

Toronto, Canada

ISRRT World Congress

and CAMRT Annual General Conference

June 7-10, 2012

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# *Clinical Learning & Assessment in Simulated & Virtual Worlds*

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## ***DISCLOSURE***

We do not have a financial interest, arrangement or affiliation with a commercial organization that may have a direct or indirect interest in the subject matter of our presentation

## *Learning Objectives*

- To provide an overview of current simulation modalities available
- To provide an understanding of the underpinning educational theory for learning & assessment in simulated & VR environments
- To outline current research into learning & assessment through simulation

## *History and context of medical education*



*The Anatomy Lesson of Dr. Nicolaes Tulp*

Rembrandt,  
1632

The Anatomy Act did clearly establish to whom a dead body belongs. Until relatively recently, the principle that the 'only lawful possessor of the dead body is the earth' prevailed in the UK.

## *Background to clinical education for Allied Health Professionals (AHPs)*

- Apprenticeship
- Socialisation



## *Apprenticeship*

- Historical model of education
- Alder Hey / Bristol enquiry highlighted problems
- Teaching belies absolute patient care
- Disparity between what the mentor “wants” to teach and what the student “needs” to learn

## ***Socialisation of students: Situated learning*** *(One theoretical perspective)*

- Shared repertoire / joint enterprise (policy)
- Community of practice
- Mutual engagement (care of patient)
- The stronger students are usually accepted into the community either through excellent knowledge and skill demonstration or pure belligerence

## *Learning in placements?*



Social learning- sometimes poor teaching

Unstructured learning unsupervised  
performance –learning by osmosis

Self-directed practise – reinforcing  
poor techniques if unsupervised



## *What is simulation?*

- Simulation is defined as a:

*“real world event that that represents a referent which then draws its essential meaning from that referent”*

- Unlike a simulator:

*“a simulator is comparable to a genetic code, and a simulation to the realization of that code into the living organism”*

Crookhall, Oxford and Saunders (1987)

## *History of simulation*

- Jousting, chess, war-gaming, military exercise, Aviation
- 1832 – Anatomy Act
- 1960's – SimONE
- 1980's –GAS
- 1990's – Surgical haptic simulators
- 2000's – HPS/ECS
- 2010 – 3G/iStan

## *Defining simulation types*

- Wargaming
- Aviation
- Nuclear industry
- Space programme
- Tribal dancing
- Military training
- Jousting
- Chess
- Emergency services
- Forensics

## *Simulation as a concept*

There are many terms that are afforded the term simulation, including:

- Low fidelity manikin
- Hi Fidelity manikin
- Part task trainers
- Games (driving rehearsal)
- Haptic systems
- VR
- Simulated patients
- Multimedia

## *Hi fidelity simulation advantages*

- Draws referent from clinical practice (context)
- Aims to facilitate suspension of disbelief
- Allows for 4D teaching (time)
- Allows for repetition and rehearsal
- Stress inoculation (covert sensitisation)

## *Benefits of simulation*



- Patients are not exposed to complete novices
- Safe environment where mistakes become learning opportunities
- Complexity can be altered according to the needs of the student
- Self efficacy can be built before contact with real patients

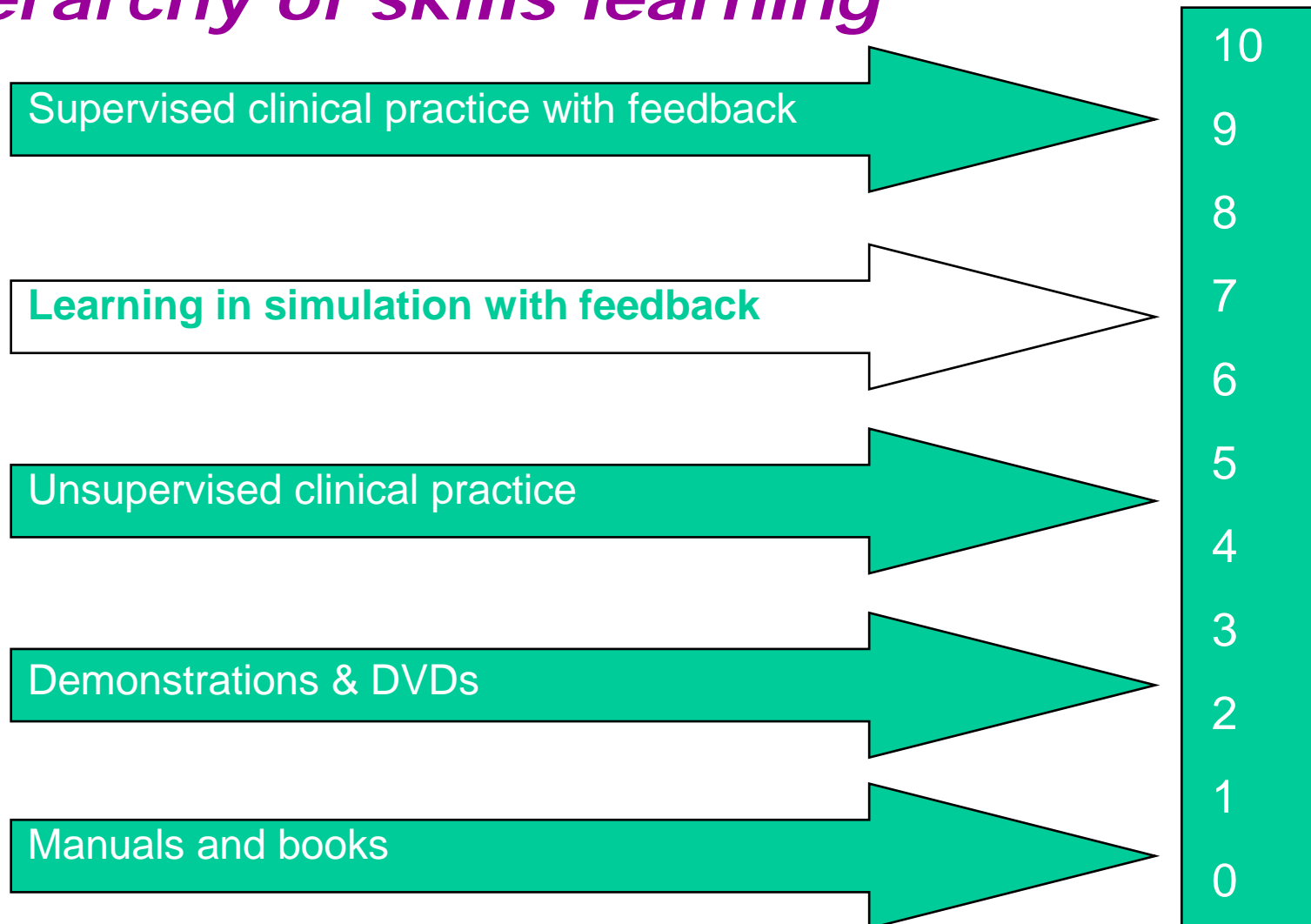
## *Benefits of simulation*



Students can:

- repeat the skill as often as necessary to develop confidence
- learn at their own pace
- experience being 'on the receiving end'
- express their fears and ask 'difficult' questions
- make mistakes and appreciate the consequences without harm to the patient

## *Hierarchy of skills learning*





## *Hi fidelity simulation disadvantages*

- Adrenaline gap
- Uncanny valley
- Fear / upset
- Manpower hours



~~Practise makes perfect~~  
Practise makes permanent!

Only well supervised practise with  
constructive feedback  
makes perfect



## *Theory – practice dichotomy*

- If used correctly simulation will facilitate classical conditioning (2<sup>nd</sup> nature)
- Objective outcome measurement (Anne vs iStan)
- Development of communication and psychomotor domains

***SUMMATIVE CLINICAL ASSESSMENT***  
***IN***  
***RADIATION THERAPY EDUCATION***  
***@ UoP***

## *Clinical Assessment Structure*

- 2 part process –

Practical element = procedural skill (Clinical Team)

Clinical discussion = declarative knowledge (Academic Team)

- Millers pyramid of competence

## *Pause For Thought*

- We do it like this because we always have
- No longer acceptable
- Radiation Therapy is evidence driven
- So is learning & assessment different?

## *Profile*

- **Year 1**

Linear Accelerator daily QA checks

Parallel opposed pair / simple multi - field (pelvis)

- **Year 2**

Head & Neck

Breast

Complex multi – field

- **Year 3**

Risk assessment (any procedure)

CT localisation

Lin Acc based pre treatment verification

## *Profile*

- **Year 1**

  - ***Linear Accelerator daily QA checks***

    - Parallel opposed pair / simple multi - field (pelvis)

- **Year 2**

  - Head & Neck

  - Breast

  - Complex multi – field

- **Year 3**

  - Risk assessment (any procedure)

  - CT localisation

  - Lin Acc based pre treatment verification



## *Virtual versus Real World Assessment*

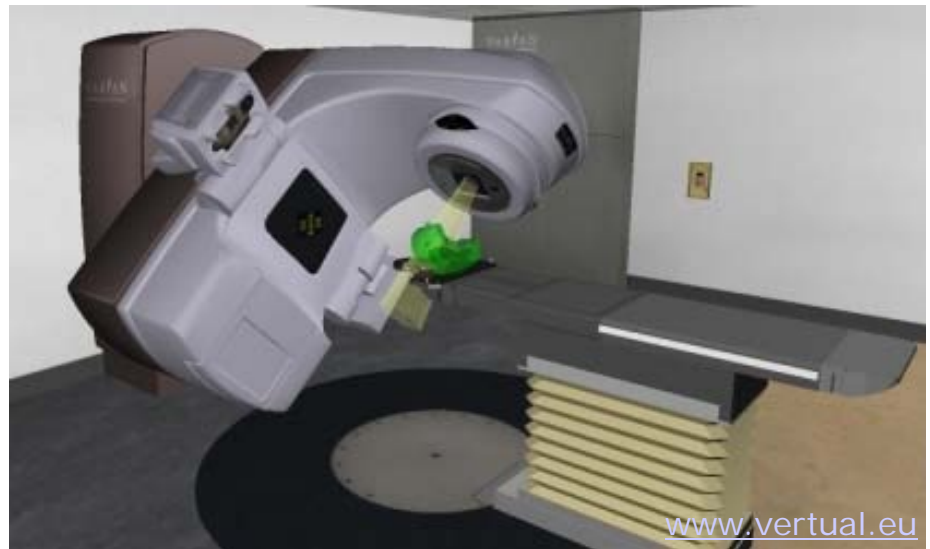
- Must resemble the real life situation (face validity)
- Must be reliable (producing similar results over different time points)

## *What is VERT™?*



[www.varian.com](http://www.varian.com)

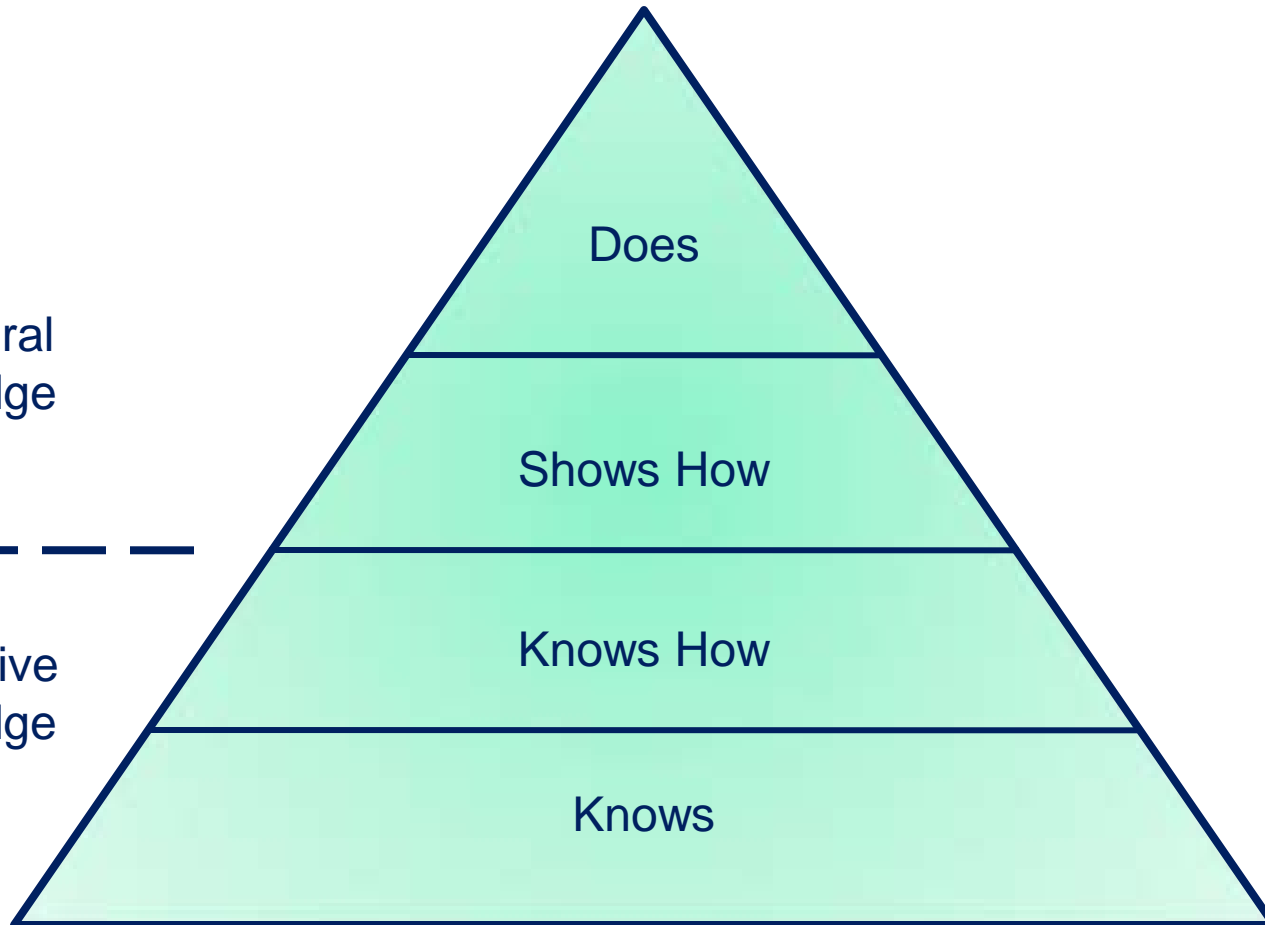
**Real Linear Accelerator**



[www.virtual.eu](http://www.virtual.eu)

**Virtual Reality Linear Accelerator**

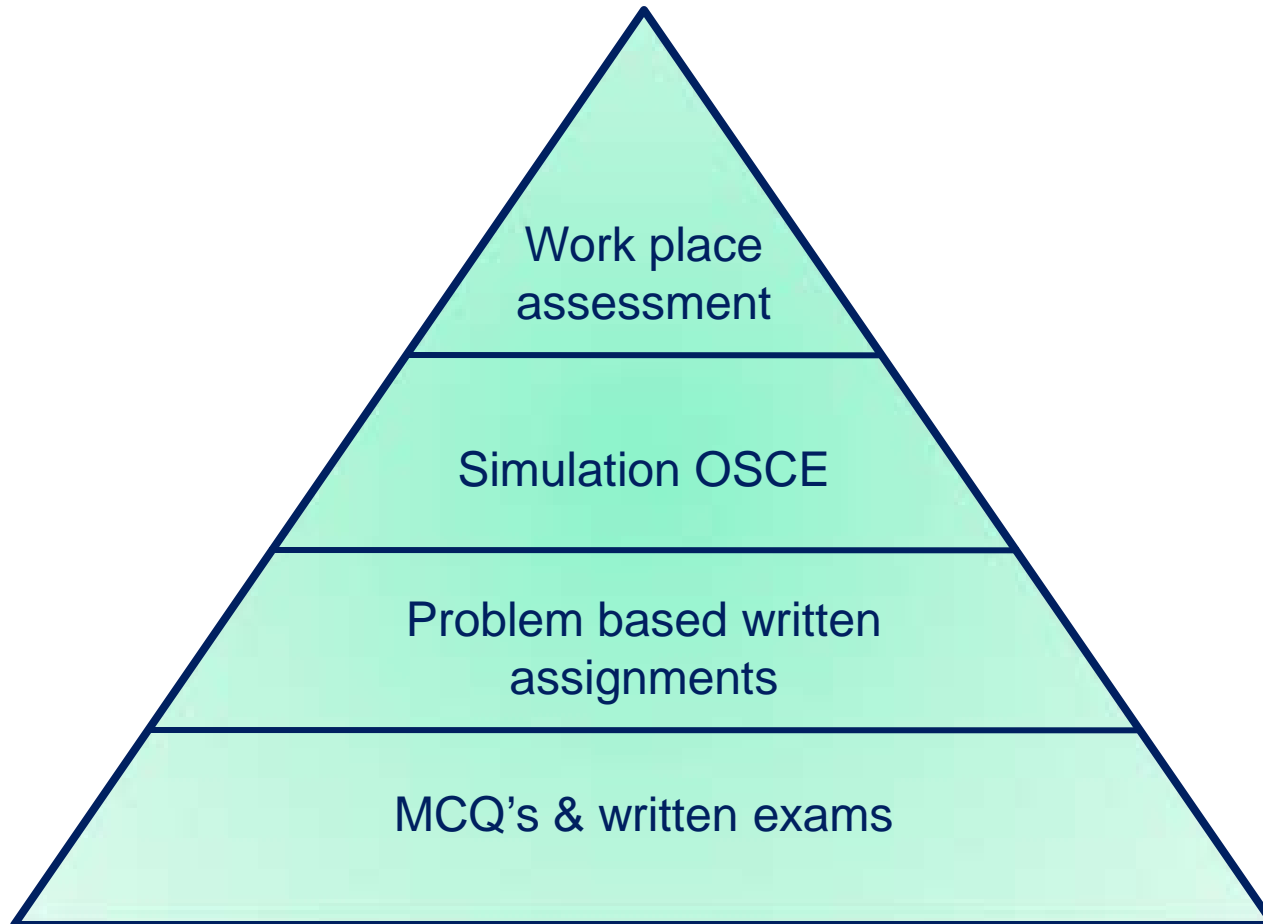
## *Millers Pyramid of Competence*



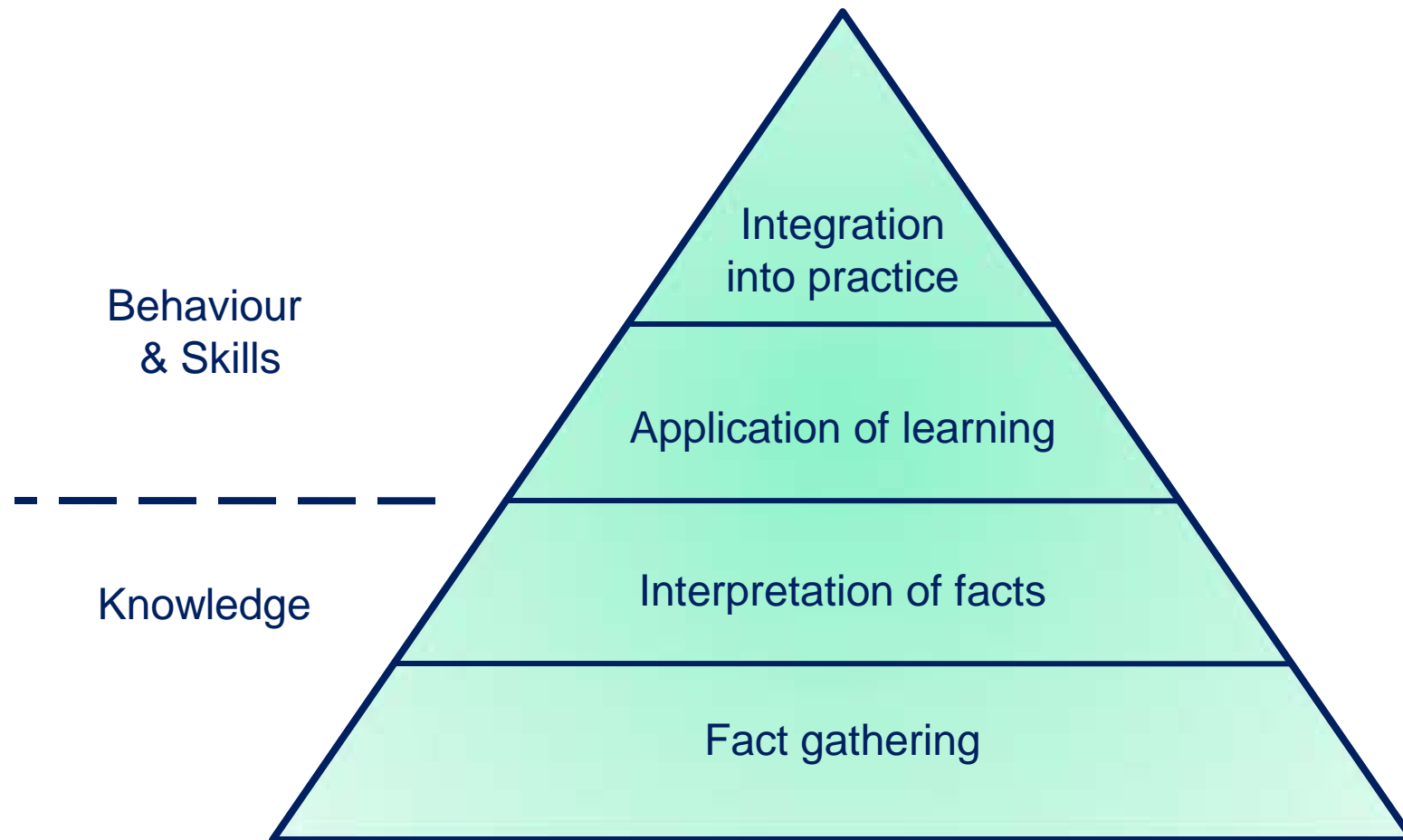
Procedural  
Knowledge

Declarative  
Knowledge

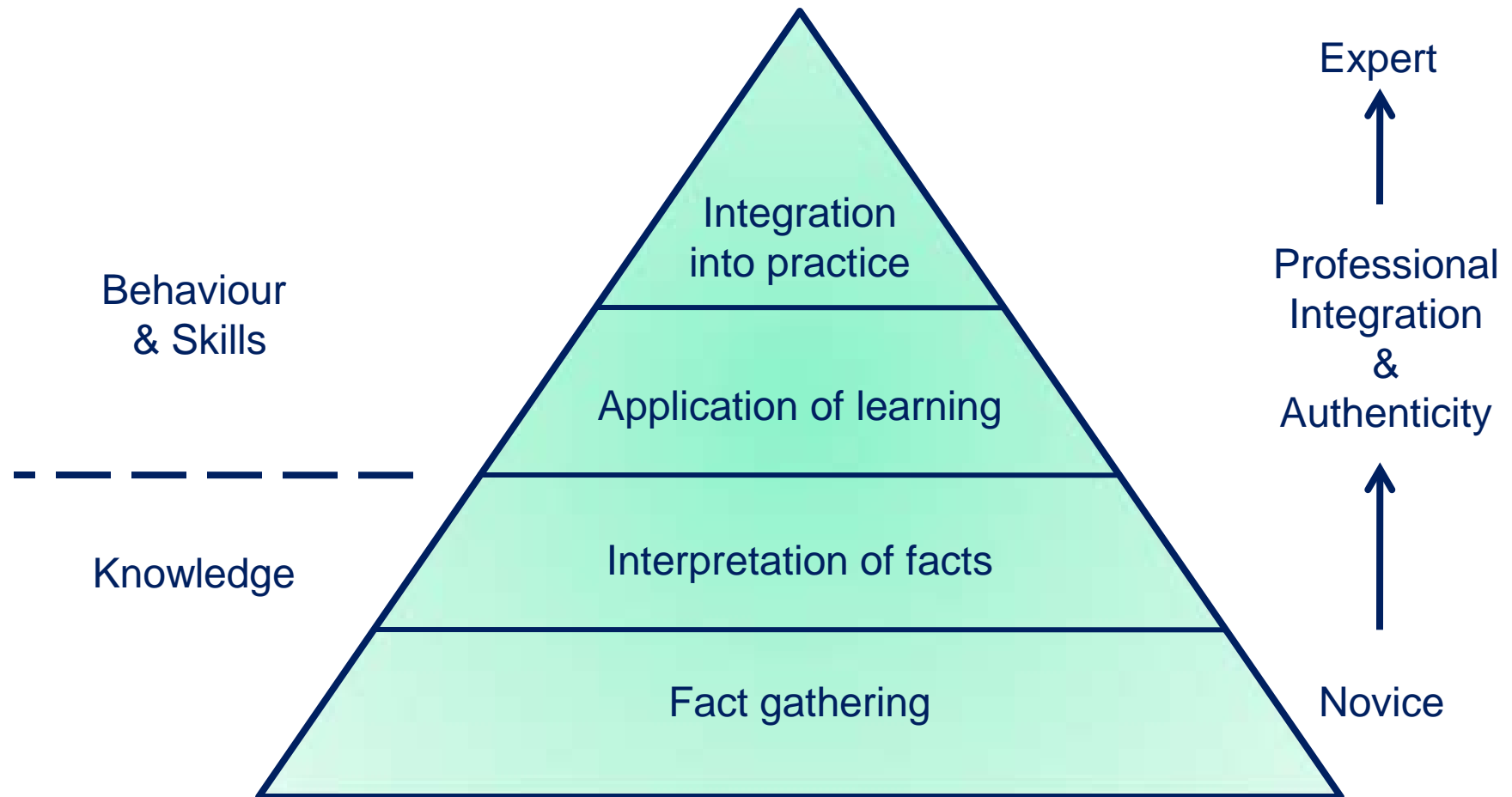
## *Millers Pyramid of Competence*



## *Millers Pyramid of Competence*



## Millers Pyramid of Competence



## Results

Practical	Clinic 1	Clinic 2	VERT 1	VERT 2	VERT 3	VERT 4
n	13	8	10	8	17	18
Range	72 - 91	72 - 93	76 - 100	61 - 87	49 - 100	40 - 96
Mean	80	82	86	78.7	83.5	74.2
Median	80	82.5	82.25	81.5	83	76
SD	4.86	8.72	7.71	9.46	13.5	13.35

## Results

Discuss	Clinic 1	Clinic 2	VERT 1	VERT 2	VERT 3	VERT 4
Range	51 - 75	52.5 - 75	44 - 65	40 - 67.5	41 - 59	40 - 60
Mean	62	60	53.7	53.9	49	49.75
Median	63	57	53	54.63	47.5	49
SD	5.99	7.55	7.18	8.29	4.32	6.15



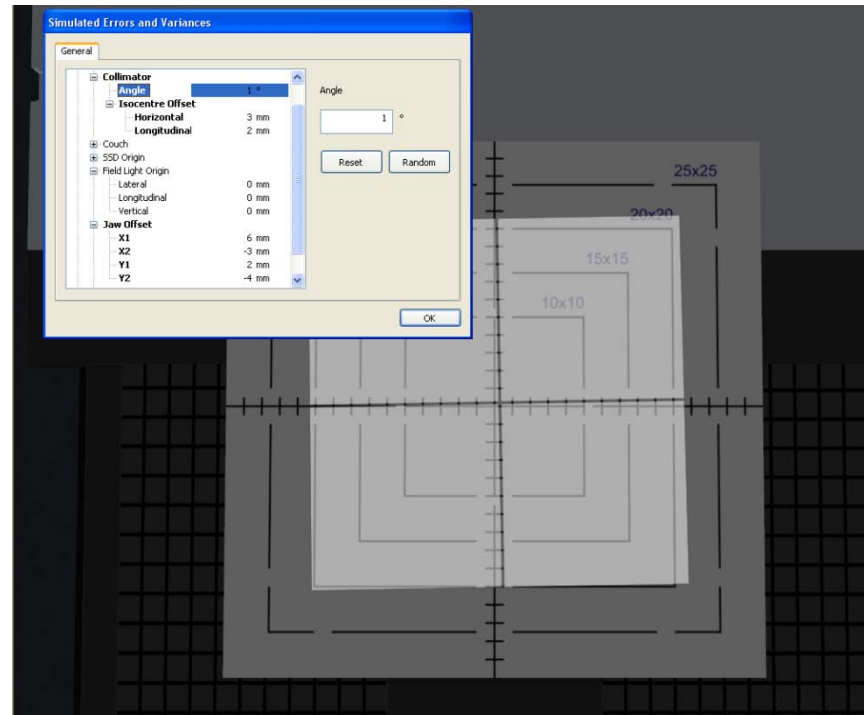
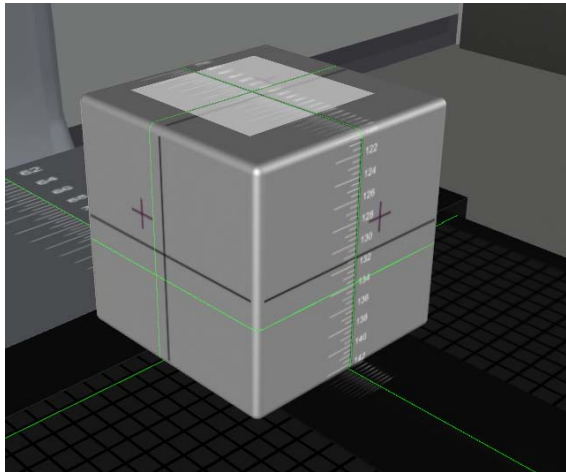
## Results

Total	Clinic 1	Clinic 2	VERT 1	VERT 2	VERT 3	VERT 4
Range	67 - 81	65 - 85	65 - 85	55 - 78	47 - 84	43 - 81
Mean	73.7	74.2	74.15	69.8	71.1	65.7
Median	74	73	74.5	72.5	71	65
SD	3.66	7.37	6.44	8.45	9.76	9.47

## *The Future*

- To 3-D or not 3-D?
- Redesign assessment to incorporate the functionality of VERT™ Physics module
- Continue to develop global rating charts

# VERT™ QA checks



UoP VERT v2.8 Physics module screen shots May 2012

## *Acknowledgements*

- ISRRT & CAMRT planning committee
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