A journey towards programmatic assessment

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Disclosure

• I have no actual or potential conflict of interest in relation to this presentation
Overview

• From practice to research
• From research to theory
• From theory to practice
• Conclusions
The Toolbox

- MCQ, MEQ, OEQ, SIMP, Write-ins, Key Feature, Progress test, PMP, SCT, Viva, Long case, Short case, OSCE, OSPE, DOCEE, SP-based test, Video assessment, MSF, Mini-CEX, DOPS, assessment center, self-assessment, peer assessment, incognito SPs, portfolio............
The way we climbed......

- **Knows**
- **Knows how**
- **Shows how**
- **Does**

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**Fact-oriented assessment:**
- MCQ, write-ins, oral.....

**Scenario or case-based assessment:**
- MCQ, write-ins, oral.....

**Performance assessment in vitro:**
- Assessment centers, OSCE.....

**Performance assessment in vivo:**
- In situ performance assessment, 360°, Peer assessment.....
Characteristics of instruments

- Validity
- Reliability
- Educational impact
- Acceptability
- Cost
Validity: what are we assessing?

• Curricula have changed from an input orientation to an output orientation
• We went from haphazard learning to integrated learning objectives, to end objectives, and now to (generic) competencies
• We went from teacher oriented programs to learning oriented, self-directed programs
### Competency frameworks

<table>
<thead>
<tr>
<th>CanMeds</th>
<th>ABMS/ACGME</th>
<th>GMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical expert</td>
<td>Medical knowledge</td>
<td>Good clinical care</td>
</tr>
<tr>
<td>Communicator</td>
<td>Patient care</td>
<td>Relationships with patients and families</td>
</tr>
<tr>
<td>Collaborator</td>
<td>Practice-based learning &amp; improvement</td>
<td>Working with colleagues</td>
</tr>
<tr>
<td>Manager</td>
<td>Interpersonal and communication skills</td>
<td>Managing the workplace</td>
</tr>
<tr>
<td>Health advocate</td>
<td>Professionalism</td>
<td>Social responsibility and accountability</td>
</tr>
<tr>
<td>Scholar</td>
<td>Systems-based practice</td>
<td>Professionalism</td>
</tr>
<tr>
<td>Professional</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Validity: what are we assessing?

Knows

Shows how

Does

Knows how

Knows

Unstandardized assessment (emerging)

Standardized assessment (fairly established)
Messages from validity research

• There is no magic bullet; we need a mixture of methods to cover the competency pyramid
• We need BOTH standardized and non-standardized assessment methods
• For standardized assessment quality control around test development and administration is vital
• For unstandardized assessment the users (the people) are vital.
Method reliability as a function of testing time

<table>
<thead>
<tr>
<th>Testing Time in Hours</th>
<th>MCQ&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Case-Based Short Essay&lt;sup&gt;2&lt;/sup&gt;</th>
<th>PMP&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Oral Exam&lt;sup&gt;3&lt;/sup&gt;</th>
<th>Long Case&lt;sup&gt;4&lt;/sup&gt;</th>
<th>OSCE&lt;sup&gt;5&lt;/sup&gt;</th>
<th>Mini CEX&lt;sup&gt;6&lt;/sup&gt;</th>
<th>Practice Video Assessment&lt;sup&gt;7&lt;/sup&gt;</th>
<th>Incognito SPs&lt;sup&gt;8&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.62</td>
<td>0.68</td>
<td>0.36</td>
<td>0.50</td>
<td>0.60</td>
<td>0.54</td>
<td>0.73</td>
<td>0.62</td>
<td>0.61</td>
</tr>
<tr>
<td>2</td>
<td>0.77</td>
<td>0.81</td>
<td>0.53</td>
<td>0.67</td>
<td>0.75</td>
<td>0.70</td>
<td>0.84</td>
<td>0.77</td>
<td>0.76</td>
</tr>
<tr>
<td>4</td>
<td>0.87</td>
<td>0.89</td>
<td>0.69</td>
<td>0.80</td>
<td>0.86</td>
<td>0.82</td>
<td>0.92</td>
<td>0.87</td>
<td>0.86</td>
</tr>
<tr>
<td>8</td>
<td>0.93</td>
<td>0.94</td>
<td>0.82</td>
<td>0.89</td>
<td>0.92</td>
<td>0.90</td>
<td>0.96</td>
<td>0.93</td>
<td>0.93</td>
</tr>
</tbody>
</table>

<sup>1</sup>Norcini et al., 1985  
<sup>2</sup>Stalenhoef-Halling et al., 1990  
<sup>3</sup>Swanson, 1987  
<sup>4</sup>Wass et al., 2001  
<sup>5</sup>Van der Vleuten, 1988  
<sup>6</sup>Norcini et al., 1999  
<sup>7</sup>Ram et al., 1999  
<sup>8</sup>Gorter, 2002
Reliability as a function of sample size

(Moonen et al., 2013)
Reliability as a function of sample size
(Moonen et al., 2013)
Reliability as a function of sample size
(Moonen et al., 2013)
## Effect of aggregation across methods

(Moonen et al., 2013)

<table>
<thead>
<tr>
<th>Method</th>
<th>Sample needed when used as stand-alone</th>
<th>Sample needed when used as a composite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-CEX</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>OSATS</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>MSF</td>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>
Messages from reliability research

• Acceptable reliability is only achieved with large samples of test elements (contexts, cases) and assessors
• No method is inherently better than any other (that includes the new ones!)
• Objectivity is NOT equal to reliability
• Many subjective judgments are pretty reproducible/reliable.
Educational impact: How does assessment drive learning?

• Relationship is complex (cf. Cilliers, 2011, 2012)
• But impact is often very negative
  – Poor learning styles
  – Grade culture (grade hunting, competitiveness)
  – Grade inflation (e.g. in the workplace)
• A lot of REDUCTIONISM!
  – Little feedback (grade is poorest form of feedback one can get)
  – Non-alignment with curricular goals
  – Non-meaningful aggregation of assessment information
  – Few longitudinal elements
  – Tick-box exercises (OSCEs, logbooks, work-based assessment).
WHO ARE WE?

STUDENTS!

WHAT DO WE DO?

WE STUDY FOR THE TESTS!

AND THEN?

THEN WE FORGET!
All learners construct knowledge from an inner scaffolding of their individual and social experiences, emotions, will, aptitudes, beliefs, values, self-awareness, purpose, and more . . . if you are learning ..... what you understand is determined by how you understand things, who you are, and what you already know.

Peter Senge, Director of the Center for Organizational Learning at MIT (as cited in van Ryn et al., 2014)
Messages learning impact research

• No assessment without (meaningful) feedback
• Narrative feedback has a lot more impact on complex skills than scores
• Provision of feedback is not enough (feedback is a dialogue)
• Longitudinal assessment is needed.
Overview

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Limitations of the single-method approach

• No single method can do it all
• Each individual method has (significant) limitations
• Each single method is a considerable *compromise* on reliability, validity, educational impact
Implications

• **Validity**: a multitude of methods needed

• **Reliability**: a lot of (combined) information is needed

• **Learning impact**: assessment should provide (longitudinal) meaningful information for learning

Programmatic assessment
Programmatic assessment

• A curriculum is a good metaphor; in a program of assessment:
  – Elements are planned, arranged, coordinated
  – Is systematically evaluated and reformed

• But how? (the literature provides extremely little support!)
Programmatic assessment

- Dijkstra et al 2012: 73 generic guidelines
- To be done:
  - Further validation
  - A feasible (self-assessment) instrument
- ASPIRE assessment criteria
Building blocks for programmatic assessment 1

- Every assessment is but one data point ($\Delta$)
- Every data point is optimized for learning
  - Information rich (quantitative, qualitative)
  - Meaningful
  - Variation in format
- Summative versus formative is replaced by continuum of stakes (stakes)
- $N$ data points are proportionally related to the stakes of the decision to be taken.
Continuum of stakes, number of data point and their function

No stake

One data point:
- Focused on information
- Feedback oriented
- Not decision oriented

Intermediate progress decisions:
- More data points needed
- Focus on diagnosis, remediation, prediction

Final decisions on promotion or selection:
- Many data points needed
- Focused on a (non-surprising) heavy decision

Very high stake
Assessment information as pixels
Classical approach to aggregation

Method 1 to assess skill A

Method 2 to assess skill B

Method 3 to assess skill C

Method 4 to assess skill C

\[\Sigma\]
More meaningful aggregation

Method 1

Skill A

Method 2

Skill B

Method 3

Skill C

Method 4

Skill D

Σ

Σ

Σ

Σ
A model for purposeful for purpose

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Abstract

Programmatic assessment is an integral approach to the design of an assessment program with the intent to optimise its learning function, its decision-making function and its curriculum quality-assurance function. Individual methods of assessment, purposefully chosen for their alignment with the curriculum outcomes and their information value for the learner, the teacher and the organisation, are seen as individual data points. The information value of these individual data points is maximised by giving feedback to the learner. There is a decoupling of assessment moment and decision moment. Intermediate and high-stakes organisational procedures to ensure their dependability. Self-regulation of learning, through analysis of the assessment information and the attainment of the ensuing learning goals, is scaffolded by a mentoring system. Programmatic assessment-as-learning can be applied to any part of the training continuum, provided that the underlying learning conception is constructivist. This paper...
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From theory back to practice

• Existing best practices:
  – Veterinary education Utrecht
  – Cleveland Learner Clinic, Cleveland, Ohio
  – Dutch specialty training in General Practice
  – McMaster Modular Assessment Program in Emergency Medicine
  – Graduate entry program Maastricht
From theory back to practice

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  – Graduate entry program Maastricht
Physician-clinical investigator program

- 4 year graduate entry program
- Competency-based (Canmeds) with emphasis on research
- PBL program
  - Year 1: classic PBL
  - Year 2: real patient PBL
  - Year 3: clerkship rotations
  - Year 4: participation in research and health care
- High expectations of students: in terms of motivation, promotion of excellence, self-directedness
The assessment program

- Assessment in Modules: assignments, presentations, end-examination, etc.
- Longitudinal assessment: assignments, reviews, projects, progress tests, evaluation of professional behavior, etc.
- All assessment is informative and low stake formative
- The portfolio is central instrument
Longitudinal total test scores across 12 measurement moments and predicted future performance
Maastricht Electronic portfolio (ePass)

Comparison between the score of the student and the average score of his/her peers.
Every blue dot corresponds to an assessment form included in the portfolio.
<table>
<thead>
<tr>
<th>Date</th>
<th>Feedbacktype</th>
<th>Competency</th>
<th>Narrative feedback</th>
<th>Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>06-11-2013</td>
<td>Improvement</td>
<td>General</td>
<td>don’t repeat too much, no irrelevant details. Conclusion: antenatal care in pregnancy may be done by a midwife and delivery will be done by a gynecologist, I revise</td>
<td>Mini-CEX-N</td>
</tr>
<tr>
<td>06-11-2013</td>
<td>Strength</td>
<td>General</td>
<td>included all information.</td>
<td>Mini-CEX-N</td>
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<td>General</td>
<td>included all info.</td>
<td>Mini-CEX-N</td>
</tr>
</tbody>
</table>
| 18-10-2013  | Improvement  | General    | more communication with the patient, in this case difficult because of language barrier  
more communication with supervisor                                                                                                                               | OSATS  |
Coaching by counselors

- Coaching is essential for successful use of reflective learning skills
- Counselor gives advice/comments (whether asked or not)
- He/she counsels if choices have to be made
- He/she guards and discusses study progress and development of competencies
Decision-making by committee

- Committee of counselors and externals
- Decision is based on portfolio information & counselor recommendation, competency standards
- Deliberation is proportional to clarity of information
- Decisions are justified when needed; remediation recommendation may be provided
<table>
<thead>
<tr>
<th>Strategy to establish trustworthiness</th>
<th>Criteria</th>
<th>Potential Assessment Strategy (sample)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credibility</td>
<td>Prolonged engagement</td>
<td>Training of examiners</td>
</tr>
<tr>
<td>Triangulation</td>
<td></td>
<td>Tailored volume of expert judgment based on certainty of information</td>
</tr>
<tr>
<td>Peer examination</td>
<td></td>
<td>Benchmarking examiners</td>
</tr>
<tr>
<td>Member checking</td>
<td></td>
<td>Incorporate learner view</td>
</tr>
<tr>
<td>Structural coherence</td>
<td></td>
<td>Scrutiny of committee inconsistencies</td>
</tr>
<tr>
<td>Transferability</td>
<td>Time sampling</td>
<td>Judgment based on broad sample of data points</td>
</tr>
<tr>
<td></td>
<td>Thick description</td>
<td>Justify decisions</td>
</tr>
<tr>
<td>Dependability</td>
<td>Stepwise replication</td>
<td>Use multiple assessors who have credibility</td>
</tr>
<tr>
<td>Confirmability</td>
<td>Audit</td>
<td>Give learners the possibility to appeal to the assessment decision</td>
</tr>
</tbody>
</table>
Progress test embedded in programmatic assessment – *use of information and feedback to self-directed learning*

percentage correct minus penalty for incorrect answers

<table>
<thead>
<tr>
<th>2010-2011</th>
<th>2011-2012</th>
<th>2012-2013</th>
<th>Average</th>
</tr>
</thead>
</table>

Scholarly Topics

<table>
<thead>
<tr>
<th>9</th>
<th>13</th>
<th>17</th>
<th>21</th>
</tr>
</thead>
<tbody>
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Measurement Moment

<table>
<thead>
<tr>
<th>9</th>
<th>13</th>
<th>17</th>
<th>21</th>
</tr>
</thead>
</table>
Overview

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Conclusions 1: The way forward

• We have to stop thinking in terms of individual assessment methods
• A systematic and programmatic approach is needed, longitudinally oriented
• Every method of assessment may be functional (old and new; standardized and unstandardized)
• Professional judgment is imperative (similar to clinical practice)
• Subjectivity is dealt with through sampling and procedural bias reduction methods (not with standardization or objectification).
Conclusions 2: The way forward

• The programmatic approach to assessment optimizes:
  – The learning function (through information richness)
  – The pass/fail decision function (through the combination of rich information)
Further reading:
www.ceesvandervleuten.com
12 tips

1. Develop a master plan
2. Adopt a robust system for collecting information
3. Develop examination regulations that promote feedback orientation
4. Assure that every low-stakes assessment provides meaningful feedback for learning
5. Provide mentoring to learners
6. Ensure trustworthy decision-making
7. Organize intermediate decision-making assessments
8. Encourage and facilitate personalized remediation
9. Monitor and evaluate the learning effect of the programme and adapt
10. Use the assessment process information for curriculum evaluation
11. Promote continuous interaction between the stakeholders
12. Develop a strategy for implementation