EUROPEAN SOCIETY OF RADIOLOGY

TEACHING UNDERGRADUATES RADIOLOGY:

A GUIDANCE PAPER FOR TEACHERS OF UNDERGRADUATES

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1. PREAMBLE

This guidance paper has been produced by the Undergraduate Education Subcommittee of the European Society of Radiology (ESR) for those who are interested in or engaged in teaching radiology to medical undergraduates. It is not a complete treatise on teaching methods because many of the elements of teaching radiology to other groups are inherent to teaching undergraduates. Instead, it is a collection of ideas that the authors have themselves found useful in teaching this particular group of learners and which we offer to colleagues with the aim of helping to stimulate their approach to this important group of students.

The reader may obtain most value from this paper by studying also the ESR White Paper on Undergraduate education in radiology and the ESR Curriculum for Undergraduate Radiological Education produced by the ESR.

2. WHO ARE "THE TEACHERS"?

Teaching undergraduates radiology can be done by anyone with experience in and passion for radiology, from trainee to professor, and including scientific and technical staff.

Radiology trainees are the people who have most recently learned radiology and they represent a valuable resource. They can also point out additional sources of education that they find useful in daily practice, for example teaching files, Apps, websites etc.

Teaching can also be a very valuable learning experience for the radiology trainees themselves, and may be an obligatory part of their training curriculum in some countries, as well as being mentioned in the ESR European Training Curriculum for Radiology (section B-I-16 Knowledge point 6, Skills point 5).

An enlightened teaching programme for undergraduates will draw on the instructional capabilities of a whole range of staff, remembering that undergraduates are not yet medically qualified and therefore approach their learning from a different viewpoint compared to those who have undergone professional training schemes.

3. BASIC TEACHING SKILLS

SETTING THE LEARNING ENVIRONMENT

- Think about the size of the group and ease of communication. Small groups can be taught in small rooms or even from behind a workstation; this encourages interaction.
- Remember that really small groups (2-3) can be involved easily in practical work in the department, such as learning to use ultrasound. Practical involvement often stimulates the wish to learn more.
- Aim to encourage a quiet, comfortable and relaxed atmosphere but one which is attentive and interested and in which you approach the learning as a shared exercise with the students. They may not yet be trained professionals but they are intelligent adults who you can meet on equal ground as a human being.
- Do not put students in threatening situations, for example in the “hot seat” method. When asking them to pass on a pointer allow them to pass it to someone who voluntarily wants to point something out; paradoxically, this often encourages the “silent“ members to come forward and take part.
- Be conscious of the effect of heating and lighting on perception and concentration. Too little light and too much heat do not help undergraduates to stay awake!

UNDERSTANDING THE STUDENT VIEWPOINT

- Before you teach a class, make sure you know what stage of their medical training the undergraduates are in, and what they can be expected to know already, and what not.
- Always try to see the level of learning from their viewpoint: getting reliable feedback will help you to know if you have the level correct. Always reflect on the feedback you get.
- Try to confirm their alleged knowledge at the beginning of your class with some carefully chosen questions, and adjust your teaching method if necessary.
- A good start to this approach is to find out what they are most curious about.
- Always avoid the (partly understandable) temptation to show them how clever you or radiology can be!

STIMULATING INTERACTION

» This can make the class interesting for both of you. Get them talking, answering questions; ask them to describe findings instead of you doing it.

» Perhaps ask them to prepare a short (few sentences) presentation.

» Hand-held voting devices, if you have them, are very popular.

» For a larger audience, if you have the facilities, consider using an App, for example www.polleverywhere.com.

KEEPING IT CLINICALLY RELEVANT

» Remember that your students are learning to be doctors, not radiologists. So, adapt the level of your teaching to the student's curricular need. Make sure that the most important teaching points they will need in the near future are passed on and repeated.

» Use real clinical cases and scenarios. Collect a few cases in advance to illustrate your teaching points.

» Get them thinking clinically: "treat the patient, not the findings".

» Explain why you are giving certain advice, e.g. when teaching how to write a radiology request, explain them why clinical information is essential and how it influences the radiologist's report.

» Try asking them how they would manage each case as a doctor. Emphasise the importance – both to the patient and the doctor – of choosing the appropriate test. Relate this choice to radiology dose constraint and the ALARA (As Low As Reasonably Achievable) principle.

» Be sure to teach on safety issues relating to imaging: this is something all junior doctors need to know.

» Always try to teach medicine as a practical subject (imaging is SUCH a good tool for this), avoiding theory as much as possible.

PERSONAL SKILLS

UNDERSTANDING AND CHOOSING DELIVERY METHODS

- Remember that every presentation method has individual strengths and weaknesses. Adapt your choice according to the subject, the intended learning outcome, and/or the learning environment. Try to avoid using a single method only (e.g. “Death by Powerpoint”).
- Remember “KISS” – keep it short and simple.
- Add an interactive element to the class. This is essential to stimulating interest and can be done in many ways: examples include letting the students point out abnormalities, taking polls during the class about certain cases, anonymous voting devices, or using entry and exit quizzes which allow the students to see their own progress.
- Know the value of case presentations and disease-orientated approaches: these help the student relate radiology to their learning elsewhere in the curriculum.

KNOWING ONE’S OWN STRENGTHS AND WEAKNESSES

- Knowing these is a professional responsibility of anyone who wants to teach.
- They are learned by (a) self-criticism, (b) feedback analysis, (c) reviews by colleagues. Direct feedback from students, if you can encourage it successfully and openly, is a good means of understanding how your teaching is going over.
- For example, after each class you can ask informally for comments on how the undergraduates experienced your way of teaching. But you could also think about formalising feedback, for example by email, especially in a situation where a new training method has recently been set up, in order to evaluate and adjust it.
- Direct feedback from students shows you if you have presented the content successfully and whether it has been understood by the students: this relates to the speed of presentation and your form of delivery in addition to the content itself.
- If you work together with teachers at different staff levels, try asking them for their feedback: this can be a powerful aid to getting high quality teaching.

COMMUNICATION AND EMPOWERMENT SKILLS

- Train yourself to observe your audience as you teach. Ask yourself if everyone can hear and is listening.
- Understand how much you can communicate in your chosen delivery method: do not overload the teaching.
- Repeat the most important things you would like them to remember.
- Try to find a balance between too simple and too complicated. Adjust your teaching level to the different levels of the undergraduates taking the teaching class.
- Remember they are not radiologists: the language and terminology you usually use to a radiology colleague may not be appropriate for an undergraduate.
- Aim for an open dialogue with undergraduates: this stimulates them to be honest and tell you a lot (of course, you have to be prepared to receive what they say!).

MAINTAINING TEACHING SKILLS

- This is your professional responsibility. Keep your approach fresh.
- Review and modify your presentations each time you use them: this is more interesting for you and for them.
- Get peer advice. Ask colleagues to sit in on your presentations and give you feedback.

CONSIDER AVAILABLE TEACHING COURSES (E.G. “TEACH THE TEACHER”)

- Remember you are not the only person ever to have taught students. There is a lot of established experience out there for you to draw on.
- Do not feel it as a failure if you take a course on teaching: teaching is a skill, and like all skills needs learning and practising!
- Exploit networking with other teachers. Learn from each other. Ask to visit the classes of others and compare your approach with theirs. Aim to learn about interesting and innovative approaches that can fertilise your own approach.

ADDITIONAL AIDS

USING MULTIMEDIA

- Remember this does not necessarily need a lot of high-powered equipment. VDU displays, print-outs, illustrations from books and wall-charts all contribute to a varied approach.
- Use your imagination: e.g. when teaching trauma try showing movies of injuries happening (such as sports injuries), or show a ship's sail when teaching the "sail sign" on a chest radiograph.

AVAILABILITY OF PRESENTATIONS

- Ensure your presentations are available (preferably electronically) before and after your teaching.
- Make sure your teaching equipment works before you start your teaching class, otherwise you will lose valuable teaching time.
- Avoid any technical hitches by careful preparation. Have all your equipment running. You can then welcome your students to the class and be sure of their immediate attention.
- Students like taking things home. Provide handouts. Try stimulating the kinaesthetic learners by asking them to draw on handouts – e.g. the shape of lesions.
- Handing out your presentation at the beginning of the class may help them to make their notes on the hand-outs or to structure their notes effectively. This also stimulates them to pay attention and be interactive and communicative.

E-LEARNING

- Radiology is the medical specialty that holds closest connections with the way students nowadays communicate: digitally. The ESR offers an e-learning platform with selected contents and accredited online learning for general and subspecialist radiologists: learn.myESR.org. E-learning should therefore start already at undergraduate level and will help to ensure students' attention: explore e-learning tools.
- Building e-learning material requires adequate script to start with. This is the most important caveat. Adequate scripting is essential.
- Define clear learning objectives: no more than 4.
- Each learning objective requires multiple ways of explaining and illustrating, in order to adapt to the various learning styles. So use images, text, voice over and hyperlinks.
- Adequate feedback is crucial in e-learning. Not too much information per feedback item, staccato sentences, practical take-home.

- At the end of the e-learning make a list of all feedback items as a take-home.
  If possible: make this exportable. If not possible: students will use their camera on the phone to have a screen shot.
- Think of contrasting colours and consider colour blindness.
- Look and feel of the e-learning should be appealing.
- Build in a game element.

PROVIDING FURTHER READING

- Much student education is self-lead. Make sure your handouts provide the interested student with where to look for more information.

4. LEARNING OUTCOMES AND MOTIVATION FOR UNDERGRADUATES

- Identifying the desired learning outcomes is a vital step in setting teaching at the appropriate level for the student. You should always know what you expect students to be able to do as a result of your teaching.
- This may be established for you by those managing the course in which your teaching occurs. If so, make sure you know what is recommended. If not, work out learning outcomes by yourself and ensure these are communicated to the students.
- Ensure what you are teaching correlates with and supports the local curriculum that the students are following. If you teach material outside this, do not be surprised if they are less interested.
- Make sure you know what stage of the official curriculum the undergraduates are in and adjust your teaching level and contents to it.
- Think of radiology-specific outcomes. What specific radiological knowledge, skills, competences and attitudes should undergraduates learn during your class? Examples include being able to name basic radiological anatomy on a chest radiograph.

For a complete overview of suggested outcomes see the ESR Curriculum for Undergraduate Radiological Education.

STIMULATING STUDENTS THROUGH ASSESSMENT

- It is a classical tenet of educational theory that students mould their learning to the assessment they undergo. Aim to use this effect by introducing some form of assessment into their radiology course.
- This can be done in a variety of ways and does not need to be a formal examination. For example, simple quizzes can be used during or after the class.

GETTING UNDERGRADUATES INTO RESEARCH AND PUBLICATIONS

- Many students are enthusiastic about taking part in projects in the department. This is particularly likely if they have had some exposure to the practical work of the department.
- Students can be attracted to help with projects that the department has already in hand.
- It is best to start simple, with case reports and the like.

5. INVOLVING RADIOLOGISTS IN CURRICULAR PLANNING

Today a large number of subjects compete for the student's attention. This makes it important to secure a place for radiology within their curriculum. This is unlikely unless radiologists ensure they are involved in medical school curricular committees: however you can expect competition for a place at this table.

SETTING THE ACADEMIC VISION

- Make it clear to curricular planners that radiologists understand the student's requirement and are best qualified to set the curriculum for radiology.
- Have your teaching plans drawn up to communicate before you need to show them.
- Learn your medical school management strategies and show that radiology can support them.

GET RADIOLOGY INTO THE WHOLE CLINICAL CURRICULUM

- Try to get radiology taught in parallel with other subjects throughout the curriculum as a "continuous thread" subject.
- Show curricular planners and your clinical colleagues that this teaching can help support student's learning in other subjects.
- So be sure your plan for radiology interacts with clinical learning outcomes in the other subjects.

ELICITING SUPPORT FROM OTHER SPECIALITIES

- Getting other colleagues on your side is very valuable in this initiative.
- Show colleagues in other specialities how radiology teaching can support their subject. For example, use radiology to teach the natural history of chest disease.
- Avoid letting your colleagues think that your teaching will simply take the student's time away from theirs.
- Use your daily clinical networking – for example in clinicoradiological conferences - to build teaching links with clinical colleagues.
- If possible, get into teaching in other clinical specialities: exploit multidisciplinary meetings.

INVOLVEMENT IN PLANNING ASSESSMENTS

» Students tend to learn only what they know they will be assessed on, so get radiology a place in the medical school's assessment process.

CURRICULUM EVALUATION, REVIEW AND RENEWAL

» Once radiology has established a place in curricular planning keep its presence fresh by proactively reviewing and revising your input.

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