|
| Thursday 18 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 9:00am – 12:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 12:00pm – 1:00pm | LUNCH | Allerton L609 & L627 |
| | 1:00pm – 4:00pm | Group work | Gp1 Gp2 Gp3 Gp4 Gp5 MS160 MS273 MS132 MS175 MS260 |
| | 4:00pm – 4:45pm | Online evaluation questionnaire | |
| | 4:45pm – 4:59pm | Hand in assignments (before 5.00pm) | |
| Friday 19 th August | 8:30am – 9:00am | Teachers gather for overview of the day | Allerton L609 |
| | 10:00am – 11:30am | Poster Exhibition Assessor: Claire Mercer | Allerton L626 |
| | 11:30am – 12:30am | LUNCH | Allerton L609 & L627 |
| | 1230am – 3:00pm | OPTIMAX 2016 Conference Assessor: Peter Hogg | Mary Seacole Building MS 2.43 |
| | 6:00pm – 11:00pm | Farewell party, including Certificates of Attendance, food and entertainment. | |
| Saturday 20 th August | | HOME | |

A sample research question and outline method is given below in italics. When creating the research questions the facilities / equipment available at the host organisation must be considered carefully as there will be a need to make sure that the research question can be answered adequately with the available equipment.

Impact of anode heel effect on AP pelvis image quality and effective dose

The anode heel can create a range of beam intensities, from cathode and anode. Utilising this effect, research has demonstrated⁷ that gonad dose can be significantly lower in males with feet towards anode for AP pelvis. The impact of tube orientation on image quality, of feet towards anode and feet towards cathode, has not been investigated. Similarly its impact on effective dose has not been investigated either.

Using a phantom, determine the beam intensity, profile from anode to cathode, for adult AP pelvis. Then, using a range of exposures, determine whether phantom orientation (feet towards anode / cathode) has an impact on image quality and/or effective dose.

When designing your experiment you must consider measuring/estimating the following:

The effective dose using TLDs

The physical (e.g. SNR) and visual (e.g. 2 Alternate Forced Choice) measures of image quality

For this research you will probably use the adult ATOM phantom and the adult anthropomorphic phantom. Please liaise with group 1 about using the ATOM phantom as they will likely use it too.

Tutor notes tend to be less comprehensive than the student handbook, in fact to minimise the amount of administrative work to support OPTIMAX we tend to give student handbooks to the tutors too. Tutor notes indicate a range of information, including:

1. Support sessions for all tutors (which always occur 8.30-9.00 each day)
2. Training for using any facilities (e.g. X-ray lab) within the host organisation
3. Local Radiation Protection arrangements
4. A range of additional pieces of information that might be needed by the tutors

Teams are created at least one month in advance of the residential component. Teams comprise tutors and students. Within each team students are typically assigned based upon nationality, to make sure there is a good mix; also professional background can be taken into account such that physics and radiography students are mixed across all the teams. Once the team is created the lead tutor for each team makes contact with them via email and encourages they you introduce themselves to one another. Around the same time a Facebook page is created (e.g. <https://www.facebook.com/Optimax2016/?fref=ts>) and they are encouraged to like / join it. Throughout the residential component any photographs which are taken will be stored in Facebook.

A virtual learning environment (VLE; e.g. Blackboard) is set up to store any documents (e.g. PowerPoint slides, handouts, handbook, etc) which will be required within the residential component. The interesting thing about this is any of the participating organisations can create it if they have a VLE. Typically the organising who looks after the VLE is not the one who hosts the summer school.

The host organisation must ensure that all equipment to be used in the research must be quality controlled and operate within legal and manufacturer specifications. This should be assured by the host prior to residential component.

The final activity to be completed before the residential component is the creation of the cultural presentations. Typically these comprise of a series of PowerPoint slides, often with videos. Their purpose is to inform OPTIMAX participants about the countries and cultures that are represented. All tutors and students from each country are involved in developing their presentation, as well as its delivery. Aside the general slides about the country and the organisation from which they emanate, each student and tutor has one slide to talk about themselves – where they come from and their hobbies.

August

Everything should now be in place for a successful summer school. A few important matters do need explaining which have not yet been discussed. The overall organisation of the residential component requires input from two different aspects – scientific support and organisational support. On two occasions one person has played both roles in our summer schools but this has not been ideal as the time-demands on one person are too great. Scientific support should be offered to all teams on an equitable basis, from day 1 to the final day. This person would act as Principle Investigator and would be knowledgeable and experienced in theoretical and practical aspects of the types of research that will be conducted within the teams. They will offer advice on the sorts of methods which might be used

and how and as required direct tutors / students to learning materials. Organisational support involves making sure everything runs to plan, from the research components to the social-cultural aspects. It will involve identifying problems before they arise and trying to solve them; equally it will involve solving problems as they arise. The organisational supports should be employed by the host organisation; the scientific support person need not be employed by the host organisation.

If student work is to be assessed the students must be made aware of this. We assess the poster, article and presentation and award ECTS credits. At the end of the summer school, as part of the farewell event we award certificates of attendance along with ECTS marks. The final formal activity students and tutors do at the end of each summer school is to complete an evaluation questionnaire. This takes into account the academic and socio-cultural programme.

September – March

The following would occur in tandem with preparation for the 'next' OPTIMAX summer school.

After the summer school has been completed work on the OPTIMAX book can commence. Examples of former OPTIMAX books are stored on line^{8,9}. At the same time the abstracts are prepared for submission to the European Congress of Radiology¹⁰. In both

cases the lead tutor for each group takes the following responsibilities

- Acts as liaison person between scientific support person (see 'August', above) and team members (co-authors)
- Takes feedback from the scientific support person on the conference abstract / article / book chapter and makes changes as required
- Submits the abstract to the conference and ensures that all co-authors are indicated
- If an abstract is 'accepted' the lead tutor would repurpose the OPTIMAX conference slides to be suitable for presenting at ECR
- The lead tutor should ensure that all co-authors (and therefore students) for the ECR paper and the book chapter are informed of any changes to the chapter / abstract and approve them

The scientific support person reviews all work and may, if adequate intellectual input has been given, become a co-author on specific pieces of work. In all cases all students are co-authors on book chapters and conference papers. For the book, the scientific support person becomes the editor, along with others who have an involvement in the editing process.

From now on the scientific support person will be referred to as the [OPTIMAX] book editor.

The book editor proposes the chapters which will be included in the book. At a minimum all the articles produced by the students will be included. In addition new chapters will be commissioned, often based upon lectures given within the summer school. For these chapters proposed authors should be invited in good time to produce their chapters; their chapters should be reviewed by the editor and if needed additional work might be required. The editor also reviews the articles produced within OPTIMAX and at this stage further feedback might be given to improve them.

All draft chapters should be ready by mid-January ready for type setting to occur. Typically we have done type setting in-house, with one of our partner universities offering to support this activity. As this

is being done an ISBN number is arranged and included into the final version of the book ready for e-publishing. The book should be published into an Open Access forum to be available free of charge (e.g. University of Salford Institutional Repository¹¹); we normally publish the book online by 1st March following the OPTIMAX summer school. Beyond August, it normally takes around 6-months of work to develop the material, type set it and publish it. Once the OPTIMAX is published a strategy is adopted to promote it. Normally this could involve writing promotional news pieces for professional magazines and the lead tutor from each organisation should ensure this is done. Links to the book are placed onto institutional web-sites. Finally book reviews are organised so they can be published in national / international peer review journals.

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