A Programmatic Approach to Assessment

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www.ceesvandervleuten.com

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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......

Performance assessment in vivo: In situ performance assessment, 360°, Peer assessment.....

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

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

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

CanMeds
- Medical expert
- Communicator
- Collaborator
- Manager
- Health advocate
- Scholar
- Professional

ACGME
- Medical knowledge
- Patient care
- Practice-based learning & improvement
- Interpersonal and communication skills
- Professionalism
- Systems-based practice

GMC
- Good clinical care
- Relationships with patients and families
- Working with colleagues
- Managing the workplace
- Social responsibility and accountability
- Professionalism
Validity: what are we assessing?

- Knows
- Knows how
- Shows how
- Does

Validity:
- Standardized assessment (fairly established)
- Unstandardized assessment (emerging)
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(^1)</th>
<th>Case-Based Short Essay(^2)</th>
<th>PMP(^3)</th>
<th>Oral Exam(^4)</th>
<th>Long Case(^5)</th>
<th>OSCE(^6)</th>
<th>Mini CEX(^7)</th>
<th>Practice Video Assessment(^7)</th>
<th>Incognito SPs(^8)</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>

\(^1\)Norcini et al., 1985  
\(^2\)Stalenhoef-Halling et al., 1990  
\(^3\)Swanson, 1987  
\(^4\)Wass et al., 2001  
\(^5\)Van der Vleuten, 1988  
\(^6\)Norcini et al., 1999  
\(^7\)Ram et al., 1999  
\(^8\)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)
<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>
Resultaten Betrouwbaarheid

Per instrument
Alle jaren:
8 KPB, 9 OSATS, 9 MSF
Eerste jaar:
6 KPB, 6 OSATS, 6 MSF

Gezamenlijk
Alle jaren:
7 KPB, 8 OSATS, 1 MSF of
5 KPB, 6 OSATS, 2 MSF
Eerste jaar:
5 KPB, 6 OSATS, 1 MSF
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 (Δ)
• 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
More meaningful aggregation

Method 1
- Skill A
- Skill B
- Skill C
- Skill D

Method 2
- Skill A
- Skill B
- Skill C
- Skill D

Method 3
- Skill A
- Skill B
- Skill C
- Skill D

Method 4
- Skill A
- Skill B
- Skill C
- Skill D
A model for programmatic assessment fit for purpose

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Abstract

We propose a model for programmatic assessment in action, which simultaneously optimises assessment for learning and assessment for decision making about learner progress. This model is based on a set of assessment principles that are interpreted from empirical research. It specifies cycles of training, assessment and learner support activities that are complemented by intermediate and final moments of evaluation on aggregated assessment data points. A key principle is that individual data points are maximised for learning and feedback value, whereas high-stake decisions are based on the aggregation of many data points. Expert judgement plays an important role in the programme. Fundamental is the notion of sampling and bias reduction to deal with the inevitable subjectivity of this type of judgement. Bias reduction is further sought in procedural assessment strategies derived from criteria for qualitative research. We discuss a number of challenges and opportunities around the proposed model. One of its prime virtues is that it enables assessment to move, beyond the dominant psychometric discourse with its focus on individual instruments, towards a systems approach to assessment design underpinned by empirically grounded theory.
12 Tips for programmatic assessment

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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 decisions are based on multiple data points after a meaningful aggregation of information and supported by rigorous 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-for-learning can be applied to any part of the training continuum, provided that the underlying learning conception is constructivist. This paper provides concrete recommendations for implementation of programmatic assessment.
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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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  – McMaster Modular Assessment Program in Emergency Medicine
  – 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

<table>
<thead>
<tr>
<th>Module 1</th>
<th>Module 2</th>
<th>Module 3</th>
<th>Module 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>PT 1</td>
<td>PT 2</td>
<td>PT 3</td>
<td>PT 4</td>
</tr>
</tbody>
</table>

Longitudinal Module exceeding assessment of knowledge, skills and professional behavior

Module exceeding assessment of knowledge in Progress Test
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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<tr>
<td>06-11-2013</td>
<td>Improvement</td>
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<td>06-11-2013</td>
<td>Strength</td>
<td>General</td>
<td>included all info.</td>
<td>Mini-CEX-N</td>
</tr>
<tr>
<td>18-10-2013</td>
<td>Improvement</td>
<td>General</td>
<td>more communication with the patient, in this case difficult because of language barrier more communication with supervisor</td>
<td>OSATS</td>
</tr>
</tbody>
</table>
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

"LUNCH? WELL, YES--BUT WHAT ARE YOUR LONG-TERM GOALS?"
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></td>
<td>Triangulation</td>
<td>Tailored volume of expert judgment based on certainty of information</td>
</tr>
<tr>
<td></td>
<td>Peer examination</td>
<td>Benchmarking examiners</td>
</tr>
<tr>
<td></td>
<td>Member checking</td>
<td>Incorporate learner view</td>
</tr>
<tr>
<td></td>
<td>Structural coherence</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 selfdirect learning*

- Percentage correct minus penalty for incorrect answers

- 2010-2011
- 2011-2012
- 2012-2013
- Average

- Scholarly Topics

- Measurement Moment
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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