



KoKoHs

Modeling and **Measuring**
Competencies in Higher Education

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KoKoHs Working Papers

No. 9

Miriam Toepper & Olga Zlatkin-Troitschanskaia (Eds.)

Modeling and Measuring Competencies in Higher Education

Report from the International Conference at Johannes Gutenberg
University Mainz from 28-29 November 2014

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***KoKoHs Working Papers* from the BMBF-funded research initiative
„Modeling and Measuring Competencies in Higher Education“**

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Report from the International Conference at Johannes Gutenberg University Mainz from 28-29 November 2014

Miriam Toepper & Olga Zlatkin-Troitschanskaia (Eds.)

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Modeling and Measuring Competencies in Higher Education

Report from the International Conference at Johannes Gutenberg University Mainz from 28-29 November 2014

Abstract:

Our meeting on Modeling and Measuring Competencies in Higher Education took place at the Johannes Gutenberg-University, Mainz from 28-29 November 2014. The KoKoHs project as well as international cooperation partners were involved at the conference. The program included presentations and discussions with renowned international experts on the topics Modeling and Assessing Structure and Levels of Competencies, Competency Acquisition, Longitudinal Approach, Innovative Methods for the Assessment of Competencies, Validation Capabilities of Specialized Knowledge Tests with Focus on Differential and Prognostic Validity and Correlation between Teaching-Learning Conditions and Competency Levels. The present working paper documents these presentations and discussions. Finally, we would say thanks for the active participation and exchange during the meeting and the enrichment of the meeting.

Keywords:

Modeling and Measuring Competencies, KoKoHs program

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Olga Zlatkin-Troitschanskaia, Johannes Gutenberg University Mainz, Germany

Hans Anand Pant, Humboldt University of Berlin, Germany

Welcome

We would like to welcome you warmly to the international conference on “Modeling and Measuring Competencies in Higher Education (KoKoHs)”.

The research program KoKoHs, funded by the German Federal Ministry of Education and Research (BMBF), includes 24 interdisciplinary research alliances, comprising nearly 70 distinct projects with approximately 220 researchers at more than 50 higher education institutions throughout Germany, Austria and Switzerland. This project helps to provide systematic, internationally compatible and clear fundamental research on theoretical modeling and empirical assessment and validation of domain-specific and generic competencies in higher education.

The conference participants include not only members of the 24 KoKoHs project alliances, but also many external colleagues from Germany and abroad. Renowned national and international experts will be presenting and discussing the national and international state of research on modeling and assessing academic competencies. This conference offers a platform for exchanging research experiences within an interdisciplinary and international discourse. We hope it will be a good incentive to establish, continue, and intensify collaboration in this research field.

The KoKoHs poster on the next page will summarize the first milestones that have been achieved and the substantial progress in fundamental research on higher education learning outcomes in Germany, which has been made so far.

We would like to thank you all for actively participating in this conference, and for contributing to a broad and multi-perspective discussion on the questions of modeling and measuring competencies in higher education.

Your KoKoHs Team,

led by



Olga Zlatkin-Troitschanskaia



and Hans Anand Pant

Conference Program

Day 1 – Friday November 28, 2014

Time	Program	Room
11.30 – 12.30	Registration and Lunch	Linke Aula
12.30 – 13.30	<p>Conference Opening</p> <p>Prof. Georg Krausch, University President (Johannes Gutenberg University Mainz)</p> <p>Dr. Stefanie Stegemann-Böhl (German Federal Ministry of Education and Research)</p> <p>Prof. Olga Zlatkin-Troitschanskaia & Prof. Hans Anand Pant (Head of the KoKoHs Coordination Project, Johannes Gutenberg University Mainz & Humboldt University of Berlin)</p> <p><i>“The German Research Program KoKoHs – Results, Challenges, and Perspectives”</i></p>	Atrium maximum
13.30 – 14.15	<p>Prof. Hamish Coates (University of Melbourne)</p> <p>Moderation by Prof. Christiane Spiel (University of Vienna)</p> <p>Keynote I</p> <p><i>“The Future of Learning Outcomes Assessment in Higher Education”</i></p>	
14.15 – 15.00	<p>Prof. Rolf van der Velden (Maastricht University)</p> <p>Moderation by Prof. Christiane Spiel (University of Vienna)</p> <p>Keynote II</p> <p><i>“Skills for the Future: Challenges for Higher Education”</i></p>	
15.00 – 15.30	Coffee break	Linke Aula

Two parallel sessions 15.30 – 17.00	Session 1: Chair: Discussant:	Modeling and Assessing Structure and Levels of Competencies Prof. Hamish Coates Dr. Timo Bechger	
	15.30 – 16.00	Prof. Benjamin Rott, Prof. Timo Leuders & Prof. Elmar Stahl (Freiburg University of Education, University of Duisburg-Essen) <i>LeScEd - Learning the Science of Education</i>	Atrium maximum
	16.00 – 16.30	Heike Dietrich (Heidelberg University) <i>WiKom-SoWi - Modeling and measurement of scientific competency in social sciences</i>	
	16.30 – 17.00	Prof. Tobias Richter & Sarah von der Mühlen (University of Kassel) <i>KOSWO - Competencies of university students in dealing with scientific primary literature</i>	
	Session 2: Chair: Discussant:	Competency Acquisition/Longitudinal Approach Prof. Rolf van der Velden Prof. Ronald Hambleton	
	15.30 – 16.00	Prof. Alexander Renkl & Anke Wischgoll (University of Freiburg) <i>LeScEd - Learning the Science of Education</i>	Atrium minimum
	16.00 – 16.30	Janina Roloff Heno (Kiel University) <i>SEKO - Teachers' self-regulation as a generic aspect of professional competence: Stability and change in teacher training at the university and predictive validity</i>	
Time	Program		Room
	Session 3: Chair: Discussant:	Innovative Methods for the Assessment of Competencies Prof. Jan-Eric Gustafsson Prof. Alicia Alonzo	
	16.30 – 17.00	Anne Roth (TU Darmstadt) <i>PRO-SRL - Product- and process-oriented modeling and assessment of self-regulated learning competencies in tertiary education</i>	Atrium minimum
17.00 – 17.15	Coffee break		Linke Aula

Two parallel sessions 17.15 – 18.45	Session 1: Chair: Discussant:	Modeling and Assessing Structure and Levels of Competencies Prof. Hamish Coates Dr. Timo Bechger	
	17.15 – 17.45	Prof. Augustin Kelava & Benjamin Anders (TU Darmstadt) <i>MoKoMasch - Modeling Competencies of Mechanical Engineering Students in the Areas of Construction, Design and Production Engineering</i>	Atrium maximum
	17.45 – 18.15	Prof. Niclas Schaper (University of Paderborn) <i>KUI - Teaching competencies in informatics</i>	
	18.15 – 18.45	Matthias Heiner, Monika Radtke, Dr. Stephan Schreiber, Malte Lehmann, Jörg Kortemeyer (TU Dortmund University, University of Freiburg, University of Paderborn) <i>KoM@ING - Modeling and developing competences - integrated IRT based and qualitative studies with a focus on mathematics and its usage in engineering education</i>	
	Session 3: Chair: Discussant:	Innovative Methods for the Assessment of Competencies Prof. Jan-Eric Gustafsson Prof. Alicia Alonzo	
	17.15 – 17.45	Prof. Cornelia Gräsel (University of Wuppertal) <i>COMPARE – Competent Argumentation with Evidences. Measurement and Modeling in Educational Sciences and Transfer from Medical Studies</i>	Atrium minimum
	17.45 – 18.15	Dr. Edith Braun & Julia-Carolin Brachem (International Centre for Higher Education Research (INCHER) Kassel, German Centre for Research on Higher Education and Science Studies, Hannover) <i>KomPaed - Task-related skills in educational fields of occupational activities</i>	
	18.15 – 18.45	Dr. Christoph Kulgemeyer & Elisabeth Tomczyszyn (University of Bremen) <i>ProfiLe-P - Professional Knowledge of Physics Student Teachers</i>	
19.00	Social Evening, Poster Award Ceremony		Linke Aula

Day 2 – Saturday November 29, 2014

Time	Program		Room
Two parallel sessions 09.00 – 10.30	Session 1: Chair: Discussant:	Modeling and Assessing Structure and Levels of Competencies Prof. Hamish Coates Dr. Timo Bechger	Atrium minimum
	09.00 – 09.30	Dr. Daniel Schneider, Petra Danielczyk & Eva Weinberger (University of Wuppertal, TU Dresden) <i>HEED - Higher Entrepreneurship Education Diagnostics</i>	
	09.30 – 10.00	Prof. Nicola Brauch (Ruhr University Bochum) <i>SOSCIE - Future Social Sciences Teacher's Competencies</i>	
	Session 4: Chair: Discussant:	Validation Capabilities of Specialized Knowledge Tests with Focus on Differential and Prognostic Validity Prof. Sigrid Blömeke Prof. Ronald K. Hambleton	Atrium minimum
	10.00 – 10.30	Dr. Stefan Hartmann (Humboldt University of Berlin) <i>Ko-WADiS - Evaluating the development of scientific literacy in teacher education</i>	
	Session 5: Chair: Discussant:	Correlation between Teaching-Learning Conditions and Competency Levels Prof. Rolf van der Velden Prof. Alicia Alonzo	
	09.00 – 09.30	Simone Dunekacke (Humboldt University of Berlin) <i>KomMa - Structure, level and development of kindergarten teachers' professional competencies in mathematics</i>	Atrium maximum
	09.30 – 10.00	Dr. Frank Musekamp (University of Bremen) <i>KOM-ING - Modelling and Measurement of Competencies of Engineering Mechanics in the Training of Mechanical Engineers</i>	
	10.00 – 10.30	Prof. Silke Grafe, Prof. Bardo Herzig & Prof. Niclas Schaper (University of Würzburg, University of Paderborn) <i>M³K - Modelling and measuring of pedagogical media competence</i>	
10.30 – 10.45	Coffee break		Linke Aula
Two parallel sessions 10.45 – 11.45	Session 4: Chair: Discussant:	Validation Capabilities of Specialized Knowledge Tests with Focus on Differential and Prognostic Validity Prof. Sigrid Blömeke Prof. Ronald K. Hambleton	Atrium minimum
	10.45 – 11.15	Florina Stefanica, Stefan Behrendt & Elmar Dammann (University of Stuttgart) <i>KoM@ING - Modeling and developing competences - integrated IRT based and qualitative studies with a focus on mathematics and its usage in engineering education</i>	

Time	Program		Room
Two parallel sessions 10.45 – 11.45	11.15 – 11.45	Prof. Olga Zlatkin-Troitschanskaia, Jun.-Prof. Manuel Förster & Sebastian Brückner (Johannes Gutenberg University Mainz) <i>WiwiKom - Modeling and measuring competencies in business and economics among students and graduates</i>	Atrium minimum
	Session 5: Chair: Discussant:	Correlation between Teaching-Learning Conditions and Competency Levels Prof. Rolf van der Velden Prof. Alicia Alonzo	
	10.45 – 11.15	Stefanie Berger & Franziska Bouley (University of Mannheim, Goethe University Frankfurt) <i>KoMeWP - Modeling and measurement of content knowledge and pedagogical content knowledge in Business and Economic Education</i>	Atrium maximum
	11.15 – 11.45	Prof. Timo Ehmke & Prof. Udo Ohm (Leuphana University of Lüneburg, Bielefeld University) <i>DaZKom - Professional competencies of prospective teachers (secondary schools) for German as a Second Language (GSL)</i>	
11.45 – 12.45	Lunch		Linke Aula
12.45 – 13.15	Further Perspectives on Competence Research in Higher Education Prof. Dirk Van Damme (Head of the Innovation and Measuring Progress (IMEP) Division, OECD) Dr. Jutta von Maurice (Executive Director of Research, National Educational Panel Study, NEPS)		Atrium maximum
13.15 – 14.00	Prof. Jan-Eric Gustafsson (University of Gothenburg) Moderation by Prof. Fritz Oser (University of Fribourg) <i>Keynote III</i> <i>"The KoKoHs Results in Relation to a Framework of Competence Modeling and Assessment"</i>		Atrium maximum
14.00 – 15.00	Panel Discussion and Conclusion Moderation by Prof. Christiane Spiel Prof. Alicia Alonzo (Michigan State University) Prof. Ronald K. Hambleton (University of Massachusetts) Prof. Fritz Oser (University of Fribourg) Prof. Hans Anand Pant (Head of the KoKoHs Coordination Project) Dr. Dirk van Damme (Head of the IMEP, Division, OECD) Dr. Jutta von Maurice (Executive Director of Research, NEPS) Dr. Peter A. Zervakis (German Rectors` Conference)		
15.00	Closing Remarks Prof. Hans Anand Pant & Prof. Olga Zlatkin-Troitschanskaia		Atrium maximum
15.05 – 15.30	Internal Coffee Break		Linke Aula
15.30 – 16.30	Internal Panel Discussion (in German) German Federal Ministry of Education and Research (BMBF), Project Management Agency of the German Aerospace Centre (DLR) & Scientific Advisory Board <i>"Further Research in the Thematic Field of KoKoHs"</i>		Atrium maximum

Keynote Speakers



Prof. Hamish Coates

(Centre for the Study of Higher Education, University of Melbourne, Australia)

Hamish Coates has a Chair of Higher Education at the Centre for the Study of Higher Education (CSHE), University of Melbourne. He was Founding Director of Higher Education Research at the Australian Council for Educational Research (ACER) from 2006 to 2013, and between 2010 and 2013 also Program Director at the LH Martin Institute for Tertiary Leadership and Management. Hamish completed his PhD in 2005 at the University of Melbourne, and executive training at INSEAD in 2012. A specialist in assessment and evaluation, Hamish focuses on improving the quality and productivity of learning, academic work and leadership. Interests include large-scale evaluation, tertiary education policy, institutional strategy, outcomes assessment, learner engagement, academic work and leadership, quality assurance, and tertiary admissions. He has initiated and led many successful projects, and was Founding International Director of OECD's Assessment of Higher Education Learning Outcomes Feasibility Study (AHELO) Feasibility Study.



Prof. Jan-Eric Gustafsson

(University of Gothenburg, Department of Education and Special Education, Sweden)

One of his research interests involves individual preconditions for education, where Jan-Eric Gustafsson has worked with various models for the structure of cognitive abilities, and with the entrance examination for higher education and other instruments for selection in higher education. Another interest targets the effects of education on knowledge and skills, which Jan-Eric Gustafsson has studied through international comparative investigations, for instance. Issues concerning the organization of education and the importance of different types of resources, such as teacher competence, have also come to be in focus more and more. Another research activity that has run parallel to his content-related research has dealt with the development of quantitative methods focusing on measurement and statistical analysis.

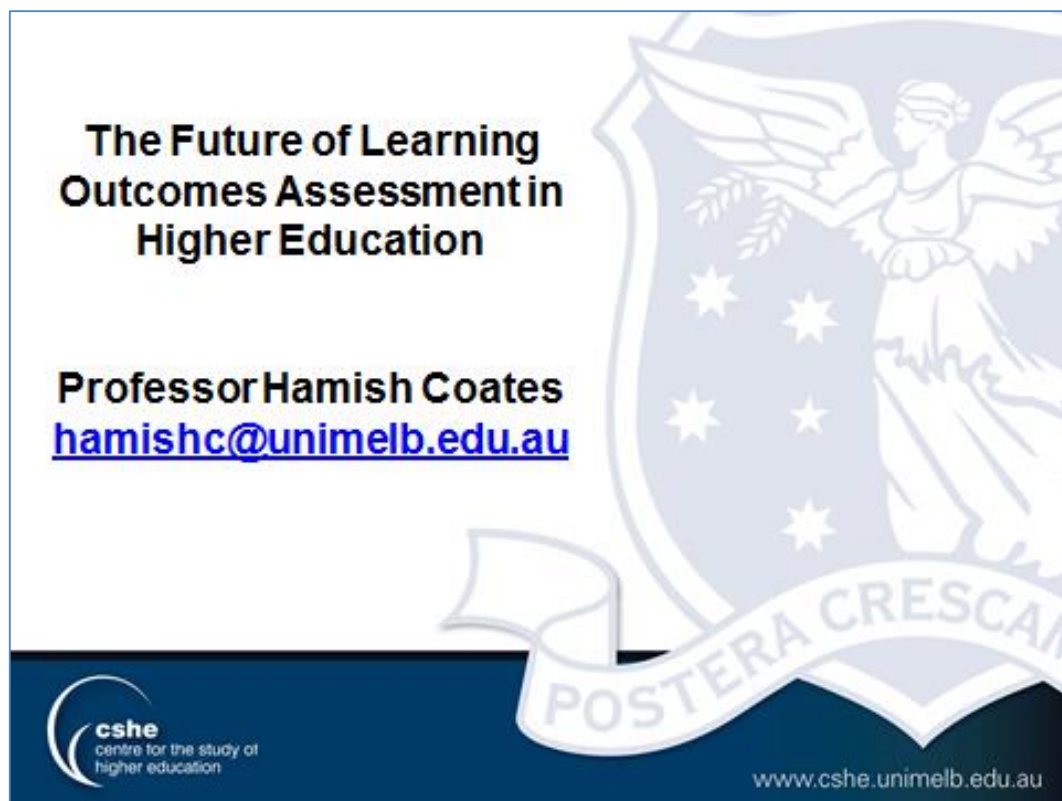
**Prof. Rolf van der Velden**

(Maastricht University, Director of the Research Centre for Education and the Labour Market (ROA), The Netherlands)

Rolf van der Velden (1955) is Professor at Maastricht University, Director of the Research Centre for Education and the Labour Market (ROA). He supervised several (inter)national studies on the transition from school to work. He recently coordinated the international REFLEX project and was advisor on the related HEGESCO project. Currently he is involved in the PIAAC project where he was responsible for the development of the background questionnaire. He is member of several research associations in the field of social stratification, education and labour market. In 1983 he finished his study sociology at the University of Groningen. From 1983 till 1990 he worked at the Institute for Educational Research in Groningen, where he held the position of Head of the Division of Labour Market Research. In 1991 he finished his Ph.D. thesis on 'Social Background and School-success'. He has published on many studies in the field of education, training and labour market.

Hamish Coates, University of Melbourne, Australia

Keynote I “The Future of Learning Outcomes Assessment in Higher Education”

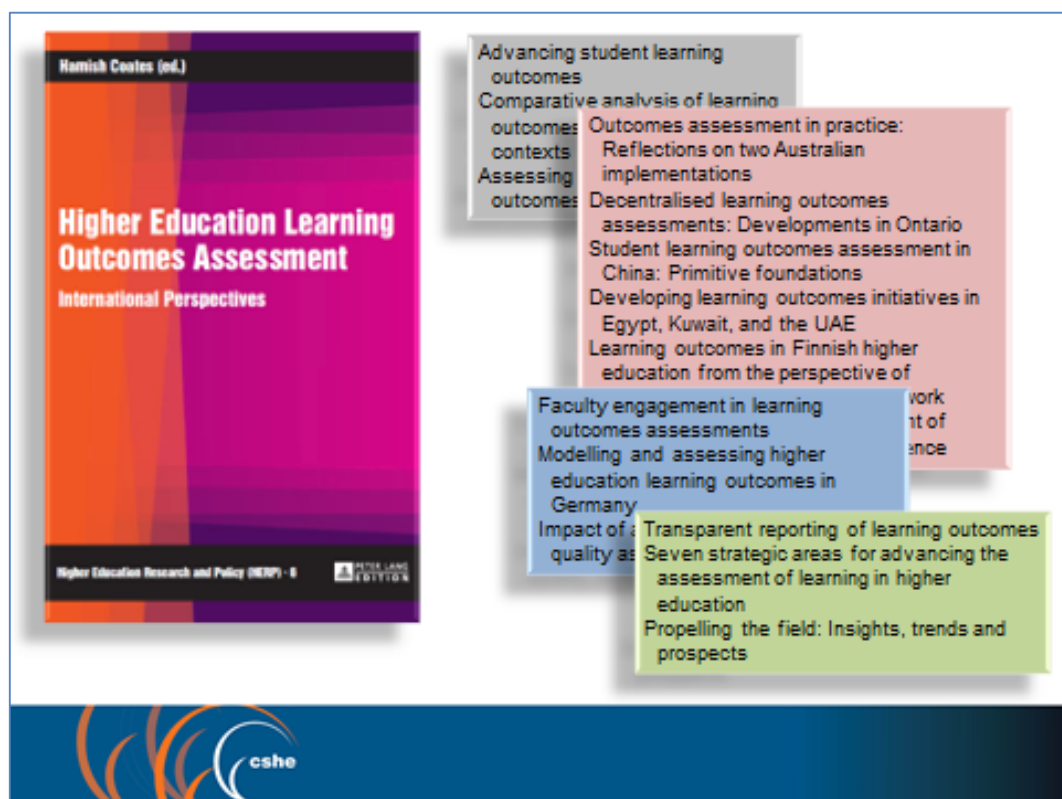


The Future of Learning Outcomes Assessment in Higher Education

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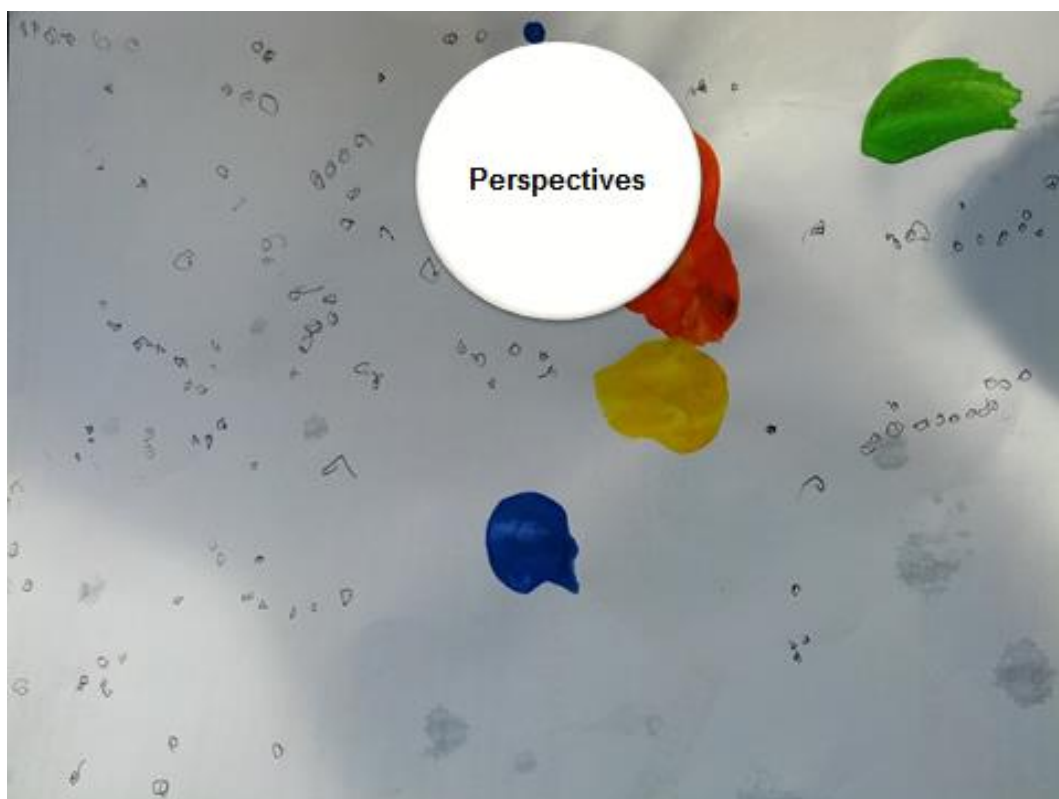
Hamish Coates (ed.)

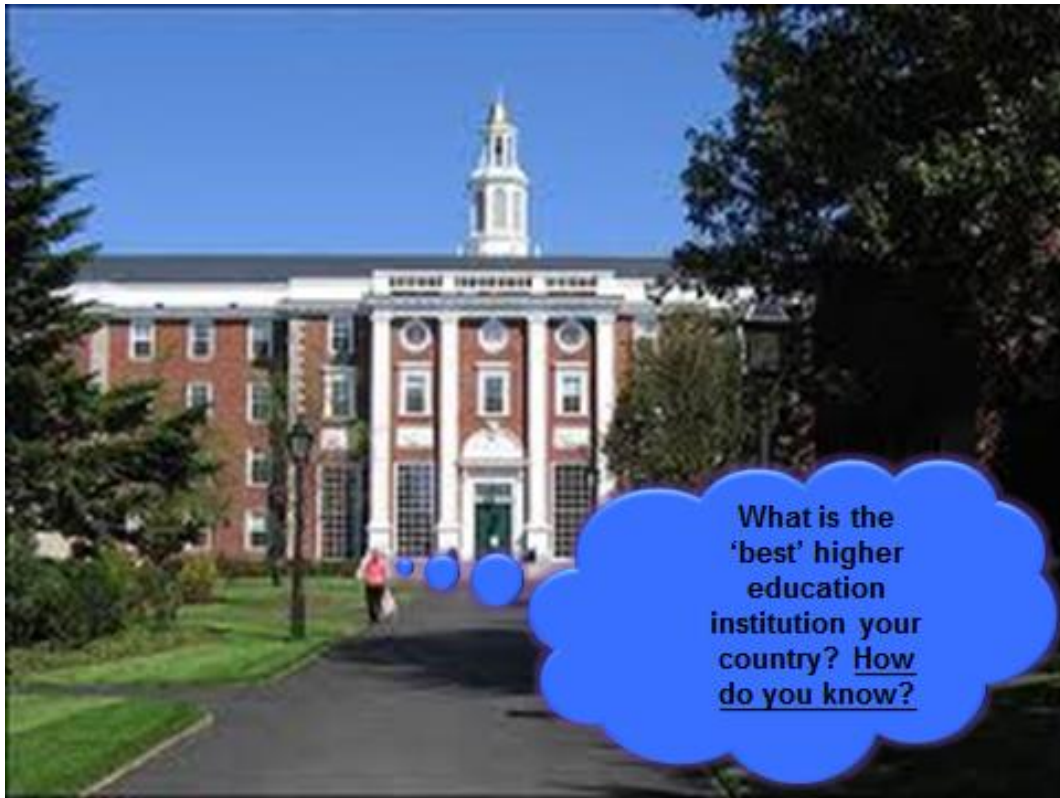
Higher Education Learning Outcomes Assessment

International Perspectives

Higher Education Research and Policy (HERP) - 6

Advancing student learning outcomes
 Comparative analysis of learning outcomes
 Outcomes assessment in practice: Reflections on two Australian implementations
 Decentralised learning outcomes assessments: Developments in Ontario
 Student learning outcomes assessment in China: Primitive foundations
 Developing learning outcomes initiatives in Egypt, Kuwait, and the UAE
 Learning outcomes in Finnish higher education from the perspective of
 Faculty engagement in learning outcomes assessments
 Modelling and assessing higher education learning outcomes in Germany
 Impact of a
 Transparent reporting of learning outcomes
 Seven strategic areas for advancing the assessment of learning in higher education
 Propelling the field: Insights, trends and prospects







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Academic Ranking of World Universities 2013

Ranking Methodology Statistics					
World Rank	Institution*	Country /Region	National Rank	Total Score	Score on Alumni ▼
1	Harvard University		1	100	100
2	Stanford University		2	72.6	40
3	University of California, Berkeley		3	71.3	67.8
4	Massachusetts Institute of Technology (MIT)		4	71.1	68
5	University of Cambridge		1	69.6	79.1
6	California Institute of Technology		5	62.9	47.8
7	Princeton University		6	61.9	52.9
8	Columbia University		7	59.8	66.1
9	University of Chicago		8	57.1	60.9
10	University of Oxford		2	55.9	51.8
11	Yale University		9	55.4	47.5
12	University of California, Los Angeles		10	52.9	27.3
13	Cornell University		11	50	38.2

ACADEMIC RANKING OF WORLD UNIVERSITIES SINCE 2003

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2013

**Education quality =
count of alumni with
Nobel Prizes and
Fields Medals**

Academic Ranking of World Universities

World Rank	University	Country	Total Score	Score on Alumni
1	Harvard University	USA	100	100
2	Stanford University	USA	96	40
3	University of California, Berkeley	USA	71.3	67.8
4	Massachusetts Institute of Technology (MIT)	USA	71.1	68
5	University of Cambridge	UK	69.6	79.1

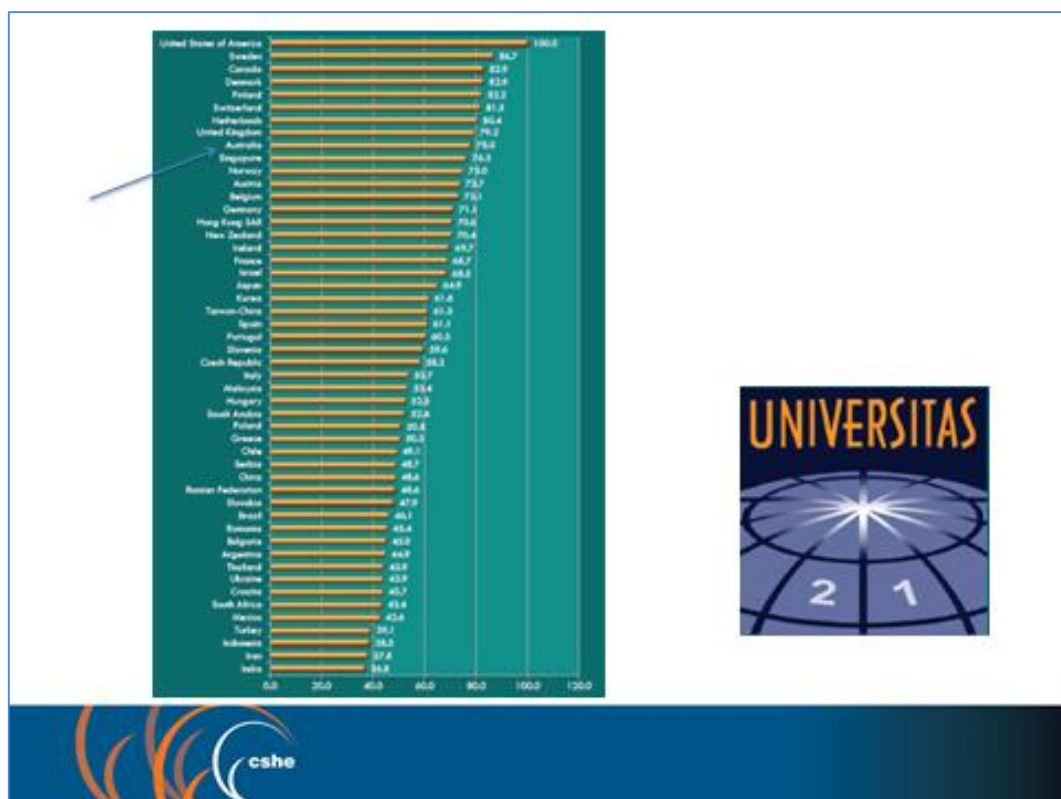
THE UNIVERSITY

World rankings - Oceania

Rank	Institution	Location	Overall score	Change 2012
32	University of Melbourne	Australia	71.9	
38	Australian National University	Australia	71.2	
58	University of Sydney	Australia	62.4	
74	University of Queensland Australia	Australia	58.6	
117	Monash University	Australia	51.1	
173	University of Auckland	New Zealand	44.6	
173	University of New South Wales	Australia	44.6	
188	University of Western Australia	Australia	42.9	
201-225	University of Adelaide	Australia	Data withheld by THE	
201-225	University of Otago	New Zealand	Data withheld by THE	
226-250	Macquarie University	Australia	Data withheld by THE	
251-275	Victoria University of Wellington	New Zealand	Data withheld by THE	
251-275	University of Wollongong	Australia	Data withheld by THE	
276-300	The University of Newcastle	Australia	Data withheld by THE	
301-325	Queensland University of Technology	Australia	Data withheld by THE	

cshe









Despite substantial advances...

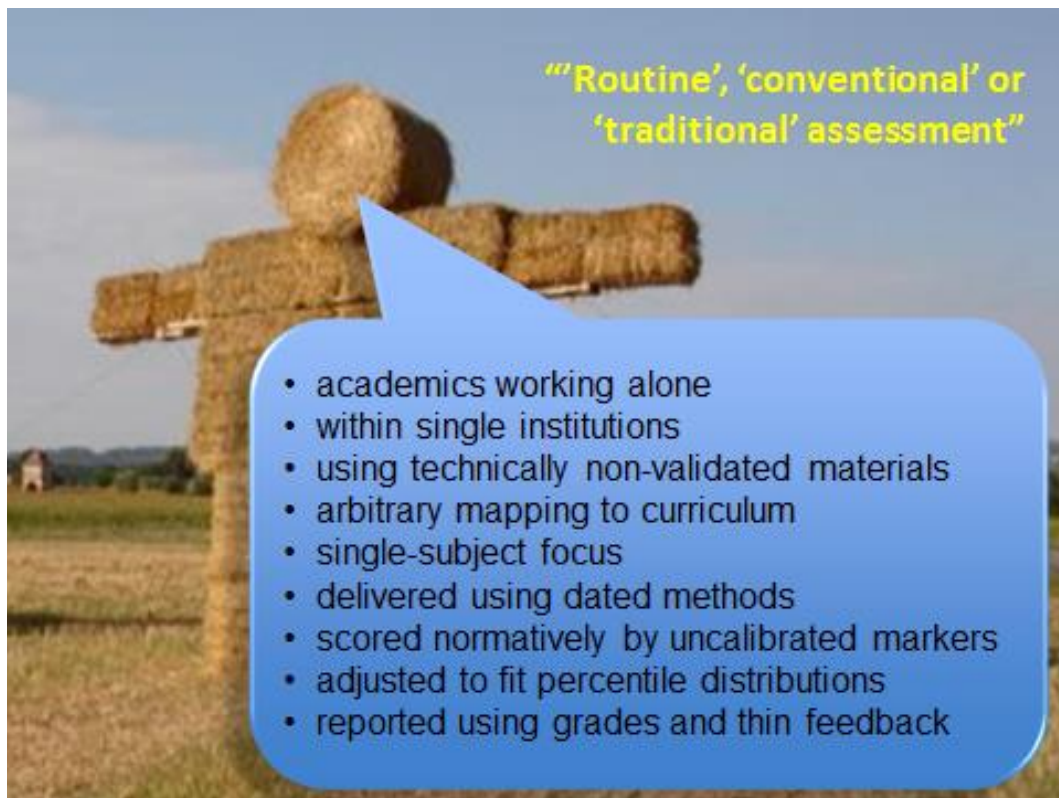
- Electronic learning
- Funding and quality
- More diverse students
- New generations of faculty
- New institutional forms
- New fields and graduate skills



Framing assumptions...

- 'Assessment' interpreted broadly as involving the measurement, reporting and interpretation of student learning and development
- Talking about formative and summative, in-class and cross-national, with emphasis on policy implications of formal assessment
- Assume that assessment must be improved: indirect or proxy measures no longer good enough
- Driven by desire to improve quality and productivity of education
- Assume the importance of transparency and collegiality

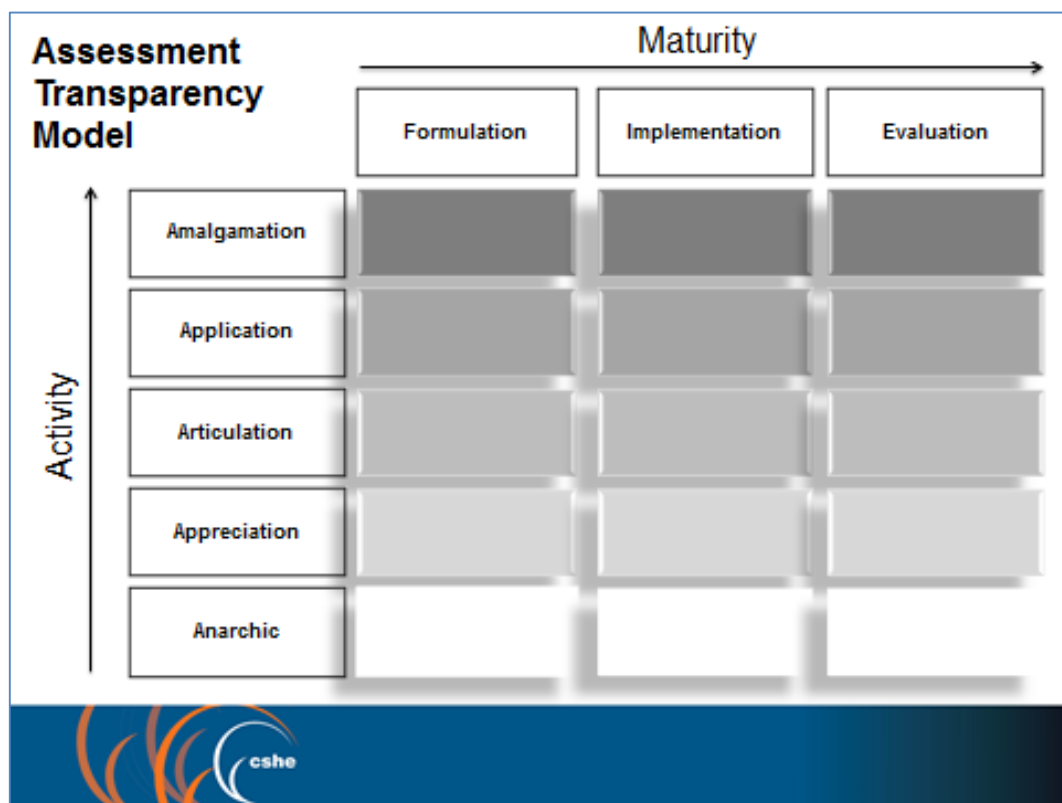


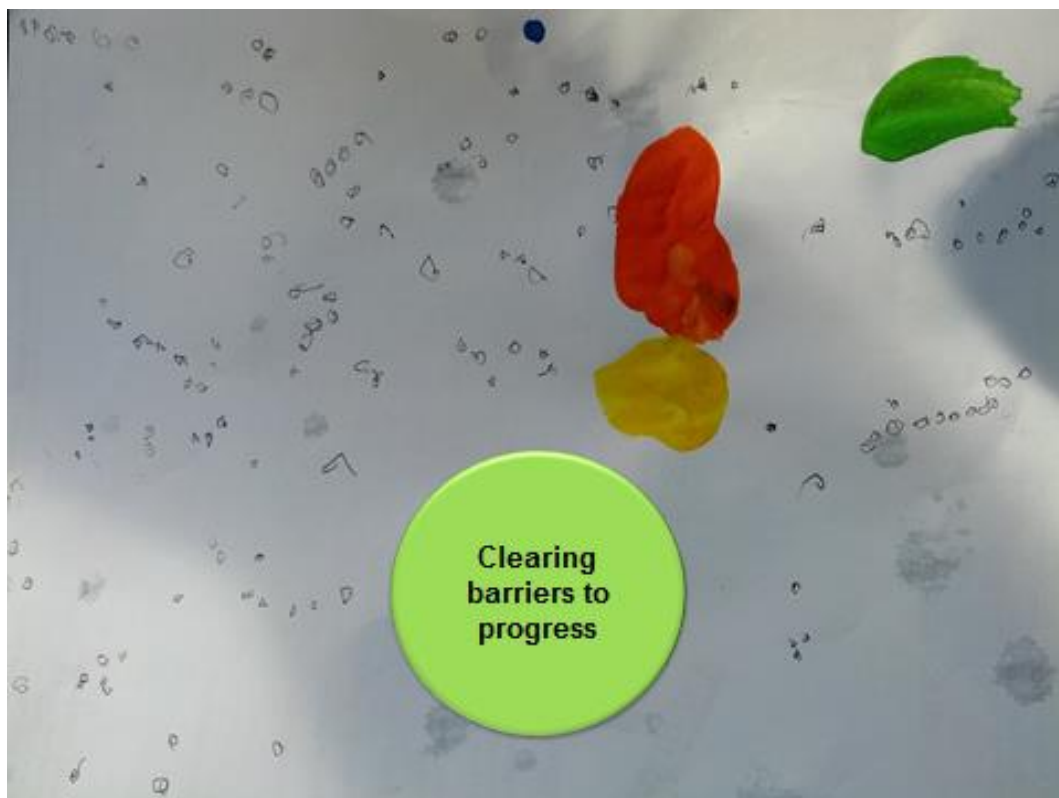


Framing assumptions...

- Value in advancing assessment in the spirit of continuous improvement
- Strategic institutional rationales for finding innovative ways to assess student learning
- Enormous value for institutions, faculty, students and governments in finding cheaper ways to assess learning
- Concerns about quality are prompting changes in assessment
- Producing more cogent data on outcomes would help prove economic and social returns from education
- Other quality initiatives are limited or inadequate







Why no game changing moment...

- People with vested interests in entrenched approaches
- Short supply of relevant professional capability
- Spasmodic training of academics
- Privatisation of academic autonomy
- Waiting for the exogenous shock
- Inherent security and confidentiality constraints
- Increasing commercial considerations
- Low priority to institutions
- Faculty/institution agency misalignment
- Satisfaction with current practice



Where to invest: VCA+BPE...

Planning	Development	Implementation	Analysis	Reporting
<ul style="list-style-type: none"> • Governance • Leadership • Management 	<ul style="list-style-type: none"> • Mapping resources • Specifying outcomes • Selecting formats • Drafting materials • Qualitative review • Quantitative review • Material production 	<ul style="list-style-type: none"> • Designing administration • Organising facilities • Managing students • Administering assessment • Resolving problems 	<ul style="list-style-type: none"> • Collation of results • Marking • Data production • Cross-validation 	<ul style="list-style-type: none"> • Production of grades • Analysis and commenting • Reporting • Assessment review and improvement

- Strengthen forms of governance
- Adopting more advanced
- Improve assessment technology
- More collaborative approaches
- Better material production
- Apply new technologies
- Increased independence, collaboration and outsourcing



By way of summary

- The quality and productivity of higher education would be improved by reforming almost every facet of assessment
- Much assessment may be excellent and efficient, but most is not
- Research has proven the feasibility of change, yet substantial obstacles hinder diffusion of reform
- There are no perfect solutions, and likely a suite of approaches are required for reform
- Need to work across multiple levels and engage faculty, institutional managers and leaders, and stakeholders

Assessment Redesign Blueprint

- Detail contexts and rationales driving the need for reform
- Analyse primary assessment activities
- Review assessment support activities—infrastructure, human resources, technology and procurement
- Identify cost drivers, and strategies for reducing costs
- Specify quality and value criteria, and mechanisms for assurance and differentiation
- Must speak to the creation of new professional community



Nine change forecasts

1. Possible, if not feasible
2. Difficult to plan and takes longer than expected
3. Yields unexpected outcomes
4. Happens in the unforeseen ways
5. Led by partnerships
6. Institutions and markets will change
7. Funding streams need reform
8. Progress signalled in new ways
9. Need effective organising mechanisms



The Future of Learning Outcomes Assessment in Higher Education

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Rolf van der Velden, Research Center für Education and the Labour Market, Netherlands

Keynote II “Skills for the Future: Challenges for Higher Education”



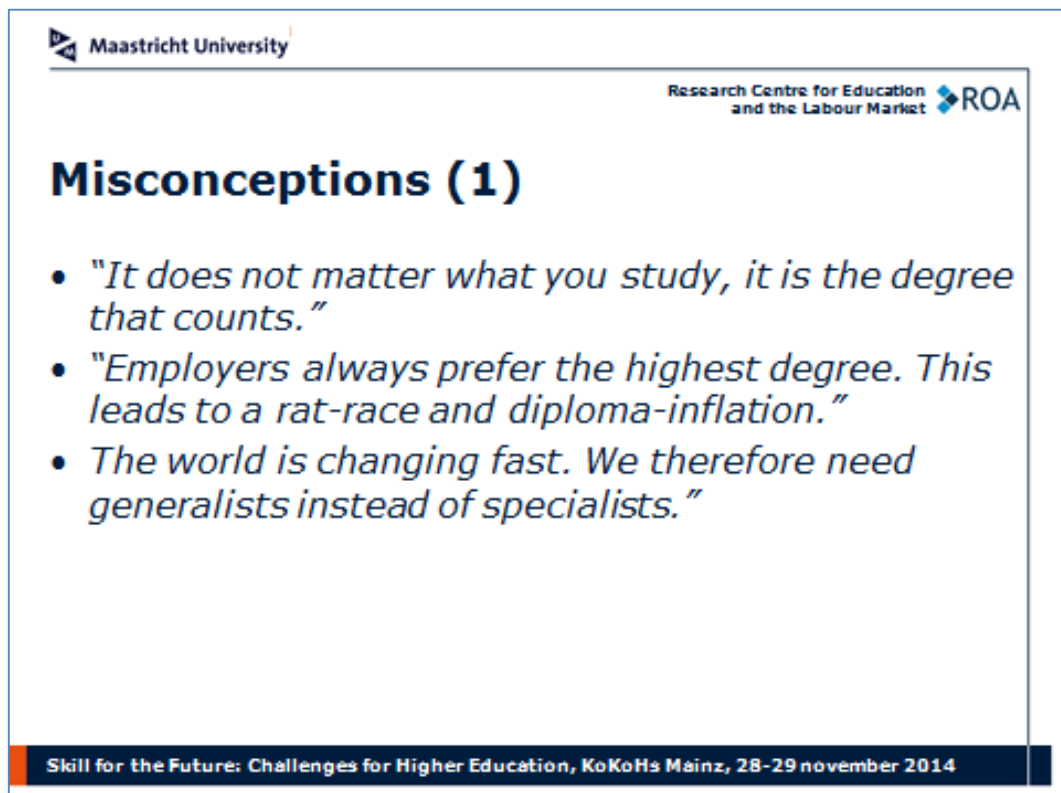
Maastricht University

Research Centre for Education and the Labour Market ROA

Skills for the Future

Challenges for Higher Education

Rolf van der Velden



Maastricht University

Research Centre for Education and the Labour Market ROA

Misconceptions (1)

- *"It does not matter what you study, it is the degree that counts."*
- *"Employers always prefer the highest degree. This leads to a rat-race and diploma-inflation."*
- *"The world is changing fast. We therefore need generalists instead of specialists."*

Skill for the Future: Challenges for Higher Education, KoKoHs Mainz, 28-29 november 2014

Misconceptions (2)

- *"Through Internet graduates no longer need to have specific knowledge; they just need to know where to find it."*
- *"THE employer wants ..."; 'THE student should ..."*
- *"Employers are best informed about future needs."*

Contribution of this study

- Current information from employer surveys limited:
 - Too general (neglect specific skills).
 - Or too specific (focussing on a single sector).
 - Unrealistic: what is important? Everything!
- Result: employers want Jacks-of-all-trades.
- But: "You can't always get what you want".
- This study's contribution:
 - More realistic picture by forcing employers to choose.
 - Combination of quantitative and qualitative methods.

Conjoint study: Example dating

Preference

- Nice: 35%
- Humour: 30%
- Intelligent: 25%
- Good looks: 10%

Choice

- Jacky Chan (mr. Nice Guy)
 - Mr. Bean
 - Einstein
 - Brad Pitt
-
- Actions reveal 'true' preferences.
 - Choice dependent on level.

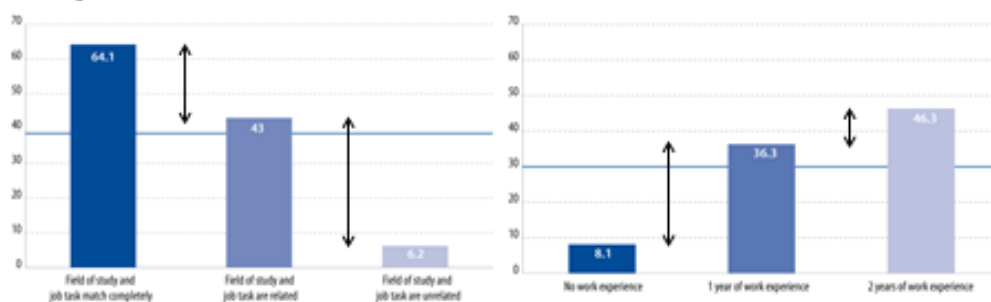
Design study

- Simulation of selection procedure in two steps (900 employers in 9 countries):
 - Step 1: choice job interview between 3 candidates based on CV attributes (e.g. field of study, work experience etc.).
 - Step 2: hiring decision between 3 candidates based on reports from assessment centre on their skills.
- Complemented with literature review, in-depth interviews and focus groups with stakeholders.

Step 1: Which CV attributes are relevant?

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Most important: Field of study and work experience

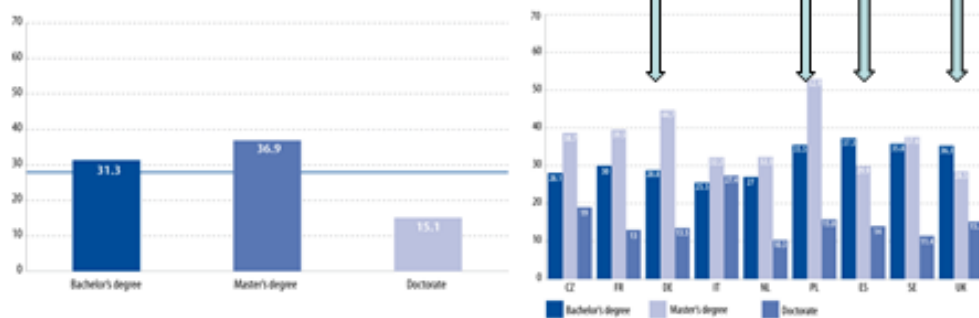


"The discipline is really a main indicator for how quickly someone is broken in."

"Work experience shows they can hit the ground running and get on with the job straightaway."

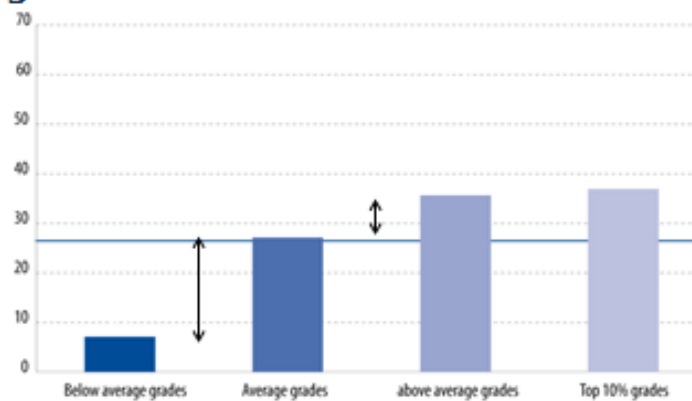
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Signal bachelor's and a master's degree differs between countries



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Grades are important: avoid being below average



"People who don't have high grades in the right modules cannot do the job well."

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Sometimes attributes can compensate

- Field of study-job mismatch can – to some extent – be compensated with relevant work experience.
- Not having a master's degree can be compensated with relevant work experience.
- Excellent grades important when you lack work experience. Conversely, work experience can compensate for having below average grades.

Step 2: Which skills are relevant?

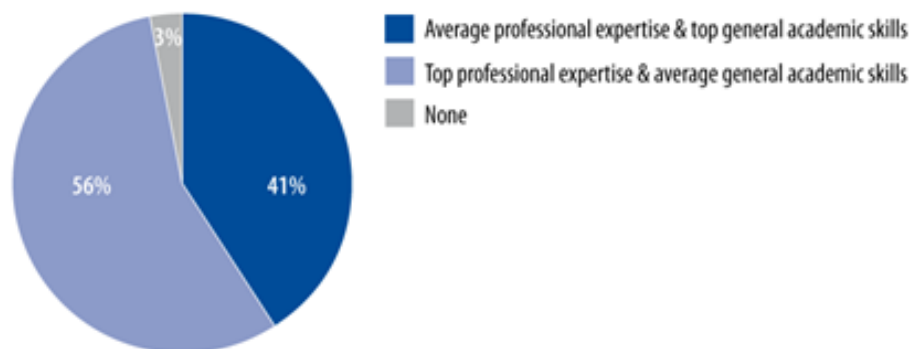
Relevant skill domains

- Professional expertise
- Social and organisational skills
- Innovative and creative skills
- Commercial and entrepreneurial skills
- International orientation
- Flexibility

On the role of professional expertise

- Professional expertise is THE driver of labour market success (even when working outside your own domain!).
- Combination of: subject-specific skills + general academic skills.
- The content is needed for development of academics skills, but the academic skills provide transfer value and ensure long-term employability.
- Specialisation should not be too narrow!
- Was, is and should be the prime focus of HE.

General academic skills cannot compensate for a lack of professional expertise



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On the role of social skills

- Social skills are increasingly important
- High Performance Workplaces give workers high degree of autonomy.
- This requires: interpersonal skills + (self) management skills + strategic-organisational skills.
- But is HE the only or even the best place to develop them?

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On the role of innovative and entrepreneurial skills

- Economic development in Western countries mainly dependent on innovative activities that have commercial value.
- Innovation requires not only creativity but also networking, strategic ICT skills and implementation skills.
- Entrepreneurship not restricted to self-employed.
- Not everybody needs to have this: room for specialisation.
- Can it be developed?

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On the role of international orientation

- Graduates are increasingly working in an international, highly competitive world.
- HE has become more international oriented, but the world outside has developed even faster.
- Not only foreign language proficiency but also intercultural skills.

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On the role of flexibility

- Graduates are faced with an insecure environment.
- Need to be able to deal with changes and uncertainties, ability to learn new things and to stay employable.
- Although flexibility is needed, it is not in itself rewarded: more 'insurance policy'.
- Strategic skills, innovative skills, or entrepreneurial skills needed to effectively deal with increasing uncertainty.

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Top level skills and bottom level skills

Skill	% of average salary	
	Top vs. average	Bottom vs. average
Professional expertise	17.3	-29.7
Interpersonal skills	12.9	-35.0
Commercial/entrepreneurial skills	7.4	-29.4
Innovative/creative skills	14.0	-26.3
Strategic/organizational skills	12.7	-24.1
General academic skills	11.2	-21.2

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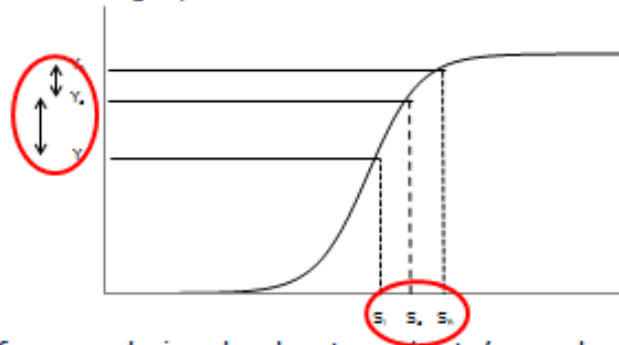
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Why reliable signals are important

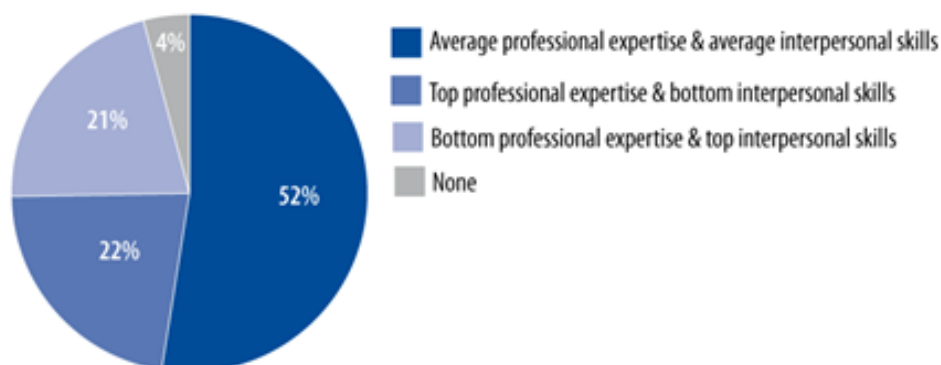
- The costs of underperformance are twice the possible benefits of above average performance.



- Therefore good signals about graduate's employability are so important: degree, field of study, work experience.
- Prefer average all-rounder over one-sided specialist.

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Average all-rounder preferred over one-sided specialist



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Policy implications (1)

- Produce ideal mix of graduates instead of 'ideal' graduate.
- Never underestimate the relevance of specific knowledge: general academic skills cannot be developed without content.
- Innovative and entrepreneurial skills crucial for economic development and therefore one of the major challenges for HE.

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Policy implications (2)

- Make a good choice which skills should be developed in HE and which not.
- Time is limited, so we need to ask:
 - Is HE the most efficient environment to develop these skills?
 - What is the best age to develop these skills?
 - What is the trade-off between developing this skill instead of another?
- Need to know more about the skills production in education: research agenda needed.

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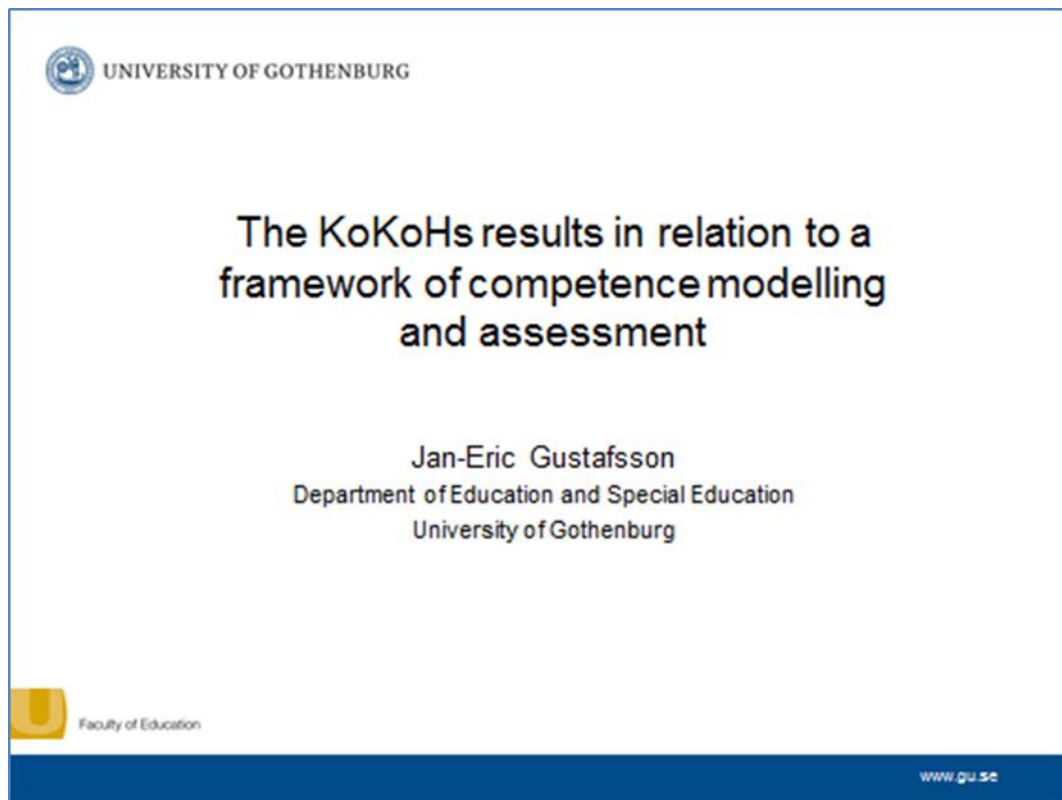
Discussion

More information? Contact:
R.vanderVelden@Maastrichtuniversity.nl

- The literature review "What is expected of higher education graduates in the 21st century?" will appear in: J. Buchanan, D. Finegold, K. Mayhew and C. Warhurst (eds.), *Oxford Handbook of Skills and Training*, Oxford University Press.
- The report "The Employability of Higher Education Graduates: The Employers' perspective" is available at http://ec.europa.eu/education/library/study/2013/employability_en.pdf

Jan-Eric Gustafsson, University of Gothenburg, Department of Education and Special Education, Sweden

Keynote III "The KoKoHs Results in Relation to a Framework of Competence Modeling and Assessment"





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Outline

- A framework of competence modelling and assessment
- Some basic methodological distinctions
- Formative evaluation of some methodological aspects of the project



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Beyond dichotomies: Competence viewed as a continuum

- Competence as a:
 - Multifaceted construct
 - Horizontal continuum
 - Vertical continuum



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Competence as a multifaceted construct

- Successful behavior in real-life situations
- Underlying characteristics of a person which results in effective and/or superior performance in a job:
 - Generic cognitive abilities (intelligence or information processing abilities) or domain-specific competence
 - Non-cognitive competence: affective-motivational dispositions, personality characteristics
- Emphasis on competence as successful behavior in real-life situations has its roots in research on selection of personnel, licensing and certification; emphasis on underlying characteristics rather has its roots in developmental and educational research.



Analytic and holistic approaches to assessment

- Two approaches to assessment:
 - *The analytic (or trait) approach*: Competence is analytically divided into several cognitive and affective-motivational traits (or competencies), each to be measured validly and reliably.
 - *The holistic (or performance) approach*: Create measures of competence as closely related to criterion performance as possible, optimally through sampling real-world tasks and observing performance on them.





Competence viewed as a horizontal continuum

- To what extent can the analytic trait approach capture the meaning of the competence construct? What accounts for variability in performance in the holistic approach.
- If we combine the two approaches in a process model, we may be able to answer such questions.
- Even though this model may be impractical in many cases, it may be useful as a conceptual framework.

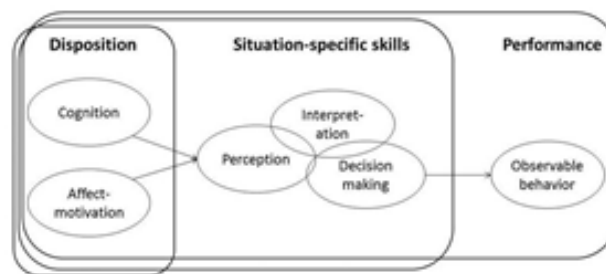


Figure 1: Modeling competence as a continuum



Competence viewed as a vertical dimension

- Competence is a continuous characteristic, ranging from lower to higher levels. Nevertheless, categorizations of levels of competence are often asked for.
- Questions often asked:
 - What level of competence is sufficient to pass examination requirements, or to be awarded a particular grade?
 - What characterizes performance at different levels? How is development of competence best described and how is it best supported?





Methodological approaches and levels of inference

- Much general methodological debate starts from a dichotomy between quantitative and qualitative methods. However, Ercikan and Roth (2006) argued that the quantitative and qualitative dichotomy is fallacious:
 - Quantitative research is typically based on qualitative distinctions in data generation and in conceptualisation
 - Much qualitative research aims at, and does achieve, generalizations.
- They proposed that different forms of research should instead be put on a continuous scale that goes from the lived experience of people on one end (low-level inference) to idealized patterns of human experience on the other (high-level inference).
 - Low-level inference research is characterized by contingency, particularity, being affected by the context, and concretization,
 - High-level inference research is characterized by standardization, universality, distance, and abstraction.



A metaphor for low- and high-level inference research: weather and climate

- Weather affects our daily lives, how we dress, what we do and talk about. We may adapt to weather but there is not much we can do about it. In the short run we can predict weather, but beyond a week or so weather is unpredictable.
- Climate is generalized weather over a longer period of time. We experience weather, and through aggregating these experiences, we get a sense of climate. In a more precise manner scientists define climate as aggregate aspects of weather, using indicators such as mean temperature and mean rainfall. Thus, climate is an abstraction.
- While weather is unpredictable and chaotic, climate and climate changes are stable phenomena, which we can be understand theoretically and for which empirically based models may be constructed, that predict long-term development.
- In terms of this metaphor, high-level inference research is concerned with climate, while low-level inference research is concerned with weather.





The foundation of high-level inference research: aggregation

- Climate is a social construction, and research on climate is based on a highly developed technology of devices for generating data, on agreed-upon definitions, and analytical models. But the fundamental idea is to aggregate multiple observations of different aspects of weather.
- In the same manner quantitative research in education is based on aggregation of observations of different aspects of phenomena of teaching and learning: Two types of aggregation:
 - aggregation over observational units, such as students, classes, schools, municipalities and school-systems. This is referred to as statistical aggregation.
 - aggregation over different observations for the same unit, such as when responses to several items are combined into a total score. This is also referred to as measurement.



Measurement

- Aggregation of observations is used to create measures of abstract constructs, such as general intelligence, reading literacy, self-efficacy, and conscientiousness.
- With aggregation over observations stability and consistency (*reliability*) is gained, according to the general principle that combination of many fallible observations from different contexts and contents yields a less fallible aggregated score.
- However, aggregation over contexts and contents may cause the meaning of the aggregate to become unclear or get lost entirely.
- If we do not measure the intended constructs we have problems of *construct validity*. There are two major sources of threats against construct validity:
 - Construct irrelevant variance (the measure is influenced by irrelevant factors, such as reading ability or social desirability).
 - Construct underrepresentation (the measure does not fully cover the intended construct, perhaps because the data collection methods impose restrictions on the type of observations that may be obtained).





Referent generality of constructs and validity

- Some constructs are broad and encompass a wide range of phenomena (e.g., general cognitive ability). Such constructs are said to have high referent generality. When the purpose is to measure such constructs it is necessary to aggregate over a broad range of observations.
- Other constructs are narrow, and encompass a more circumscribed range of phenomena (e.g., literacy competence, or brain surgery competence). When we aim to measure constructs with low referent generality we must be careful not to aggregate over irrelevant aspects, and not to omit any of the relevant aspects.



Competence in terms of the weather-climate metaphor

- Higher-education competences thus have low referent generality, while dispositional constructs such as general cognitive ability and personality constructs (e.g. the Big Five) have high referent generality.
- However, both competences and abilities are high-level inference constructs which are abstract and are assumed to have temporal and situational stability. Measurement of competences therefore also requires aggregation over multiple and varied observations to achieve reliability and stability
- If general ability is climate, competence is microclimate (i.e., a local zone where the climate differs from the surrounding area, and which may be due to both to natural variation and to human intervention).
- Teaching and learning activities to develop competence is, metaphorically, weather, and to capture and understand these low-level inference approaches are often required.



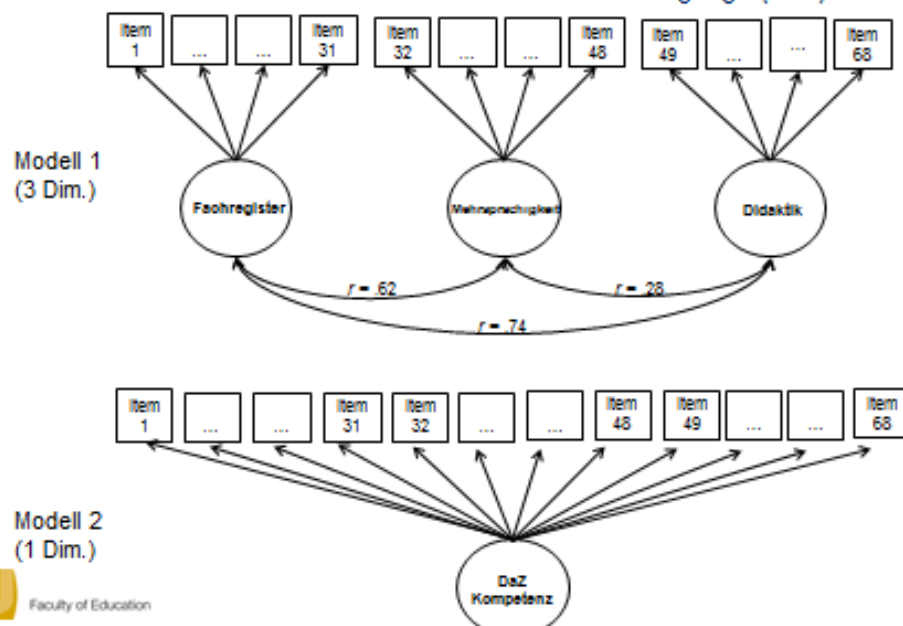


Multidimensionality

- Competence constructs are multifaceted and in almost all the KoKoHs projects multidimensional competence models and frameworks have been derived.
- The assessment designs typically capture competencies in terms of a set of correlated dimensions, identified with CFA or multidimensional IRT techniques.
- In these models each dimension typically is related to a set of indicators, and each indicator is only related to a single dimension, in line with the principle of "simple structure".
- In the process, a broad construct tends to be splintered into more and more narrow constructs, which may cause us to lose our over-arching competence construct,



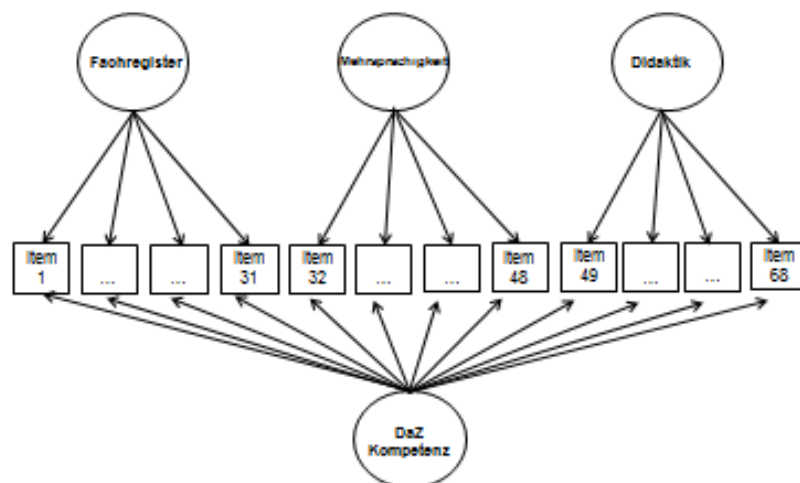
Ehmke & Ohm: DaZKom - Professional competencies of prospective teachers (secondary schools) for German as a Second Language (GSL)





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A bifactor (nested-factor) version of the DaZ model, with one broad competence factor, and three narrow factors



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The bifactor model and essential unidimensionality

- In the bifactor model, the observed variables are influenced by multiple latent variables, with different degrees of referent generality
- The bifactor model allows for both a general factor and multiple narrow dimensions
- When the general factor dominates in the presence of multidimensionality, the term 'essential unidimensionality' is sometimes used
- The bifactor model supports use of both overall scales and subscales



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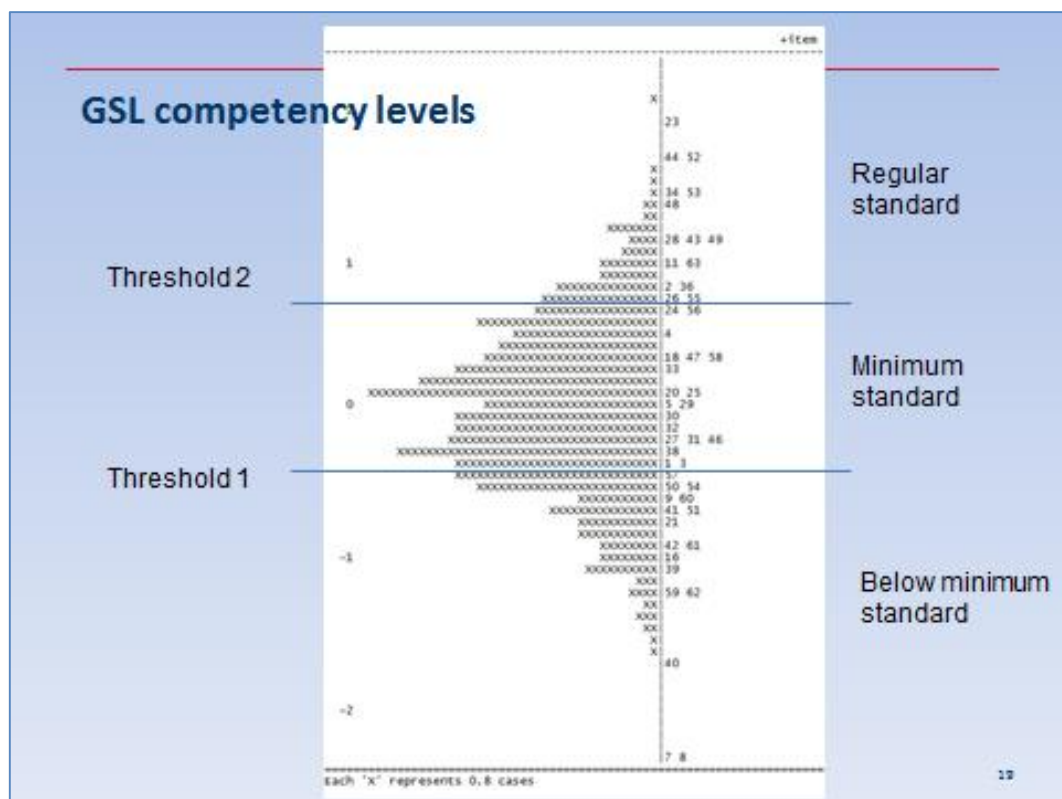
The vertical dimension of competence

- Many constructs span a wide range of competence, such as the development over a four-year program, or even longer periods of time.
- Such broad constructs are typically essentially unidimensional, and often multiple instruments of different levels of difficulty are needed to measure them.
- This requires vertical equating of the scales, for which purpose IRT-techniques are excellent suited.
- IRT-techniques also offer useful tools for characterizing the nature of competence at different level, through descriptions of the nature of the items that persons at different levels of the scale can manage.



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GSL competency levels

Level	Description
Regular Standard	e.g. know language facilitation elements; can analyze class interactions, students' productions, and teaching and learning materials (<i>informed</i>)
Minimum Standard	e.g. can reduce discrimination of multilingual learners in the content classroom; know relationship between content learning and language learning; have selective GSL knowledge; Have first ideas about GSL facilitation (<i>sensitized for GSL</i>)
Below Minimum Standard	e.g. realize unspecifically that language is involved in teaching; know some basic linguistics; realize differences between written and spoken language (<i>unspecific approach</i>)

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Development of competence

- Which processes connect cognition and volition-affect-motivation on the one hand and performance on the other hand?
- Which instructional and institutional factors support development of competence?
- To study these kinds of questions longitudinal designs, perhaps in combination with experimental designs, are useful
- In longitudinal designs it is essential to have a wide range of measures of cognitive and non-cognitive abilities
- However, if that is not possible, a measure of entry-level characteristics is essential



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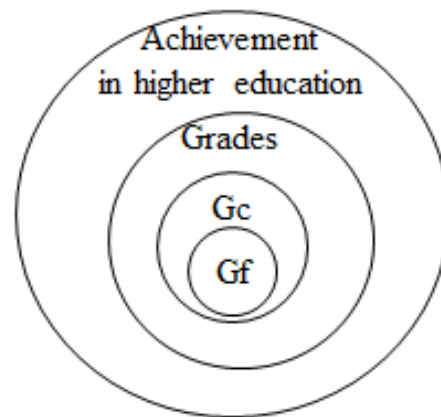
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The Encapsulation model



Measures of Gc contain all information about Gf

Grades contain all information about Gc and Gf, along with volitional-affective-motivational aspects.



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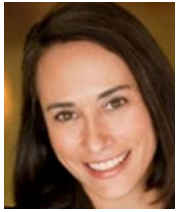
**Good luck with the next phase of
KoKoHs!**



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International Experts



Prof. Alicia Alonzo

(Michigan State University,
Department of Teacher Education,
United States)



Dr. Timo Bechger

(Central Institute for Test Development
(Cito) Arnheim, The Netherlands)



Dr. Roger Benjamin

(President Council for Aid to
Education (CAE), United States)



Prof. Jinsoo Hahn

(Gyeongin National University of Educa-
tion, Korea)



Prof. Ronald K. Hambleton

(University of Massachusetts
Amherst, Department of
Educational Policy, Research &
Administration, United States)



Diane Lalancette

(Council of Ministers of Education, Canada)



Prof. Dirk Van Damme

(OECD, Head of the Innovation and
Measuring Progress (IMEP) Division
Directorate for Education and
Skills, France)

Panel Discussion: Summary

The panel discussion was moderated by *Alicia Alonzo*, the discussants were *Fritz Oser*, *Dirk van Damme*, *Ronald Hambleton*, *Jan-Eric Gustafsson*, *Jutta von Maurice* and *Hans Anand Pant*.

The panel discussion provided an opportunity for all researchers within the KoKoHs initiative to connect with international experts and get an impression of how external professionals debate and reflect on central research questions within the research program. Furthermore, the panel discussions enabled KoKoHs researchers to hear the experts' assessment of the progress of the research program and what they consider to be the next steps.

The panel discussion dealt with the strengths and challenges of the KoKoHs program. KoKoHs will likely have a positive and enormous impact on the educational system. But considering the inflation in competencies it was noted that a clear and careful defining of competence and the terms (competency, dispositions, performance, or sub-components thereof) is very important. Competency development should be conceptualized more clearly and coherently throughout the program.

A strength of the KoKoHs program is the high level of methodology and modeling, in this context KoKoHs modeling and measurement looks very promising with big samples and large-scale assessments. Instruments are powerful, but longitudinal assessment should be tackled. NEPS (or large testing institutions) may not be able to focus on all aspects of assessment, e.g. not on detailed subject conceptualization, and gladly cooperate with research projects to this end. Projects should focus on short instruments (up to 30 minutes), so the NEPS can use and administer them in large-scale assessment studies. Furthermore, many projects use IRT analyses, but hardly any computer-based testing, although computer-based (adaptive) testing enables an easier data collection and analysis.

A challenge for KoKoHs is to integrate a) research across projects and b) many facets of one competency within a project. KoKoHs has many good instruments. Now, intervention studies/formative assessment should be carried out to gather evidence on differences in beliefs, motivations etc., to analyze how competency is created, and to differentiate it more clearly from knowledge. To define 'horizontal' questions to be addressed by all researchers may be worth considering. Projects can design intervention studies and better connect their studies to literature on teaching and learning (also in non-educational fields).

KoKoHs projects should consider conceptualizing national longitudinal scales of scientific thinking. Longitudinal scales would enable assessing the baseline and the state of study progress each year on one scale. Longitudinal studies could be designed as cohort studies, like NEPS. They would also gather data on the critical phase of transition from higher education to the job. Using longitudinal scales makes assessment easier, more precise and enable adaptive testing. They are not easy to create, but worth the effort. Current scales can be extended longitudinally to measure growth. These should

be combined with multidimensional measurement models and computer-based assessment to manage short testing time.

Conclusion

We would also like to thank you all for your active contribution (in the form of presentations, key-note presentations and discussions). We are proud to look back on two successful days that we will all be glad to remember. That is why we would like to point out some future actions. A two-day conference can only offer decisive incentives and we hope that these will be implemented and used as a starting point for future research.

We hope that we met your expectations towards the conference and look forward to meeting you again at other national or international conferences, for example at the AERA in Chicago. We also would appreciate to stay in touch.

Thank you again to all of you who contributed to this conference.

In case you have any questions, we will be glad to answer them afterwards. You can also contact us at info@kompetenzen-im-hochschulsektro.de

Your KoKoHs Team

Previously published:*KoKoHs Working Papers, 1*

Blömeke, S. & Zlatkin-Troitschanskaia, O. (2013). Kompetenzmodellierung und Kompetenzerfassung im Hochschulsektor: Ziele, theoretischer Rahmen, Design und Herausforderungen des BMBF-Forschungsprogramms KoKoHs [Modeling and Measuring Competencies in Higher Education: Aims, theoretical framework, design, and challenges of the BMBF-funded research program KoKoHs] (KoKoHs Working Papers, 1). Berlin & Mainz: Humboldt-Universität & Johannes Gutenberg-Universität.

KoKoHs Working Papers, 2

Blömeke, S. (2013). Validierung als Aufgabe im Forschungsprogramm “Kompetenzmodellierung und Kompetenzerfassung im Hochschulsektor” [The task of validation in the research program „Modeling and Measuring Competencies in Higher Education“] (KoKoHs Working Papers, 2). Berlin & Mainz: Humboldt University & Johannes Gutenberg-University.

KoKoHs Working Papers, 3

Blömeke, S. & Zlatkin-Troitschanskaia, O. (Eds.) (2013). The German funding initiative “Modeling and Measuring Competencies in Higher Education”: 23 research projects on engineering, economics and social sciences, education and generic skills of higher education students (KoKoHs Working Papers, 3). Berlin & Mainz: Humboldt University & Johannes Gutenberg University.

KoKoHs Working Papers, 4

Berger, S., Hammer, S., Hartmann, S., Joachim, C. & Lösch, T. (2013). Causal Inference in Educational Research. Approaches, Assumptions and Limitations. (KoKoHs Working Papers, 4). Berlin & Mainz: Humboldt University & Johannes Gutenberg University.

KoKoHs Working Papers, 5

Toepper, M., Zlatkin-Troitschanskaia, O., Kuhn, C., Schmidt, S. & Brückner, S. (2014). Advancement of Young Researchers in the Field of Academic Competency Assessment – Report from the International Colloquium for Young Researchers from November 14-16, 2013 in Mainz (KoKoHs Working Papers, 5). Berlin & Mainz: Humboldt University & Johannes Gutenberg University.

KoKoHs Working Papers, 6

Kuhn, C., Toepper, M., & Zlatkin-Troitschanskaia, O. (2014). Current International State and Future Perspectives on Competence Assessment in Higher Education – Report from the KoKoHs Affiliated Group Meeting at the AERA Conference on April 4, 2014 in Philadelphia (USA) (KoKoHs Working Papers, 6). Berlin & Mainz: Humboldt University & Johannes Gutenberg University

KoKoHs Working Papers, 7

Brückner, S., Dunekacke, S. & Happ, R. (2014). Causal Analysis Using International Data – Report from the “AERA Institute on Statistical Analysis for Education Policy” (KoKoHs Working Papers, 7). Berlin & Mainz: Humboldt University & Johannes Gutenberg University.

KoKoHs Working Papers, 8

Lautenbach, C. & Schulz, K. (2015). Developing International Research Projects in the Field of Academic Competency Assessment – Report from the „KoKoHs-Autumn Academy“ from October 6-10, 2014 in Berlin (KoKoHs Working Papers, 8). Berlin & Mainz: Humboldt University & Johannes Gutenberg University.