



Competence for life

A review of developments and
perspective for the future

Prof.dr. Martin Mulder

Farewell address upon retiring as Professor of Education and
Competence Studies at Wageningen University & Research
on 20 October 2016



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Esteemed Rector Magnificus, distinguished colleagues, respected students, family and friends.

It is a great pleasure for me to see you all here and to give this farewell address after 42 years of active service in education and science. First of all I would like to apologize for those amongst you who do not understand English very well. Wageningen University is an international university, there are many international colleagues present here, and most of our academic meetings are held in English. What I would like to do in this farewell address is to present a review of competence theory, research and practice and share a perspective on future research on competence for life. I will begin with the short version of the turbulent history of the chair group I have been leading during the past 18 years. Then I will go into the alignment of the mission of ECS with the mission of Wageningen University. Next I will address the competence construct which has been the core focus of ECS, and give a short overview of the competence research we have conducted so far. Next I will point at overviews and syntheses which have been published during the last decades, and then I will go into the issue of competence for life and the future. Finally of course I like to conclude with a series of words of thanks.

Short turbulent history of ECS

So, first of all in short hand the turbulent history of ECS. Or should I say the remarkable history of the chair group within this university. I will keep this short, although you may find this the most exciting part of my talk. When I came to Wageningen University from the University of Twente in 1998, I was not aware of the difficult situation in which Wageningen University was finding itself. Actually, it went through an existential crisis. Draconic measures were taken to discontinue many chair groups and several education programs. What nobody expected was that soon after my start in October 1998 it was decided to also strike the chair of Agricultural Education from the list of chairs of the University. This happened in November 1998, within six weeks after I assumed my position. It felt like being in the

famous Brussels bar 'A la Mort Subite'. I have spoken about this sudden and unexpected move of the university already in my inaugural address of 2004. I shared that I convinced the university that educational research and teacher education were contractual and legal commitments of Wageningen University, which resulted in postponing the decision to dissolve the chair group, and as we say in Dutch: 'van uitstel kwam afstel'. Postponing resulted in withdrawal of the decision. The chair was reinstalled as chair of 'Education Science' and a bit later as 'Education and Competence Studies'.

Some may also remember the picture I showed from the regional newspaper, which commented on the strategic plan of the university at that time, saying that certain professors had luck, such as now emeritus professor Frans Kok, and others, such as me, were having bad luck. When I shared that with professor Kok at that time, he told me that he actually disagreed with the newspaper item. He stated that it was actually not a matter of luck or bad luck that his chair was retained and mine was to be dissolved. He said it was a matter of strategy, with which he agreed. And as I said before, I concurred with him, and I still do. It was exactly the reason that I re-conceptualized the whole chair of educational sciences in Wageningen, and started to focus on three simple questions which I thought were quite relevant in the transitioning fields of agriculture and natural environment and the sectors and professions related to that:

- 1 What competencies do people need in this transforming sector?
- 2 What learning arrangements can be provided to acquire these competencies?
- 3 How effective are these learning arrangements?

As you will appreciate, the answers to these questions are by no means easy, as the labour market for graduates of the green education column is extremely segmented in levels and specializations. Furthermore, there is a large diversity in formal, informal and non-formal education, training and development. The private training sector alone is already good for thousands of education and training programs and millions of participants at all levels. The informal learning sector is even bigger when all kinds of capacity building and workplace learning activities are included.

The questions I mentioned reflect a vision on the role of the educational sciences within Wageningen University which is quite different from that of the founder of the chair in 1964, Professor Frans Prins. Van Essen and Koops (2016) have given an excellent description of his life and work in their recent book 'Seven Founders of the Educational Sciences' (in the Netherlands). Prins was expected – as they write – to educate teachers for agricultural education. However: no licence was needed for teaching in this education sector, so the students did not enrol in his courses for this

reason. However, for teaching in general secondary education, a license was needed, so students who wanted to teach in those schools became the target group of Prins. I myself for instance, when I was a student in pre-university education in the 1960s, had an excellent chemistry teacher who was a graduate from Wageningen University. But the focus of the work of Prins resulted in a kind of alienation of his work from the strategy of the university. On top of that, the requirements for getting a teaching licence were quite light, and there was no independent research programme in operation. The image left behind caused deep and long-lasting tracks. Caused by economic developments and the Task-Division and Concentration Operation in Higher Education, the teacher education program of Wageningen was closed down in the 1980s. The troublesome strategic direction of the group resulted in the threat of a total abolition of the chair a decade later.

However, a radical transformation of the mission and vision of the group was realised, which finally resulted in the creation of the chair group Education and Competence Studies. Now, 18 years later, we can say that this group has been rather successful. However, there is one thing which completely failed. The chair group grew bigger and bigger, to a point that it became the biggest chair group of the over 20 chair groups within the whole Social Sciences Department. Now you can ask yourself the question: but what is the problem then? Well, in the midst of the turmoil about the decision to continue the chair of educational sciences, I received a letter of the Executive Board of the University, signed by ir. Kees van Ast, stating that the chair group would retain two tasks: teacher education and educational research for green education, and perform these tasks with an absolute maximum of staff of 2.0 full time equivalents. However, in our peak period a couple of years ago, PhD students included, we had a total network of 80 people working with ECS. So we can rightfully say that we dramatically failed in this respect. Apologies for that esteemed Rector Magnificus.

The mission of ECS aligned with that of Wageningen University

Having said this, I will go into the topic of my farewell address: Competence for Life, although I could elaborate the whole story of the development of ECS to highlight competencies which are helpful to rescue and develop a university chair group within turbulent times. Visioning, creativity, intuition, mindfulness and negotiation competence, which we will see later as important competencies for the future, are certainly part of that. Maybe I will write about that in a later stage. Now I would like to concentrate on the field of competence studies within Wageningen University.

Linked to the mission of the university, 'To explore the potential of nature, to improve the quality of life', the mission of the Education and Competence Studies

group became: 'To explore the potential of competence to improve the quality of life and society', or to be more specific on the latter part: to understand the nature of competence in social, life and natural science domains, in green education in general, and in related societal sectors, in terms of both performance proficiency and professional autonomy. The vision of ECS was and still is that competence is needed for all effective performance. Change affects competence needs and necessitates continuous competence development. This holds for every aspect of life, but also for learning to cope with the themes of Wageningen Graduate School of Social Sciences (WASS), in which ECS participates, which are 'global challenges regarding disparity and poverty, responsible production and consumption, and natural resources and the environment'. Educational institutions have to integrate emerging future-oriented competencies in their study programmes, companies in their workplace learning, and public institutions and non-governmental organizations in their capacity building initiatives.

ECS has given its contribution to study competence needs, competence development arrangements, and the effectiveness of these arrangements in various Wageningen fields: sustainability, open innovation, entrepreneurship, rural advisory services, boundary crossing, regional planning, multi-culturalism, and multi-disciplinarity. I will elaborate on that a bit later.

ECS used three perspectives from which it studied competence development: 1. Socio-economic development; 2. Human Resource Development; and 3. Global concerns (See Figure 1).

The group created a wide research portfolio with a multitude of research programs and projects. The same was done in the field of teaching.

ECS teams for academic skills training, teacher education, human resource development, and learning for sustainability have created a rich series of courses.

The rich portfolio of ECS reflects the interest in competence-based education as an educational philosophy and practice. Although in some countries, including the Netherlands, the competence-based education practice was criticized a lot because it was used as an excuse for realizing austerity measures, the bureaucratic procedures surrounding it, the costly assessment methods, the implementation of standardization, the emphasis on minimum mastery levels, and the fragmentation of the learning content, the philosophy of competence-based education is more popular than ever. Competence-based education as of today really is a global innovation. There are various video clips on the internet which testify that, such as from US

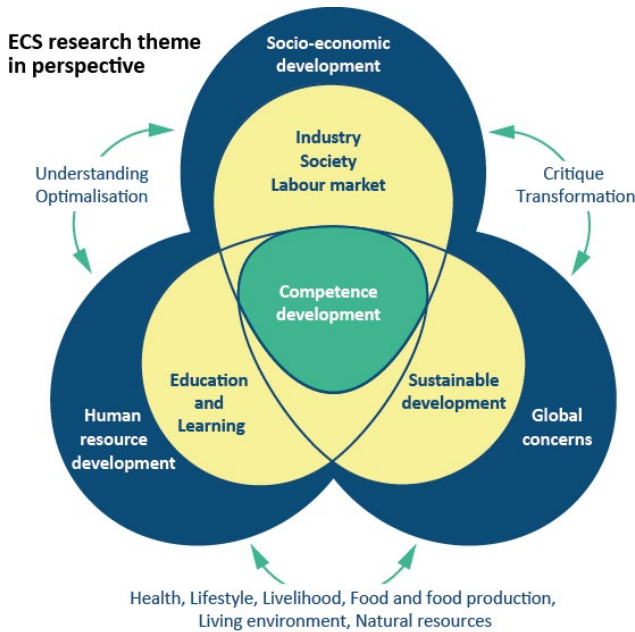


Figure 1. Perspectives of the ECS research programme on competence development in the agrifood and environment sector

educational research laboratories (<https://www.youtube.com/watch?v=RckLD9A0pqc>) and universities, such as Concordia University (https://www.youtube.com/watch?v=X_EbseBknZA) and Southern New Hampshire University (<https://www.youtube.com/watch?v=L3H-och9Hfc>). Even US President Barack Obama mentioned New Hampshire's competence-based education philosophy in which it values student performance more than just seat hours (<https://www.youtube.com/watch?v=WjNYEIRzRtI>). But there are many other examples of competence-based education initiatives, such as from China, which is improving its technical-vocational education, Ethiopia, Nigeria, Rwanda, India, Bangladesh and Mexico which are all implementing varieties of competence-based education. Apart from the many national educational reform policies, there are also sectoral examples, such as the European e-Competence Framework which defines competencies for ICT-professionals at different levels (<http://www.ecompetences.eu/>), the Great Eight competence framework developed by Bartram (2005) for the management profession, and the CanMeds competence framework (Frank & Jabbour et al., 2005) for the medical profession.

The genesis of the competence construct

However popular in educational innovation, the very phrase of competence has not always been associated with positive feelings. On the contrary, it has often been used to refer to negative situations, stressing the incompetence of people. Accusing people or institutions of being incompetent happens frequently in movies. See for instance the movie of the tragic life of Janis Joplin, the famous singer in the 1960s, who sang 'Me and Bobby McGee' of which a critic said that Janis was great, but her band was merely competent. See Philadelphia, in which excellent co-worker Andrew Beckett in a firm is being fired because he had AIDS, but which was covered up by accusing him of being incompetent. And see Skyfall in which the new Q was introduced, a young computer nerd who replaced the old Q with his white coat, whom Bond suspected to be incompetent, but who says that he can do more harm behind his laptop than Bond in the field.

Positive or negative, competence practices have a lot of attention. What in the genesis of competence practice has made competence such a resilient construct? I will give a short review of competence as a construct, competence as a field of theory and research and competence practice.

During my many presentations about competence, a recurrent question has been: is competence old wine in new barrels? And I have replied very often: "In a way, yes". The notion of competence is probably as old as humankind. The assessment of abilities of people and the allocation of tasks and responsibilities have always been there, I believe. In the middle ages this even became regulated by the guilds. They had strict rules about who would be admitted to a trade, and how the apprentices needed to be trained to become masters.

We have traced early accounts of the word competence back to the Babylonian era, in the Code of Hammurabi who was called the competent King, on the laws which were carved in stone. Varieties of this concept also exist in ancient Greek, Latin, French, English and Dutch sources. I made an attempt to also go back to Sanskrit, Chinese, and Persian, and I found translations, but this needs a further check, to determine the original expressions and meanings.

The first use of the concept of competence in educational publications dates back to the 19th century.

As recently stated (Mulder, 2017), the work 'A History of Agricultural Education in the United States 1785 – 1925' of True (1929) contains various references to teachers or their assistants as being competent, or at least, who have to be competent.

Furthermore, a committee meeting report spoke about a certain professional development manual which would be interesting for competent teachers. This meeting was held on the 12th of January, 1853.

A next example comes from 1910. This example is already described earlier as well (Mulder and Pachau 2011, 397). It is about a British committee which went to the United States and Canada to study agricultural education practice. The author of the report Childs (1910) referred to '...the competence of farmers, teachers, assessors, and competence in practical farm operations, science and management'. The report even features the word 'incompetence', when Childs wanted to make clear that there were many workers and practices which were below the expected level. It is interesting to see, that the relationship between competence and continuing professional development of teachers is already established in this report. Many teachers needed continuing professional development, which was gradually be offered by teacher colleges.

The third and last example of this is from the famous American educational philosopher, John Dewey (1916) (see Mulder, 2014). He, already in 1916, spoke about 'industrial competency', the need that all people should develop competence for career purposes. Dewey did not yet use competence as an academic construct.

For a long time I have referred to the year 1959 as the year in which the concept of competence became an academic construct. Recent further literature search has shown that the concept actually has a longer history, especially in the field of teacher education. Domas and Tiedeman (1950) already published an annotated bibliography on teacher competence nine years earlier. In the same year Barr (1950) published his work on teaching competencies. In the review of Morsh & Wilder (1954) about quantitative research done between 1900 and 1950 on the effective instructor, various sources are mentioned in which the competence concept featured as well.

Coming back to White (1959), he introduced this concept in the psychological literature as a driver of development, for instance in the sense that children want to master certain skills like walking and speaking. White saw competence as an alternative motive for behaviour than that described by Sigmund Freud.

Noam Chomsky spoke about competence in language theory in 1965. He saw competence as the underlying ability to create and understand sentences, including sentences never heard before. He saw speech performance as the output of linguistic competence. He was also one of the first to point at the fact that knowing rules does not automatically guarantee being able to speak correctly. There is more needed for effective performance than just knowledge.

In 1968 Schallock and Hale published a report on competency-based education which was originally promoted in the North-western states of the USA, but quickly became a trending topic at federal level (Anderson et al, 1972; Dodl, 1972; Houston, 1972; Houston & Ilowsam, 1972). It signalled a new approach in teacher education, based on ideas about performance-based teacher education (Elam, 1971; Johnson, 1971), behaviour modification, direct behaviour training, individualized instruction, microteaching (Allen, 1967), modularization (Arends et al, 1971) and mastery-learning (Bloom, 1968), which was evaluated by Joyce (1971), and later reviewed by Schmieder (1973) and Houston (1974), and linked to the assessment of teacher competence (McNeil & Popham, 1973). Heavily criticized for its detailed and over-specified behaviour-orientation and performativity (see for instance Dodl, 1972), and under influence of humanistic educational philosophy (Rogers, 1969) the PBTE- and CBTE-movement gradually faded out during the late 1970s.

In 1969 Peter & Hull, published their book 'The Peter Principle: Why Things Always Go Wrong'. At the time of writing it was not taken very seriously, but after publishing it became a bestseller, translated in 38 languages. The idea of this theory was that all people in organizations get promoted up to a level of incompetence. True or not, it was a thought which appealed to many organizations, which started to work more carefully on the match between competence and position of their employees.

In 1973 David McClelland stated that the measurement of competence was needed to more carefully predict success. He pointed at the fact that intelligence tests, which were quite popular at that time, had limited predictive validity. In his opinion testing what people actually can do shows better results. Furthermore, he stated that competencies should be identified by what superior performers do. This view was followed up in many studies which were conducted later.

In 1978 Tom Gilbert published his book *Competence - Engineering worthy performance*. He promoted the notion of competence and Performance Improvement Potential for societies, organizations, work units and individuals. He found that to be a much more positive trigger to develop competence than the concept of IQ, which he said is often stigmatizing people.

In 1982, Richard Boyatzis published his book on the competent manager. This was the first big attempt to map the competencies of managers to predict their success. This work became the foundation of many management selection and development programmes.

In 1990, Prahalad and Hamel published their work on the Core Competence of the Organization. They showed that organizations did better when they were focusing on their core competencies, or key strengths. Perceived by some as a metaphor, this work had an enormous impact on outsourcing. I found this work particularly relevant for education, which also has to focus on its own strengths, and to align education programs with core competencies. It is also important that education helps students to find their own core strengths and talents, and help develop these.

In 1994, the book of Michael Eraut appeared, on Developing professional knowledge and competence. In this book he linked competence to professional development. This book also gained worldwide attention and pointed at the social and contextual meaning of competence.

In 1996, Robert Quinn and his colleagues published their book 'Becoming a Master Manager: A competency framework'. In this book they stated that a series of conflicting management values should be included in management practice. Teams should include different roles and corresponding competencies, so as to include multiple perspectives in work, which improves its quality.

Dave Bartram finally, as said, developed the great eight Competence Framework, which was published in the year 2005. This framework tries to explain all human behaviour, but it is predominantly aimed at the management profession.

Alongside the theoretical developments, the field of competence practice has grown exponentially. It is omnipresent. Professional associations have developed competence frameworks, governmental organizations have enacted competence domains for teachers, testing companies have developed competence measurement tools, consultancy firms have made competence dictionaries and provide advisory services for competence assessment and development, organizations have created or adopted competence management systems and educational institutions have implemented qualifications frameworks in which competencies are integrated.

Competence research of ECS

Against the background of these theoretical and practical developments, ECS created its research program and carried it out. What are the contributions of the group to competence theory, research and practice during the last 15 years? I would say: quite a bit. I will shortly point them out. I have categorized the contributions in three groups, related to the core questions of ECS I mentioned earlier: 1. which

competencies are relevant? 2. with what learning arrangements can these be developed? and 3. how effective are these arrangements?

Which competencies?

One of the first projects of ECS in the field of competence was the project to develop a competence profile for the purchasing profession (Mulder et al, 2005). This project resulted in a job profile, a list of trends in the profession and series of job pictures and competence specifications. This project was used to test various research methods for the development of job profiles.

Similar studies followed which were aimed at identifying competencies for various professional domains such as rural advisory services, focusing on the development of a competence framework for agricultural instructors in Iran (Karbasioun et al, 2007), rural consultancy in the field of HIV/Aids in Africa (Brinkman et al, 2007), floriculture and tropical horticulture (Van der Heide et al, 2008; Mulder et al 2011; 2013), environmental education for which competencies were identified (Wesselink and Wals, 2011), entrepreneurship in greenhouse horticulture (Lans, 2009); teacher competence on inquiry-based science teaching (Alake-Tuenter et al, 2012) and corporate social responsibility (Osagie et al, 2014).

All these projects revealed research issues in the development of competence frameworks, which are related to the uniqueness of competence specifications for certain professions or task domains, their definitions, their scope, and their context-dependency.

Many professional organizations and associations have benefited from this work.

Learning arrangements

Regarding learning arrangements in competence-based education programmes, starting with my inaugural address of 2004, we have discussed a lot what principles constitute the core of the competence-based education philosophy. Based on an initial list of principles (Mulder, 2004), a Delphi study and follow-up projects resulted in the matrix of competence-based education (Wesselink, 2010). This matrix consisted of eight principles of education and four levels of implementation. Experiences of teachers and students with the matrix were studied (Wesselink, Dekker-Groen, Biemans and Mulder, 2010). Next, the model was further elaborated and now consists of ten principles of education and five levels of implementation. It is validated, and proven to be useful in assessing and developing competence-based education programs (Sturing, Biemans, Mulder and De Bruijn 2012). This instrument contributed to the quality of professional and activity-based learning. As an

intermediate review Biemans et al (2004) reported the backgrounds and pitfalls of competence-based vocational education and training, measures to overcome the most common pitfalls, and the effects of these measures (Biemans et al, 2009).

The competence methodology as developed has been used in various projects in education development cooperation projects of ECS, such as in Uganda (Kasule et al, 2015), Ethiopia (Solomon, 2016) and Indonesia (Zainun et al, 2015) to name a few. Reflections about these projects (Mulder & Gulikers, 2011; Nederstigt & Mulder, 2011; Mulder & Kintu, 2013) showed the complexities of attempts to implement competence-based education practices in the non-western world.

ECS researchers also have been involved in higher education research. Not always framed under the label of competence studies, this research certainly has elements in it of competence studies, and is conducted in the fields of argumentation, interdisciplinary thinking, intercultural cooperation and regional learning competence.

Argumentation competence is studied by Noroozi et al (2011 a b; 2012 a b; 2013 a b). The studies conducted are taking place in computer-supported collaborative learning environments which was originally introduced in Wageningen University by Frank de Jong and his at that time PhD student Else Veldhuis-Diermanse. The studies are implemented in courses within Wageningen University, such as in food ethics and international food law. Students work together in digital platforms to conduct learning tasks. These tasks are scripted in various ways, and the effects of that on learning processes and outcomes are studied. Currently the effects are investigated of second order argumentation. By first order argumentation we mean the domain-specific argumentation. Second order argumentation transcends that and consists of using general argumentation rules. What we want to study is whether conscious second order argumentation contributes to the learning process and learning results, also at domain-specific level.

A comparable line of research of ECS is aimed at intercultural cooperation in study groups. Given the current geo-political tensions, which are strongly related to intercultural differences, this research is extremely current and important. Like the research of Noroozi, Popov also experimented with scripts in computer-supported collaborative learning (Popov et al, 2012, 2014 a b). He focused on international and culturally mixed student groups.

Also related to this, Van Ginkel (2015a b) is studying oral presentation competence. Although this research is less heavily computer-supported, students use their own

smartphones to record presentations, and share these for receiving feedback. The role of feedback is an important issue in this research. A current study is aimed at the implementation of virtual reality in oral presentation courses. An experiment is set up to study the effects of virtual reality practice on actual oral presentation performance. If practicing with VR has positive and sustained effects, this will directly influence the way in which oral presentation teaching will be delivered in the future.

Another field of study is the design of interdisciplinary thinking competence development (Spelt et al, 2009). This research has been embedded in a course on Food Quality Management, which is an interdisciplinary field by nature. The food part of this course is obviously related to science and technology, whereas the management part of the course is related to social theory and practice. During the beginning of this research there were hardly any guidelines for teaching and learning in the field of interdisciplinary thinking and acting. Nevertheless, this field of study is found to be very relevant for higher education nowadays. Spelt has given various guidelines to make courses interdisciplinary.

Studies like these on interdisciplinarity, intercultural, argumentative and oral presentation competence are important for Wageningen University, as many of the problems students and professionals encounter in the natural, life and social sciences are open-ended or non-scripted. Since professionals need to be able to justify their choices and practices more and more (also in digitalised working environments), it is extremely relevant to pay sufficient attention to these competencies.

Another research line is related to the work of Cremers et al (2014). She generated and analysed design principles for hybrid learning, which is a kind of learning in which two worlds are combined: the world of formal education and the world of work. Different hybrid learning solutions were investigated, and their design principles were elaborated.

A related series of studies is conducted by Oonk (2016) and Oonk et al (2016), which is on regional learning. The essence of this boundary crossing education practice is that student groups participate in regional planning processes, which are multiple stakeholder processes. The recent boundary crossing literature (Akkerman & Bakker, 2011) nicely fits to this kind of education. Lecturers who teach in regional learning arrangements need new competencies, and this research has clearly shown which ones are specifically new for these lecturers.

Another line of research is aimed at the professional development of teachers in competence-based vocational education by team learning arrangements. This

research is conducted by a team of researchers of Wageningen University and Tilburg University. The idea behind this research is that teams are collectively responsible for the educational programs in which they have a role. Whereas in the past teachers were held responsible for their accomplishments individually, they are now held accountable for their programs as teams (Bouwman et al, 2016; Zoethout et al, 2016).

Effectiveness

Regarding the research on the effectiveness of learning environments which are aimed at acquiring certain competencies, the ambition of the research program of ECS was to establish an empirical relationship between competence and professional performance. This relationship is rather complicated, and there are at least two camps in this respect: those who argue that competence can be measured separately from performance (Bartram, 2005) and those who claim that competence needs to be inferred by sample-based performance measurement (Shavelson, 2010). The competence-performance relationship has been addressed before by Chandler (1991), and the impression is that there is little advancement of this field of research. In the field of vocational education, Lassnigg (2017) concluded that there is very little research on the effectiveness of competence-based education. Wesselink et al (2017) went further into this issue, and suggested that the reason for this might be that as most generic educational innovations, the time cycle to detect effects is rather long, and that many other variables may influence the emerging state of education, including the value of the performance variables which are relevant to study.

But there is beginning evidence in competence-based training in surgery. A study of Xue et al (2015) showed that this training practice is more effective than the traditional task-related training practice.

In organizations, research on the relationship between competence and performance is more advanced. There is research conducted by Lans (2009), Lans et al (2008a b, 2010, 2014) and Mulder et al (2007) on entrepreneurship competence in greenhouse horticulture, by Du Chatenier (2009) and Du Chatenier et al (2009, 2010) on open innovation in large organizations, and Birru (2016), on export competence in the leather industry, again in small and medium sized companies. Furthermore, the study of Bartram (2005) mentioned above was on the relationship between competence and job performance. This study established a relationship between independent competence assessment and job performance assessments. The argument in that study was that previous studies on the relationship between assessment and performance lacked sufficient criterion differentiation. Obviously, measuring the relationship between competence and performance needs a great deal of precision, and necessitates the inclusion of authentic competence assessment.

Since establishing worthy performance is costly, and performance outcomes (accomplishments) should justify the costs of performance, it seems to be worthwhile to further investigate the effects of competence development on professional performance improvement in general.

Interesting is that on competence assessment, a solid line of effectiveness research has been developed over the years within ECS. This research especially focuses on authentic assessment in competence-based education (Baartman et al, 2007), in which students are being assessed in authentic performance situations. Furthermore, Gulikers et al (2009) described evaluations of the quality of competence-based assessments as perceived by curriculum developers, teachers, students and employers. Experiences of education developers, teaching staff and students regarding competence-oriented learning environments have been also studied to evaluate the different perceptions of these stakeholders regarding the intentions and practices of this educational innovation (Wesselink, 2010).

Time for overview and synthesis

Given the wide variety of competence theories, definitions, strategies, research studies and practices, the need for creating an overview and synthesis grew. There have been various reviews of the competence field and critical analyses, as said, already from the 1950s (Domas and Tiedeman, op cit; Grim and Hoyt, 1952). In the 1970s Grant and his co-authors composed and edited a book with chapters from competence-based education practices in universities and colleges in the United States (Grant et al, 1979). Later reviews are from Ellström (1997), Rothwell and Lindholm (1999); Arguëlles and Gonczi (2000), USDE/NCES (2002), Hager (2004), Winterton (2011) and others. Critical evaluations have been published by Lum (1999), Westera (2001), Hyland (2006), Mulder, Weigel & Collins (2007) and others.

Although each and every publication has its own merits, a broad need was felt to make a comprehensive overview and analysis of the field. This was realized with a collective effort of most of the global experts in competence-based education (CBE) and related specializations, who produced the edited Volume ‘Competence-based Vocational and Professional Education. Bridging the Worlds of Work and Education’ (Mulder, 2017), which also has links with primary, secondary and academic education. The diverse viewpoints regarding CBE were collected, the group unravelled controversies in CBE debates, deepened the understanding of CBE theory, reviewed policies and practices regarding CBE, assessed the value added of CBE, and pointed at research priorities in the field of CBE.

One of the major conclusions of the Volume is that competence-based education is a

worldwide innovation in education, but that the development, implementation and evaluation needs careful attention, or this innovation may turn into a major disaster.

What are the other results of the book project? There are a couple of major assets which I see.

First of all, comparing the multitude of theories and definitions of competence, 10 dimensions are distinguished by which they differ, such as contextuality, definability and measurability. Different authors have very different opinions on the possibility of understanding competence which is detached from a specific context, on the possibility to actually define competence in operational terms, and on the possibility to really measure competence directly. In my opinion, competence differs in terms of centrality (competencies can be core and peripheral), but are definable (as is done in the many competence frameworks which exist), can be developed (at varying costs), are dynamic in nature (varying by specific circumstances), include knowledge (without any knowledge it is hard to be competent), are inferred based on performance testing, can be mastered at various levels (from insufficient to excellence), are indirectly related to performance and conditionally transferable. I do not have time to explain this further, but this variation is important when implementing competence-based education, competence assessment, or competence-based management. There is not one theory of competence, nor is there one practice of competence-based education.

Secondly, the principles of competence-based education have been revisited, and embedded in international competence-based practices. Typically, in mature implementation of competence-based education practices, there is:

- 1 a competence framework as a foundation of curriculum choices;
- 2 a tool for dedicated competence-oriented educational policy making at school level;
- 3 an elaborate strategy for competence-based curriculum development or revision;
- 4 a set of instructional design measures to translate competence-based curricula into teaching and learning environments, such as in argumentation competence development;
- 5 a set of measures to enhance self-regulated competence-oriented learning as a basis for lifelong learning;
- 6 a system for the assessment of prior formal and informal learning;
- 7 a system for formative competence assessment, to monitor competence growth and inform the learning process;
- 8 a system for valid and trustworthy authentic summative assessment, to test the actual mastery of the key competencies for a job or occupation;

- 9 an instrument for laddering competencies across education levels to distinguish the meaning of the competencies at these different levels;
- 10 a system of competence management for all professionals in the organization, with adequate competence feedback and development instruments.

Thirdly, definitions of competence, competency and competencies are given. These are:

- ***‘Competence’***

Competence is the state of being able, or the generic capability which is a necessary requirement to perform; the set of characteristics which enable performance; e.g. she has the competence of being a good intensive care nurse. When related to vocational and professional education, the concept can also be defined in other words: ‘Professional competence is seen as the generic, integrated and internalized capability to deliver sustainable effective (worthy) performance (including problem solving, realizing innovation, and creating transformation) in a certain professional domain, job, role, organizational context, and task situation’ (Mulder, 2014).

- ***Competent***

Competent is being adequate or qualified and having the abilities or qualities to function and develop; e.g. he is a competent cardiovascular surgeon.

- ***Competency***

Competency is an element and characteristic of competence; e.g. this researcher has binding leadership ability. In other words ‘A competency is a part of generic competence; it is a coherent cluster of knowledge, skills and attitudes which can be utilized in real performance contexts’ (Mulder, 2014).

- ***Competencies***

Competencies is the plural of competency, e.g. the framework of competencies of teachers’ (Mulder, 2017).

During the book project it was evident that many authors agreed with these definitions, but there are also authors who did not agree with that, or who even totally opposed the idea of using competence as a foundational principle for education. They generally prefer a liberal education philosophy, although reviewing that there is no fundamental contrast between the current broad and inclusive view on competence-based education and principles of liberal education (AACU, 2015). Lots of discussions about competence and education are also not practical, in the sense that they remain theoretical. Educational theories without practical examples are of little help in my opinion.

Therefore, I always liked to explain the core of the concept of competence in a practical way. To do that, I have often used a picture of a kind of conference room, or class room, but in which the people depicted think of flowers. The picture is actually showing one of the trading rooms of flower auction Flora Holland in Aalsmeer. The room is furnished with the latest flower trading technology, and whereas the flowers used to enter the trading rooms in trolleys, this has been transformed into a totally digital way of trading. There are even trading rooms outside the facilities of Flora Holland, in big flower trading companies elsewhere, which look like trading rooms in stock exchanges. I use to show these pictures to explain that all these professionals need professional competence, and continuous competence development, as their work is technology-rich, and always changes. These professionals need the knowledge, skills and right attitudes to do their job. Knowledge alone is not enough. For example, I can read a lot about making music, but unless I am going to practice, I will never be able to play an instrument. And without the right attitude I will not have the stamina to keep on practicing, and the capacity to control my emotions in performances. The latter is perfectly visible in the classic video recording of pianoplayer Maria Joao Pires in the Royal Concert Hall in Amsterdam, who, when conductor Riccardo Chailly starts the concert, immediately panics because she had prepared the wrong piece. The video shows (https://www.youtube.com/watch?v=CJXnYML_SuA) that Chailly notices the panic of Pires, but reassures her that she knows the piece very well, as she had played it before. And after the first hesitation, Pires started and played the piece impeccably, by heart, which is of course an indication of her extreme level of competence, or her brilliance, but also of her capacity to control her emotions at the right time. This is quite different from the competence, or rather incompetence, of many Dutch soccer players in the Champions League, in taking penalties, but I think I should not elaborate on this national trauma in recent football history here and now.

So I see competence as the integrated capability of professionals, existing of the right combinations of knowledge, skills and attitudes, for realizing effective performance, but also for realizing change and transformation (Mulder, 2014).

Competence for life and the future

Given the complexities and challenges of our current life and the uncertainties regarding the future of the society across the globe it is essential to concentrate on what competence for life entails. The last chapter in the book 'Competence-based Vocational and Professional Education' also calls for that.

There are various initiatives which are broadly linked to community, health and life style competence development. It is interesting to see how in these environments the notion of competence for life and the unknown future exists.

Regarding education, there have been several initiatives to define the most important competencies for future life. To make clear what is meant by competence for life and the future, a distinction is made between competence 1.0, 2.0 and 3.0, which is based on the description of the three approaches to competence theory: 1. Functional behaviourism, 2. Integrated occupationalism and 3. Situated professionalism (Mulder, 2014). I do not have the time to elaborate on this, but put shortly, they refer to specific skills training, integrated workforce education, and context-specific development of professional expertise. In practice, all three approaches are relevant.

Competence 1.0 relates to specific skills training, and goes back to the origins of competency-based training in the US military. This training is related to specific detailed tasks, such as operating machines, using software or flying a plane. For crucial functions or tasks this often goes together with a process of licensure. Competence 1.0 statements are often long laundry lists of specific skills. For a certain job it is not unusual to see hundreds of these skills which students need to master and check. Competence 1.0 follows *command logic*. Learners are not asked for initiative or critical reflection, they are asked to learn prescribed tasks as efficiently and effectively as possible.

Competence 2.0 relates to broad occupational responsibilities. Students are being prepared to be able to carry these responsibilities. For instance in occupations like nursing, teaching or research. This normally leads to qualifications given by educational institutions. Competence 2.0 statements are often included in qualifications frameworks, such as the national qualifications frameworks, or the European Qualifications Framework, or the Asian-Pacific Qualifications Framework. Competence 2.0 employs *demand logic*. Based on sectoral social dialogue, scientific developments, professional needs, and interests of students, education programmes are made demand-driven. Reflection, creativity and critical thinking are consciously stimulated, and integrated in these education programmes.

Competence 3.0 relates to professional development in practice, which is often taking shape as informal workplace learning. Learning by experience, in networks, coaching, supervision and intervision often fall under this category of competence development. These learning activities mostly do not lead to any kind of recognized certificate. Nevertheless, many years of working experience and learning may result in a higher level of functioning. Therefore many countries have set up a system of accreditation of prior learning, or acknowledgement of acquired competencies. Not all these systems are working well, especially not when educational institutions are asked to assess the portfolios of candidates and together with that begin with demanding further training for the final qualification process via inflexible programs

which do not match with the needs, resources of the possibilities of the adult learner. Competence 3.0 statements are often included in guidelines of professional associations which specify conditions for further education or professional registration. Sometimes they are limited to mentioning domains and guidelines for re-registration, whereby participation is the criterion for assessment. In many cases competence shortlists used for performance assessments lead to the formulation of development priorities and personal development plans. In still other situations individuals and teams are being stimulated to realise their own learning and development for which space is provided. Competence 3.0 is based on *agency-logic*. It is the learner who can use the affordances of workplaces for self-regulated self-development. Holism and mindfulness are key in this approach.

Competence 1.0, 2.0 and 3.0 are also referring to competence development for known tasks, existing occupations, and the unknown future. Whereas it is important to introduce students to the known, it is equally important to prepare them for the unknown. Often we see a mix of both in proposed competence frameworks which deal with the future of education.

Various models have been proposed as a foundation for education for future and lifelong learning. This movement began with structuring the field of competence.

For instance, Delamare-Le Deist and Winterton (2005) created a model with two dimensions, the conceptual-operational and the occupational-personal. The combination of these dimensions yields four types of competence, functional competence, cognitive competence, social competence and meta-competence. Students and professionals all need these.

The same holds for the European Qualifications Framework. It distinguishes three categories of educational outcomes: knowledge, skills and competences. This is a bit awkward if competence is seen as the overarching label of all professional capabilities. But it is a generic model that indicates reference levels of educational programs. It does not specify future competencies content-wise. Related to the European Qualifications Framework EU member states have been working on their own National Qualifications Frameworks. They all reflect certain national peculiarities caused by differences in culture and education legislation (Cedefop, 2015).

In the German national qualifications framework competence is indeed seen as the overarching professional capability. In that framework competence is divided into professional and personal competence, and these two are divided in knowledge,

skills, social competence and autonomy. The specification of autonomy resembles the hierarchy of competences in the European Qualifications Framework.

France has a certification framework which does not really fit the European Qualifications Framework, but its constituting categories *savoir*, *savoir-faire* and *savoir-être* resemble the categories knowledge, skills and competences.

These national qualifications frameworks are helpful at the education systems level, to differentiate levels of education, but they do not directly specify the future content of education. Other initiatives which have been undertaken are more dedicated to this issue. Some of these initiatives refer to skills, but what is meant is essentially the same. In overviews of key skills, knowledge and attitudes remain equally essential.

During the last 15 years interesting projects have been conducted which are aimed at identifying the most important future competencies for all education. For instance, the OECD conducted a project called the 'Definition and Selection of Competencies: Theoretical and Conceptual Foundation', the DeSeCo-project in short, to broaden their work which was until then mainly on reading, mathematics and scientific literacy (Rychen & Salganik, 2003). Their scope was broadened to include competencies which are needed in society in general, or as they put it, for *successful life* and a *well-functioning society*. The competencies the project team distinguished were put in a framework of 1. a vision of society regarding human rights, sustainability, equality, productivity and social cohesion, and 2. demands of life, such as technology, diversity, mobility, responsibility and globalization. Theoretical elements of key competence they distinguished (with the corresponding key competencies between brackets) are 1. interacting in heterogeneous groups ('relating well to others; cooperating; managing and resolving conflict'), 2. acting autonomously ('acting within the big picture or the larger context; forming and conducting life plans and personal projects; defending and asserting one's rights, interests, limits, and needs') and 3. using tools interactively ('using language, symbols, and text interactively; using knowledge and information interactively; using technology interactively') (Rychen & Salganik, op cit). These competencies are essential for the core theme of this address: competence for life.

But many frameworks of competencies and skills followed which have the same purpose as the one of the DeSeCo-project: to define essential capabilities people need to effectively fulfil their role in life and to create a better functioning and inclusive society.

In 2006, the European Union (2006) published the key competences for lifelong learning: 1. Communication in the mother tongue; 2. Communication in foreign languages; 3. Mathematical competence and basic competences in science and technology; 4. Digital competence; 5. Learning to learn; 6. Social and civic competences; 7. Sense of initiative and entrepreneurship; and 8. Cultural awareness and expression. This set of competencies is partly different from the DeSeCo key competencies, but these key competencies are also relevant to include in the definition and selection of competencies for life.

Parallel to the discussion about competence for life and society and key competencies for lifelong learning, a debate started on 21st Century Skills, when the model of the NCREL/Metiri Group (2003) was published. Developed as a framework for literacy in the digital age, the core of it is 21st century learning. The skills included in this framework are related to 1. digital-age literacy itself ('Basic, Scientific, Economic, and Technological Literacies'; 'Visual and Information Literacies'; 'Multicultural Literacy and Global Awareness'), 2. effective communication ('Teaming, Collaboration, and Interpersonal Skills'; 'Personal, Social, and Civic Responsibility'; 'Interactive Communication'), 3. high productivity ('Prioritizing, Planning, and Managing for Results'; 'Effective Use of Real-World Tools'; 'Ability to Produce Relevant, High-Quality Products'), and 4. inventive thinking ('Adaptability, Managing Complexity, and Self-Direction'; 'Curiosity, Creativity, and Risk Taking'; 'Higher-Order Thinking and Sound Reasoning') (Source: <http://pict.sdsu.edu/engage21st.pdf>). As said, these skills also include knowledge and attitudes, and are also relevant for the definition and selection of competencies for life.

Another interesting example of statements regarding competencies which are important for the future is the set of Essential Learning Outcomes as defined by the American Association of Universities and Colleges (AAUC, 2008). These outcomes, relevant for the preparation for 'twenty-first-century challenges' (op cit) are: 1. knowledge of human cultures and the physical and natural world (including sciences and mathematics, social sciences, humanities, histories, languages and the arts), 2. intellectual and practical skills (consisting of inquiry and analysis, critical and creative thinking, written and oral communication, quantitative literacy, information literacy, teamwork and problem solving), 3. personal and social responsibility (existing of civic knowledge and engagement at the local and global level, intercultural knowledge and competence, ethical reasoning and action, and foundations and skills for lifelong learning), and 4. integrative learning (which includes synthesis and advanced accomplishments across general and specialized studies). Again, these learning outcomes are important to consider when thinking of competence for life.

Similarly, Wagner (2010) defined and described Seven Survival Skills for today's students: 1. Critical Thinking and Problem-Solving, 2. Collaboration across Networks and Leading by Influence, 3. Agility and Adaptability, 4. Initiative and Entrepreneurialism, 5. Effective Oral and Written Communication, 6. Accessing and Analysing Information, and 7. Curiosity and Imagination. Several of these skills are included in the frameworks proposed by the DeSeCo-project, the Lifelong learning competence framework of the European Union, the NCREL/Metiri Group, and the American Association of Universities and Colleges.

Another important contribution in relation to the debate about 21st Century skills is the 21st Century Skills Framework proposed by project P21 (P21, 2015), which also defines a series of competencies for life. These are divided in core subjects and 21st century themes, and three related competence domains. The core subjects are English, Reading, or Language Arts, World Languages, Arts, Mathematics, Economics, Science, Geography, History and Government and Civics. The 21st Century Themes are: Global Awareness, Financial, Economics, Business and Entrepreneurial Literacy, Civic Literacy, Health Literacy, and Environmental Literacy. The related competence domains are 1. Learning and innovation skills (consisting of creativity and innovation, critical thinking and problem solving, and communication and collaboration), 2. Information, media and technology skills (consisting of information literacy, media literacy, information and communications technology (ICT) literacy), and 3. Life and career skills (consisting of flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, and leadership and responsibility). Again, there is overlap with the previous proposals for competence and skills frameworks for successful life and a well-functioning society.

For the field of leadership in the VUCA-world, which is characterized by vulnerability, uncertainty, complexity and ambiguity, Vora (2015) defined mind-sets and skills which are also important for the discussion on competence for life. Vora formulated these as processes: develop an adaptive mind-set, have a vision, embrace an abundance mind-set, weave ecosystems for human engagement, anticipate and create change, be self-aware, be an agile learner, network and collaborate, focus on the customer, develop people, design for the future, constantly clarify and communicate. Obviously aimed at management, and not at education and society as a whole, there are many elements in this overview which are relevant in this respect. The latest development in the discussion on competence for life and society tentatively culminated in the global competence movement, which is very topical given the current global tensions. Based on the vast literature on intercultural competence, this field already produced extensive matrices, assessments of global

competence aptitudes, and certificate programs for global competence. The global competence movement relates to the quest for inclusive education for the democratic ideal, also expressed by the Council of Europe (2016) in their report 'Competences for Democratic Culture', which is to a large extent based on the work of Deardorff (2009) on intercultural competence. The latest publication on global competence is of the OECD (2016b) which stresses the importance to focus on global competence to establish a more inclusive world. In contrast to the way in which the European Union defines competence, the OECD framework of global competence consists of the three components defined widely as essential in competence, which are knowledge, skills and attitudes (Mulder, 2014; 2017). The OECD model also includes values, although the essence of the affective domain in the literature on educational objectives is the same: the integration of a value system in personal and professional identity. As such, the value component is integrated in the attitudinal aspect of competence. In the OECD model, knowledge, skills and attitudes together make the competencies which are needed for action. In the domain of knowledge, disciplinary, interdisciplinary and practical knowledge are distinguished. The field of skills consists of cognitive and meta-cognitive skills, social and emotional skills, and physical and practical skills. The OECD plans to include the measurement of global competence in its 2018 PISA study, and is thinking of including the themes 'knowledge and understanding of global and intercultural issues', 'ability to interact respectfully, appropriately and effectively', 'flexibility', 'empathy', 'openness towards people from other cultures', 'respect for cultural otherness', 'global-mindedness' and 'responsibility' (OECD, op cit). These global competencies are also important to include in the discussion about competence for life.

The last contribution regarding the definition and selection of essential competencies for life and society is the list of so-called 3.0 competencies for the future as published in the last chapter of the book *Competence-based Vocational and Professional Education* (Mulder, 2017). This list includes ambiguity handling, argumentative reasoning, balancing interests, complex problem solving, computational thinking, creativity – creation, entrepreneurship, global competence, intuition, mindfulness, negotiating meaning, professional identity, resilience, sustainability, transformation and uncertainty handling.

Looking back on these sets of competencies, the question arises if a synthesis is possible. As said repeatedly, the different sets of competencies, key competencies, global competencies, life skills and 21st century skills, are all important to consider in the discussion on what competencies are necessary for the future, and to include in a broad framework of competence for life. So is a synthesis of all future competence proposals possible? A first attempt has been made, and the result of this is presented

below. All key competencies, 21st Century Skills, Essential learning outcomes, Survival skills, Critical competencies, Global competency, and Competencies 3.0 mentioned above have been taken into account, which leads to a model of competence for life (see Figure 2), which consists of two dimensions and a core. The core of the model is *integrative learning competence*, which is essential for grasping understanding from all other fields in the model. This integrative learning competence consists of ambiguity and uncertainty handling, dealing with vulnerability and ambiguity, developmental competence, knowledge co-creation competence, evaluation competence, synthesizing competence, sustainability competence, lifelong learning competence, and transformation competence.

The vertical dimension consists of the disciplinary/interdisciplinary knowledge base and the personal ability to manage oneself and one's career. The knowledge base is fundamental and should not be neglected. The horizontal dimension is the dimension of professionalism, and consists of the personal and social competence side of that.



Figure 2. Components of Competence for Life

Foundational *disciplinary and interdisciplinary competence* includes financial, economic, business literacy, mathematics literacy, social sciences literacy, humanities literacy, languages literacy, arts literacy, digital (ICT) literacy, media and information

literacy, reading, writing, numeracy, computational competence, science, technology, design and inquiry literacies, environmental literacy, higher order thinking, sound argumentative reasoning and analysis, and interdisciplinary problem solving competence.

Self-management and career competence includes acting autonomously, self-regulation competence, life planning competence, personal project planning competence, responsibility, managing for results, prioritizing, productivity, accountability, resilience and stamina, sense of initiative, innovation and entrepreneurialism and calculated risk taking.

Personal-professional competence includes adaptability, flexibility, agility, reflection and self-awareness, emotions handling, curiosity, imagination, and creativity, intuition, mindfulness and integrity, big picture visioning, global competence, cultural awareness and expression, civic competence (balancing, defending/asserting rights, interest, limits, needs), anticipate and create change, critical thinking and complex problem solving, managing complexity, health competence, physical competence, and ethical reasoning and action competence.

Finally, *social-professional competence* includes civic knowledge and engagement, relating well to others, interpersonal competence, interactive communication skills, clarification competence, meaning negotiating competence, multicultural literacy, productive teamwork, collaboration in networks, creating ecosystems for engagement, leadership competence and managing and resolving conflicts.

As will be clear, these competencies do not suggest an order of priority. Further study and discussion is necessary to define, refine and aggregate these competence domains and link them to initial and lifelong learning arrangements to be sure the current population of children and students learn the right things. This looks like the quest to get skills right and solve skills mismatch, which is also an OECD (2016a) initiative, but the skills debate is more about the match between education programs and jobs, whereas the competence for life debate bears broader relevance for life and society. Questions which pertain to the discussion of further defining and selecting life competencies are the following: are the competence dimensions well chosen? are the headings inclusive enough? are the specifications in the parts of the model mutually exclusive and well-placed? So enough questions to think about – in the future.

Conclusions

Having said all this, let me finish with these conclusions:

- There is a wide variation in competence theories.
- The competence approach is much criticized.
- But it is more popular than ever.
- The concept has a long history – and is now institutionalized.
- However, many competence-based education initiatives concentrate on known tasks and present jobs.
- We must, however, also think about competence which is essential for life in the unknown future.
- Furthermore, research is needed on dedicated learning arrangements which contribute most to the acquisition of competencies which are needed in the future.

So far about my view on competence for the life in the unknown coming decades.

Words of thanks

With this I am coming to my words of thanks. I am really very grateful for the wide support I have had from my parents, teachers, partner and colleagues during my studies and career. Actually there are too many persons to thank individually, so I will have to limit myself here.

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Last but not least, my home front: with my life time partner, 3 children, their partners and 5 grandchildren, I feel blessed. Willemijn: as you will remember, at the end of my inaugural address of 2004, I said that I was sorry for deceiving you with my second love: educational science. To make it even worse: I promised at that moment to not change that on the short term. Terrible. But now I am telling you: I am not promising that again, if you understand what I mean. I really look forward to having much more time together in the coming years. Thank you for everything you did.

Finally: all of you here present today: thanks for coming. I appreciate that very much. Thanks.

Ik heb gezegd.

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'The concept of competence is probably as old as humanity. Introduced in the academic literature in the 1950s, it underwent a remarkable development. Used in the 1960s, criticised in the 1970s, discarded in the 1980s, renewed in the 1990s, and transformed in the 2000s, the global competence movement in the 2010s is stronger than ever. Started as an approach to train specific skills and teach for known jobs, it developed as a strategy to align the worlds of work and education and to prepare professionals for the labour market and lifelong learning. Now it is time to think about competencies for the unknown future and about ways to learn these.'