

Medical Physics Education and Training in the Global Village

Issues, Strategies, and Experiences

7 November 2013

Jacob (Jake) Van Dyk

Professor Emeritus

Western University, London, Ontario, Canada

Medical Physics Education: Global Issues

- Variation in ...
 - Basic educational backgrounds
 - Undergraduate and graduate education
 - B.Sc., M.Sc., Ph.D.
 - Residency/Registrar ... or on-the-job training
 - Available technologies
 - Available training programs
 - Available resources
 - Instructors with practical experience
 - Different professional certification procedures

My Involvement in International Education/Training

- Training courses
 - IAEA
 - ICTP
 - Other
- Fellowships
 - IAEA/PAHO
 - Other
- Scientific visits
 - To review our residency program

International Training Courses Taught in Last Ten Years



IAEA Africa Regional Training Course, Cape Town, South Africa:

2-D RT to 3-D CRT, 21 – 25 October 2013

- Participants: Teams from 9 countries
 - Egypt, Ethiopia, Ghana, Kenya, Libya, Sudan, Uganda, Tanzania, Zimbabwe



Experiences

- **Every course is different**
 - With some similarities
- Course duration usually 5 days (3 - 6 days)
- Course components
 - Lectures (~67-75%)
 - Hands on/practicals (~25-33%)
- Attendees
 - Depending on topic and/or local language
 - Medical Physicists only
 - Team: Medical Physicist & Radiation Oncologist & possibly Radiation Therapist
 - Variable experience
 - Variable technologies
 - Variable knowledge of English language
- IAEA courses – often regional courses – from different countries – diversity of backgrounds/technologies
 - Given in English
- Participants receive CD/USB drive
 - With PDF copies of PPTs
 - Resource materials

In-house meetings on education/training

Hierarchy of Student Learning in the Cognitive Domain



Put elements together to form a coherent whole function; reorganize elements into new patterns of structure

Making judgments based on criteria and standards

Break material into its constituent parts and determine how the parts relate to one another and to the overall structure or purpose

Carry out a procedure in a given situation

Construct meaning from instructional messages, including oral, written and graphic communication

Retrieve relevant information from long-term learning

6 levels of knowledge/cognitive skills

In-house meetings on education/training

Hierarchy of Student Learning in the Cognitive Domain



BLOOM'S TAXONOMY

...form a coherent whole
...patterns of

- Break material into its component parts
determine how the parts relate to each other
the overall structure or purpose
- Carry out a procedure in a given situation
- Construct meaning from instructional messages, including oral, written and graphic communication
- Retrieve relevant information from long-term learning

6 levels of knowledge/cognitive skills

In-house meetings on education/training

Hierarchy of Student

Learning in the Cognitive Domain



BLOOM'S

to form a coherent whole
patterns of

**Very few of us have
had formal training
in educational theory
and practice!**

cluding

g-term learning

6 levels of knowledge/cognitive skills

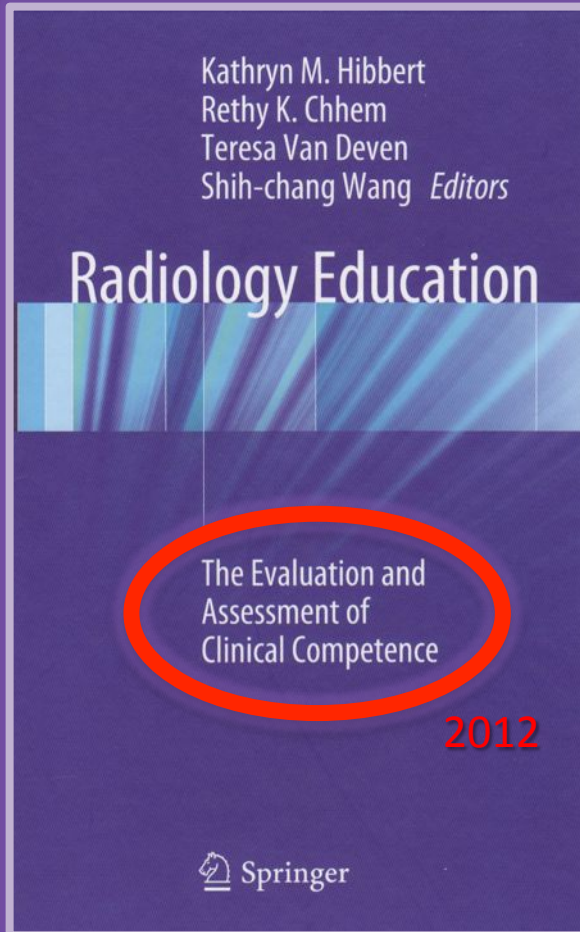
Lessons Learned

- Engagement
- **Everyone wants more practicals**
- Course evaluations are crucial
- Student evaluations are helpful
 - As teaching & learning tool
 - As self-evaluation aid
- Lecturers tend to give too much detail in lectures
 - Students need to assimilate & apply knowledge at home
- Student mother tongue ... usually not English
 - Instructors need to adapt accordingly
- Good to know students' available technologies
 - SurveyMonkey® survey prior to course

Evaluation of Success of Training

- Very difficult to get objective answer
- Ideally,
 - Independent objective observer provides assessment of on-the-job competence
- Practically,
 - Done by certification exams
- Realistically,
 - Quality of on-the-job competence data hard to come by

Evaluation of Success of Training



Assessment of Radiation Oncology Medical Physics Residents: The London, Ontario (Canada) Experience

15

Jacob Van Dyk and Jerry J. Battista

15.1 Introduction

Medical physics is the application of physics to medicine. *Medical physicists* tend to be clinically oriented professional scientists, most often entering the field with a graduate degree in physics or biophysics (M.Sc./Ph.D.). However, as the field has evolved rapidly with diverse technology and techniques, entry from other disciplines of science or engineering has also occurred. Medical physicists specialize in various areas of medicine, usually in radiation or imaging related fields, although they can be involved in other areas of medicine such as hyperthermia, photodynamic therapy, physiological measurements or other therapies. In terms of hospital staffing numbers, the largest single group of medical physicists are those who are working in cancer treatment.

- Multiple methods of assessment during training
- What about quality of on-the-job work?

Evaluation of Success of Training

- Survey of graduate residents
 - SurveyMonkey®
 - Residents of previous 10 years
 - 16 residents
 - 10 questions

7. How well did the residents feel that their training prepared them for working as a medical physicist in a clinical environment?

7. Looking back ...

[Create Chart](#) [Download](#)

	Not very ...									Extremely ...	Rating Average	Response Count
How 'well' did your residency prepare you for the responsibilities of a medical physicist working in a clinical environment?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	6.3% (1)	25.0% (4)	37.5% (6)	31.3% (5)	8.94	16
How 'satisfied' were you with the entire training experience?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	6.3% (1)	6.3% (1)	50.0% (8)	37.5% (6)	9.19	16
How 'competent' did you feel to practice medical physics in a clinical context?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	12.5% (2)	18.8% (3)	0.0% (0)	56.3% (9)	12.5% (2)	8.38	16
How 'competent' do you feel now?	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	6.3% (1)	62.5% (10)	31.3% (5)	9.25	16

- Survey provided useful feedback on effectiveness of residency training program
 - Including comments on where improvements could be made

6
16
0

Summary/Conclusions

- Medical physicists, especially in less developed countries, are very hungry for learning from more experienced medical physicists
- Well organized courses provide one venue for learning
- Attendees always want more hands-on/practicals
- Course evaluations by students are essential
- Assessment of attendee learning is useful & essential
 - For both teachers and students
- Coordination of international teaching remains an issue
 - Need single website with all RT-related training courses
- Follow-up assessment of “real” success of teaching programs remains an issue