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1. Introduction

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When we rise in the morning for a new day we expect water for a shower, fruit, bread and coffee for breakfast, transportation to get to work, and a workplace to do our job. When we travel abroad, we expect a safe flight and hospitality. When we get sick we expect effective medical treatment. In all these processes billions of people deliver goods and services, and we expect they are competent in what they are doing. But how often do we become frustrated because what we get in terms of goods and services is not what we expected as a result of gross incompetence.

An example. A car owner had problems with the LPG installation in the second-hand vehicle they had recently bought. This installation was built in by the garage where the car was bought. But after a while the car did not run smoothly and the owner returned to the mechanic who had built in the LPG installation. The story was that the gas pump was broken and that it needed to be replaced. This was done, but when the car owner went on holiday abroad the problem came back and the car could not use all of its engine power, which caused serious danger when driving uphill. So an LPG installation expert in the region was consulted for a check. It appeared that the gas pump seemed to be broken (again) and that it should be (again) replaced. However, this car mechanic found out that the problem was caused by an improper installation of the gas pumps. According to him some car mechanics tend to forget to remove a special small plastic cap during installation. The explanation of this error was that the instructions for this detail in the manual were printed small and were a bit unclear. But the error causes damage to the gas pump. After this repair the problem of engine power loss never occurred again. To cut a long story short, a small bit of incompetence created a considerable problems. Issues like this happen on a daily basis. Luckily, most of them are just annoying but not harmful or fatal. But what if this happens in a nuclear power plant, pharmacy, surgery or even education? Look at the mistakes made by medical professionals. Think of the teachers who are not able to maintain their position in classrooms and who instead of nurturing

relationships with their pupils and students devastate them. It is obvious: competence is badly needed. And when we experience competent behavior in problem situations, we are immediately relieved.

1.1 The importance of competence

Not many people will argue the necessity of competence in professional decision making and behavior. Some may believe, however, that the competence movement is somewhat outdated, and overruled by current practices of online learning and other innovations. These people most likely think of the first wave of competence policies and practices, which some have experienced in their own education. The current status of educational innovation is all about learning analytics, Massive Open Online Courses (MOOCs) and brain research. Or? Well, as a surprise, current innovations in education and the competence movement were linked to each other in a 2014 issue of a leading business science journal. It says: ‘The Real Revolution in Online Education Isn’t MOOCs.’ ‘... there is a new wave of online competency-based learning providers that has absolutely nothing to do with offering free, massive, or open courses. In fact, they’re not even building courses per se, but creating a whole new architecture of learning that has serious implications for businesses and organizations around the world. It’s called online competency-based education, and it’s going to revolutionize the workforce’ (Michelle Weise in the 17 October 2014 issue of *Harvard Business Review*). Education has seen many fads and fashions, and MOOCs may be one of them, but competence-based education certainly is not. Why is it that this educational philosophy is so persistent that it has now lasted for over fifty years?

The reason for that may be simple: as said, society needs a competent workforce. Fifteen years ago, Raven and Stephenson (2001) stated that the world was far away from a competent society. Since then, much has been done, but a lot still has to be done to achieve a competent society. Education has often been accused of delivering graduates who are not really prepared for their jobs. Massive corporate training and development provision has to prepare the workforce for their future jobs, improve their current performance, and increase their employability. Graduates may be knowledgeable and may have had broad and deep inductions into a given field, but their capability of using that knowledge in specific working situations may be limited and not meet the requirements of the stakeholders involved: employers, managers, supervisors, subordinates, colleagues, clients and the public. Workers in elderly homes, hospitals, schools, banks, many of them are seen as utterly incompetent. If the word incompetence is googled, nearly ten million of hits are shown, including endless number of cases of incompetent work.

Worldwide, competence-based education has gained much interest as an innovation to prepare more effectively for superior performance, to overcome the barriers between the world of education and the world of work, and to align educational programmes in vocational, professional and higher education to labour market needs and developments in society. This

educational philosophy has challenged education to step out of its comfort zone, away from memorizing text books and doing reproductive tests, and to think outside-in. What does the changing society need from graduates, who will get or create jobs that may not yet exist? What education does the current generation of kids who enter the elementary schools need, when they – after 14 years from now – enter the labour market or go to college? This out-of-the-box thinking has resulted in lots of investments in aligning labour market needs and workforce education programs. This trend is amplified by theoretical notions of experiential (Kolb 1984), authentic (Donovan, Bransford and Pellegrino 1999), and workplace learning (Malloch, Cairns, Evans and O'Connor 2011).

But to what extent is competence-based education a novel and promising innovation? Or is it an eroded and failed approach to link work-related education to the labour market and to train students in narrow skills and give them a useless qualification? What is competence in the first place (Le Deist and Winterton 2005)? It is known that the concept of competence has a long history (Mulder 2014). The notion of competence, as knowing who is good enough to perform certain activities, is probably as old as humanity. Early accounts can be found in the Persian (17th century BCE), Greek (3rd century BCE), Latin, and Western European languages (16th century AD). In the beginning of the 20th century the concept of competence was also used in academic publications (see Dewey 1916), but it was not yet used as an academic construct.

1.2 The construct in science and practice

During the second half of the 20th century the theoretical construct of competence was introduced in various domains, such as in psychology, education, performance management, and corporate strategy. These developments will be shortly described here, by following a review of the professional competence literature (Mulder 2014).

In psychology, White (1959) saw competence as an alternative construct for the drive theory of Freud, and defined competence in terms of the innate motivation to master skills, like a young child that wants to learn to crawl, walk or speak. Freud contended that performance was in most cases sexually driven. White stated on the other hand that performance is driven by the will to master. On this psychological view, the later performance motivation theory was founded. The early work of Argyris (1962; 1965; 1968) built upon the work of White and studied interpersonal competence from a behavioral psychology perspective.

The disconnection between education and the world of work or job success was shown by McClelland (1973). He made a plea for testing on competence instead of on intelligence; at that time intelligence testing was the dominant approach in test psychology. However, the application of these tests, and the mere construct of general intelligence, was heavily contested. The opinion of McClelland was that tests of human performance should be based on showing and assessing that performance in practice.

During these years, competence-based education in the USA was introduced as a response to the lack of societal relevance of many educational programmes. There were many innovation projects in which competence-based education was implemented. Norton, Harrington and Gill (1978) and Grant, Elbow and Ewens et al (1979) described the design and implementation of competence-based education. The first evaluations were quite critical, such as in teacher education literature, in which Competency-Based Teacher Education (CBTE) was contrasted with Humanistically-Based Teacher Education (HBTE). CBTE was seen as being too behavioristic, atomistic, functionalistic, and controlled. Based on theories of Maslow (1943) and Rogers (1969), more value was attached to higher levels of self-realisation, student-centred learning, and personal and identity development. Based on the student movements of the 1960s, critiques on the capitalist society and the reconstruction of structural socio-economic inequalities by education, there were various neo-Marxist sociological and political views proposing radical changes in education (Freire 1968; Illich 1971; Apple 1972).

Because of these developments, much of the competence-based education movement was silenced, although general discontent with the detachment between education and society was not over. People believed that education remained in an ivory tower, that curricula were often outdated before they were even fully implemented, and that the education system was failing to meet the needs of the labour market. Moreover, teachers could not keep up with rapid developments in business and industry, leading to pleas for organizing internships for teachers in companies and facilitating guest lectures of relevant professionals from the world of work.

Gilbert (1978) consequently suggested connecting competence development with performance improvement, arguing that the performance improvement potential (PIP) is a much more positive indicator of human behaviour than the intelligence quotient (IQ). His work was more popular in business contexts than in education. However, it sparked interest in developing the field of performance improvement technology which became quite popular in general and human resource management. This movement also resulted in thinking about performance support systems. A classic example of this is of the pizza couriers who delivered pizza boxes which were crushed so that the box stuck to the pizza. More training of how to deliver pizzas was not effective, but placing a small plastic scaffold in the box did the trick. It prevented the box from crushing. In workplaces today there are many smart performance-support systems, many of which are digital in nature and embedded in daily work processes.

At a higher level of organizational thinking, Prahalad and Hamel (1990) applied the construct of competence in the field of corporate strategy. They convincingly showed that organizations which followed a strategy based on core competence did better. It resulted in the trend of focusing on the core competence of the organization and outsourcing all secondary business functions. The long term effect of this lean-and-mean strategy was not purely positive, as business functions which were outsourced resulted in companies who could also deliver their services to other companies and some of them even became competitors of their original parent companies (Arruñada and Vázquez 2006).

The work of Prahalad and Hamel on corporate strategy resonated well in educational board rooms. Many schools and colleges still had to deal with the public perception that their programs lacked societal relevance. They saw the core competence movement as an alternative to the earlier attempts to implement competence-based education via educational policy making and human resource management in schools. Human resource consultancy firms jumped in the gap in the market to develop competence-based management frameworks, competency dictionaries and tools for competence-based selection and assessment. First companies, and later schools and even universities massively bought these services or developed and implemented their own systems (Mulder 2001a; 2001b).

What was especially appealing in the approach of Prahalad and Hamel was that it triggered the idea that strategy should be focused on doing things in which organizations excelled. Translated to education that implied that school and colleges had to focus on talents of students. This creates much more positive energy than when schools and colleges focus on things their students cannot do. This view of Prahalad and Hamel also helped educational institutions with their decision making regarding their educational objectives, concentrating on the core objectives of education and educational programs. A main problem of many educational programs is that they are containerships stacked with course units or modules which are inserted by departments or faculty members under the umbrella of a program name, but which are really incoherent sets of overloaded and overspecialized introductions into disciplinary knowledge. A common remark of the respected faculty is that there is too little time to teach the units and that more time is needed to address even more knowledge of the same specialization. However, what is lacking is the understanding that there is never time enough to teach all knowledge from a certain field. Instead, educators need to think about the core competencies which are important, and learning to learn is certainly one of them. That means that curriculum units in a competence-based learning environment serve as introductions to enable graduates to develop themselves further in the field.

The notion that core competence is essential in steering organizations based on what they are good at also entered the field of professional development and licensure. It encouraged professional associations to think about the core of their professions. Many developed competence frameworks which served as representations of that core. There are plenty of examples of research and development studies which delivered competence frameworks, such as in purchasing (Mulder, Wesselink and Bruijstens 2005), extension (Karbasioun, Mulder and Biemans 2007), open innovation (Du Chatenier, Verstegen, Biemans, Mulder and Omta 2010), entrepreneurship (Mulder, Lans, Verstegen, Biemans and Meijer 2007; Lans, Biemans, Mulder, and Verstegen 2010) and sustainable development (Wiek, Withycombe and Redman 2011; Wesselink and Wals 2011), to name a few.

Since the introduction of the construct of competence, various conceptual analyses, reviews and research papers have been published (Ellström 1997; Rothwell and Lindholm 1999; Hager 2004; Le Deist and Winterton 2005; Mulder 2014). As with many new concepts in social science, many authors have given different definitions of ‘competence’ and

‘competency’, and reviewers have pointed at the different dimensions that have been reflected in these definitions.

Furthermore, various authors have heavily criticized the concept (Hyland 2006; Mulder, Weigel and Collins 2007); some even suggested to completely delete the concept from the professional and academic dictionary because of its ill-defined nature, lack of explanatory power and limited value added in practice (Westera 2001).

Some of the critiques are valid, some exaggerated, but the concept of competence proved extremely resilient arguably becoming *the* defining characteristic of European policies on employment, education and training. From November 1997, when the European Employment Strategy (EES) was launched at the Luxembourg Summit, measures to improve employability and adaptability have been adopted to combat unemployment, raise the employment rate, increase worker mobility and improve education-to-work transition (EC 1997). Developing the competence of the working population was one of the key mechanisms of the EES and the high skills strategy launched at the Lisbon Summit in March 2000 reinforced this imperative, establishing a policy objective of making Europe *by 2010* ‘the most competitive and knowledge-based economy in the world capable of sustainable growth and better jobs and greater social cohesion.’ (EC 2000: para. 5).

Lisbon marked the beginning of a new European policy framework for education and training, establishing targets and benchmarks and linking these with the EES and policy initiatives on Lifelong Learning that were developed in parallel (CEC 2000). After consulting Member States, the Commission produced a report in January 2001 proposing means for raising the standard of learning in line with the Lisbon objectives (Cedefop, 2003), while the Barcelona summit (March 2002) set the objective of making European education and training systems a world quality reference by 2010 (CEC 2002b). In pursuit of this high skills agenda, the Commission also published an *Action Plan for Skills and Mobility* in February 2002, emphasizing the need to increase occupational mobility of workers from the poorer regions to those of the wealthier regions of the EU (CEC 2002a).

The adoption of competence-based VET and outcome-based HE was driven by the need to make education and training more responsive to changing labour market needs, supporting the employability and adaptability imperatives of the EES as well as the high skills goals of the Lisbon Strategy and later by *Europe2020*. Competence was seen to offer a unifying concept bridging the ‘parallel universes’ of VET and HE, thereby facilitating permeability (transfer between VET and HE in either direction) and labour mobility (in career, sectoral and geographic senses) as well as being the foundation for accreditation of prior learning and recognition of work experience. The Lisbon summit called for ‘reflection on concrete future objectives of education systems focusing on common concerns and priorities while respecting national diversity’ (EC 2000: para. 27). However, national diversity in approaches to competence proved one of the major obstacles to developing European-wide instruments.

An important part of the rationale for this book is this continued confusion and diversity in approaches to competence that make coordinated policies so difficult to design and implement. The provenance of different competence models and qualifications systems can easily be traced to the specific historical and cultural traditions that led to distinctive forms of labour market regulation, training regimes and work cultures (Brockmann, Clarke and Winch 2011; Winterton 2009). These origins explain why it is so difficult to develop a common European framework for competence, since the institutions and processes in which the models are rooted have endured. For two decades EU policy initiatives have struggled to establish a common European competence model that can accommodate these differences and the challenge of developing European policy instruments is to align the different competence models (using approximation rather than harmonization).

The development of a typology of ‘knowledge, skills and competence’ for the European Credit Transfer System for VET (ECVET) offered insight into how such a ‘best fit’ approximation could be undertaken (Winterton, Le Deist and Stringfellow 2006) even though the ultimate outcome demonstrated the pitfalls of incorporating technical and political interests when developing such frameworks. The Directors-General for VET in their Autumn 2001 Bruges meeting had agreed on further efforts to enhance European-wide cooperation and in the Copenhagen Declaration (2002) gave a commitment to develop ECVET. The Commission established a Technical Working Group (TWG) in November 2002 with representatives of member states to develop the principles. Cedefop, which provided the secretariat for the TWG, commissioned underpinning research to design the ECVET architecture: the credit transfer system (Le Mouillour 2005); reference levels for qualifications (Coles and Oates 2005); and a typology of knowledge, skills and competence (Winterton, Le Deist and Stringfellow 2006).

The typology proposed identified four analytically distinct sets of competencies as a way of reconciling the three main European competence models and recommended adopting the terminology of cognitive competence (for knowledge), functional competence (for skills) and social competence (covering attitudes and behaviors). It was also recommended that the term competence without an adjective should be understood as an umbrella term including all three dimensions in a work context. The TWG, however, retained the terminology of the original remit, and in the note elaborated by the Commission (CEC, 2004), for the adoption of ECVET at the Maastricht summit on 14 December 2004, as well as in subsequent ECVET documentation, the phrase ‘knowledge, skills and competences’ was employed without further definition.

During the development of ECVET, the Berlin Communiqué (2003) recommended replacing notional workload time with learning outcomes in HE as part of moves to establish an overarching framework of qualifications for the European Higher Education Area. The parallel European Credit Transfer Systems (ECTS) for HE, extended to all Member States under the Bologna Declaration (1999), was based on notional workload input rather than competence (CEC 2003; Winterton 2005) and the notion of a single qualifications framework encompassing both VET and HE required HE to adopt competence-based learning outcomes.

The Expert Group convened by the Commission to develop proposals for a European Qualifications Framework (EQF) retained knowledge and skills in their typology but replaced competence with ‘personal and professional competence’ (Markowitsch and Loumi-Messerer 2008: 37), which was further subdivided into: autonomy and responsibility; learning competence; communication and social competence; and professional and vocational competence. A conference convened in Budapest in February 2006 to consider the EQF proposals re-defined competence as ‘learning outcomes in context’, whilst another expert group tasked with redesigning the descriptors replaced competence entirely with ‘learning outcomes’ comprising: knowledge; skills; and responsibility and autonomy, under which there was a move to subsume ‘competence’ (Markowitsch and Loumi-Messerer 2008: 42). A further TWG established in May 2006 with representatives from member states finally restored competence in place of ‘responsibility and autonomy’, but expressed as ‘competence (responsibility and autonomy)’.

As subsequent European policy instruments were developed, even greater confusion was introduced, with increasingly divergent definitions of competence. After a mid-term assessment of the Lisbon Strategy in 2004 found progress disappointing, a revised Lisbon Strategy was unveiled (CEC 2005a p. 1). The emphasis was again on increasing adaptability and flexibility of firms and workers to enable Europe to adjust to restructuring in the light of global market changes; simplifying mutual recognition of qualifications to facilitate labour mobility; and investing more in human capital. In November 2005, the Commission proposed a framework of *Key Competences for Lifelong Learning* (CEC 2005b) which included a European Reference Framework on Basic Skills, defining competence as ‘a combination of knowledge, skills and attitudes appropriate to a particular situation’ (p. 2 of Annex), and key competencies as supporting ‘personal fulfilment, social inclusion, active citizenship and employment’ (p. 3 of Annex).

With the onset of the Global Financial Crisis, the Commission published *A European Economic Recovery Plan* (CEC 2008a), outlining four strategic aims: to stimulate demand and boost consumer confidence; to lessen the human cost of the economic downturn and its impact on the most vulnerable; to ensure that when growth returns the European economy is in tune with the demands of competitiveness; and to accelerate the shift towards a low carbon economy. Supporting training and development initiatives were outlined in *New Skills for New Jobs* (CEC 2008b), which reiterated the need to enhance human capital and employability as well as ensuring the alignment of skills supply with labour market demand. *New Skills for New Jobs* was designed to anticipate future skills needs; to develop strategies to raise the overall skill level of the European labour force; and to reduce skills mismatches in the European economy. The expert group supporting this initiative recommended a T-shaped competence profile where transversal skills (the horizontal bar) are combined with job-specific skills (the vertical bar).

In the face of a deepening economic crisis, the Brussels Summit in March 2010 endorsed *Europe 2020* as a new strategy for European economic recovery (CEC 2010). Providing

relevant, high quality skills and competences was seen as a key part of the strategy (Bruges Communiqué 2010), but as the *Transferable Skills* project noted, in interim findings presented in November 2010, there was still no agreed competence model at EU level. The *Transferable Skills* project therefore adopted the knowledge, skills and attitudes model of the European reference framework *Key Competences for Lifelong Learning* (CEC 2007), supplementing this with individual ‘characteristics’ (including inborn or acquired psycho-social characteristics), thereby confusing ‘input’ characteristics with ‘output’ competencies.

Competing definitions of competence in European policy instruments derive less from the longstanding national differences in approaches to competence and more from inherent confusion in the theoretical underpinnings of the work on which they are based. The EQF, adopted on 23 April 2008, was designed to offer a facilitating framework for mapping qualifications using knowledge, skills and competence descriptors (CEC 2008). In the EQF, knowledge is described as ‘theoretical and/or factual knowledge’, skills as ‘cognitive skills (use of logical, intuitive and creative thinking and practical skills (involving manual dexterity and use of methods, materials, tools and instruments)’, and competence is described ‘in the sense of the assumption of responsibility and autonomy’ (Sellin 2008: 15). Most European countries have either aligned their National Qualifications Frameworks with the EQF or are in the process of doing so (Hanf and Rein 2008; Hozjan 2008; Tierney and Clarke 2008; Tütlys and Winterton 2006) and many problems have been encountered in the process (Bohlinger 2008). Markowitsch and Loumi-Messerer (2008: 53) argue that some of the problems stem from three implicit hierarchies operating within the EQF: an educational (or systemic knowledge) hierarchy; an occupational (or competence) hierarchy; and a skills (or individual attributes) hierarchy. Through the lens of each hierarchy, the EQF takes on a different aspect.

Various EU instruments have been developed to support the alignment of qualifications and competence models but far from resolving the difficulties these have introduced further conceptual confusion and discrepancies (Winterton 2011). For example, in 2010, the Report of an Expert Group established to propose ways of developing the *New Skills for New Jobs* initiative in the context of Europe 2020, demonstrated the inherent confusion in policy thinking with a definition of skill that is, to say the least, idiosyncratic:

Throughout this report, the term ‘skill’ subsumes knowledge, skill and competence defined in the European Qualifications Framework, where ‘skills’ means the ability to apply knowledge and use know-how to complete tasks and solve problems, and ‘competence’ means the proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development. (EU 2010: 4).

European agencies have even published misleading comments, suggesting, for example, that the zones of mutual trust in the reference levels document produced by Coles and Oates (2005) for ECVET was somehow a conceptual alternative to the competence typology (Bohlinger 2008: 101), whereas Coles and Oates explicitly incorporated the typology in their explanation of how such trust is developed.

Notwithstanding the numerous difficulties, competence has attained a pivotal structural position in international educational policy and administration well beyond the increasing popularity of competence-based education at the level of local schools and national educational frameworks (Winterton and Haworth 2013). Despite the difficulties noted above, the EQF is one of the most prominent examples of the policy influence of the competence movement (Brockmann, Clarke and Winch 2011; Council of the European Union 2004; 2008; Mulder 2012); apart from that, ‘competences’ of European Institutions are seen as the decision making powers of the Union (Article 5 (1) TEU stipulates: ‘The limits of Union competences are governed by the principle of conferral. The use of Union competences is governed by the principles of subsidiarity and proportionality’); and competence development is the cornerstone of many lifelong learning agendas (Council of the European Union 2008), including those of the European social partners (European Social Partners 2006). On a wider scale, there is ample experience with the implementation of competence-based education in the Americas (Houston 1974; U.S. Department of Education, National Center for Education Statistics, 2002) and Australia (Gonczi 1996; Arguelles and Gonczi 2000); various countries in Africa (Mulder and Gulikers 2012) and Asia (Nederstigt and Mulder 2011) also have adopted competence-based education development agendas, which is partly influenced by western education development agencies, and institutions like UNESCO (including UNEVOC), the OECD, the World Bank, and the ILO.

So the concept of competence, after having been used for centuries in daily language, and having circulated around half a century in motivation psychology, business management, and educational sciences, is now institutionalized, whether we like it or not.

The institutionalization of the competence-philosophy in international educational policy and administration process mainly serves an operationalization function in the comparison of educational levels, which in turn is worthwhile for transparency and mobility reasons. From instance, if nurses or medical doctors, engineers, computer scientists or accountants from southern European countries wish to migrate to western European countries, or the other way around, diploma comparison is easier if the educational programs of these professionals can be compared via the EQF as reference framework. The idea behind this is that the EQF would facilitate labour mobility. Indeed, qualifications in regulated professions such as medicine and pharmacy were already aligned in Europe through a process of ‘homologation’ long before the EQF was conceived.

However, competence-based education includes more than the international educational policy making and international or national qualification, certification or credit frameworks. It is also about the actual implementation of competence-based curricula, instruction and assessment in practice. At this level, there are also different ways in which competence-based educational philosophy is used, such as in curriculum re-design, the design of instructional processes, competence assessment, human resource management and teacher professional development. There have been various implementation challenges, as has been pointed out in numerous publications (Biemans, Nieuwenhuis, Poell, Mulder and Wesselink 2004; Biemans, Wesselink, Gulikers, Schaafsma, Versteegen and Mulder 2009; Winterton, 2011). Instrumental

guidelines were developed to overcome barriers and to support management and teachers to better implement this innovation, within a policy–framework that promoted competence–based education.

This actual use of and experience with the competence concept in daily educational practice, like in the development and use of competence frameworks of medical doctors, nurses, financial advisors, and teachers, in the development and implementation of competence–based education, and assessment practices, have had a tremendous impact on the discussion of its worth. Because of many parallel measures, like over–standardization in education, austerity measures, narrowing job profiles as a basis for skill–based training programmes, and reorganization, the debate on competence got contaminated by experiences with, perceptions of and opinions on these measures, especially because in various cases the implementation of these measures was justified by the relevant stakeholders by emphasizing the expected benefits of competence–based education. Moreover, scholars who were adhering to other paradigms of education, contended that there was no underpinning theory, sound empirical research evidence, nor extensive practical experience with the competence–movement, and that competence was nothing more than a metaphor.

1.3 Definitions

A major issue in the uncertainty and multiplicity of understandings of competence is in how the concept is defined. Many definitions circulate, and global consensus seems to be hard to reach. It may be wise to look at the Webster first to see that the common understanding of competence is. The dictionary says:

‘**competence** *n* (1632) **1** : a sufficiency of means for the necessities and conveniences of life <provided his family with the comfortable ~ – Rex Ingamells> **2** : the quality or state of being competent: as **a** : the properties of an embryonic field that enable it to respond in a characteristic manner to an organizer **b**: readiness of bacteria to undergo genetic transformation **3** : the knowledge that enables a person to speak and understand a language – compare PERFORMANCE

competency *n, pl* –cies (1596) : COMPETENCE

competent *adj* [ME, suitable, fr. MF & L; MF, fr. L. *competent–, competens*, fr. prp. or *competere*] (14c) **1** : having requisite or adequate ability or qualities : FIT <a ~ workman> <a ~ piece of work > **2** : proper or rightly pertinent **3** : legally qualified or adequate <a ~ witness> **4** : having the capacity to function or develop in a particular way; *specif* : having the capacity to respond (as by producing an antibody) to an antigenic determinant <immunologically ~ cells> *syn* see SUFFICIENT – competently *adv*’

A lot can be learned from these descriptions. We will not go into the 4th meaning of competence as given in the definition, which was and still is used in cell biology. See for instance the work of Shiver (2002) on replication–incompetence of a vaccine vector which is

of influence on immunity. The essence here is that the capacity of organisms to respond to intruders is also called competence. That is in line with how we see professional competence.

What can be learned first of all is (and what is mentioned above already), that ‘competence’ is a noun which was already in usage in the 17th century. It has several meanings. In the first place it is about ‘a sufficiency of means for the necessities and conveniences of life’, which means in current times that a person has *sufficient resources*, including employment and career competence for maintaining a livelihood and a personal lifestyle. Secondly, it means ‘the quality or state of being competent’, which is illustrated by three ways of using this meaning, stressing the *properties* that enable to respond (as in the example from cell–biochemistry), the *readiness* to undergo transformation and the *knowledge* to use a language. This means that in these few sentences we already have six related but different meanings of competence as:

- resources;
- quality of being;
- state of being;
- properties;
- readiness;
- knowledge.

From the description of competency, which is also a noun, we can learn that it was already used in the 16th century. The plural is competencies, which is interesting, because there is no plural indicated in the description of competence. That is also understandable as competence is seen as a general state of being, a quality of being, as having sufficient resources, as properties, readiness and knowledge. That understanding of competence make the plural competences meaningless. Because what would be the plural of the state of being, the states of being, or of the readiness to change, the ‘readinesses’? That does not make real sense. Therefore competence is often regarded as the most generic description of what people are able to do. Competency itself is not further described in the dictionary, it refers to competence, as if both would be synonymous, which, in the current understanding is not the case.

The concept ‘competent’ is an adjective or adverb, relates to being suitable and the French/Latin competent, competens, or competere, and can be used in phrases as: this person is very competent, or that is very competent behavior. The description indicates four ways of using ‘competent’, first of all as having conditional or sufficient ability or qualities, which is linked to the resources and quality of being mentioned above. Secondly it is used in the meaning of being rightly appropriate. We can think of a phrase like ‘this is a competent solution for this specific problem’, which means it is adequate in the given situation. Thirdly, competent is used as legally qualified or adequate. This juridical meaning is different from all other descriptions of the concepts in the dictionary, but it is still used to indicate the legal powers of certain people or institutions and a competent authority in the legal sense is one that

is deemed also to possess the requisite abilities. Fourth, competent means the ability to function or develop. This meaning comes very close to what many scholars understand as being competent.

So for the concept ‘competent’ there are four meanings which are distinguished. These are:

- having conditional or sufficient ability or qualities;
- adequate;
- legally qualified or adequate;
- the ability to function or develop.

In Webster’s Dictionary, the core of the concept ‘competence’ is therefore a combination of having resources, a quality or state of being, properties, readiness and knowledge to maintain a livelihood, being able to respond, to undergo transformation or to use a language. In general and current language these meanings can be described by the capability to make a living, the characteristics of persons that make them competent, the ability to adapt and change, and knowledge. Knowledge, as in the ability to use a language, is possibly a somewhat strange meaning of competence, as generally there is more needed to perform like speaking or reading, which is skill. But this meaning of competence is interesting as it goes against the general reactions on competence-based education which state that in this educational philosophy – or rather practice – knowledge is undervalued. Apparently conceptually not, as it is included in the description of the concept.

Also in Webster’s Dictionary the concept of ‘competent’ is a combination of having abilities or qualities, being adequate or qualified and ability to function or develop. There are a couple of things which are striking here. First of all, it is interesting to note that this meaning of competent goes against opinions which state that competence or being competent is aimed at a bare minimum of performance. Services and goods which are just acceptable mostly do not meet the expectations of supervisors, employers and above all clients. The phrase adequate may be interpreted in that minimalistic way, but is in fact more positive than minimal or acceptable. Having conditional or sufficient qualities does not necessarily mean that they are ‘just enough’: it all depends upon how high the bar is placed. Obviously competent does not convey the same impression as excellent and there are of course gradients of competence. If a medical specialists are described as very competent, that means they are seen as excellent doctors. Now excellence itself is not the same a brilliance, which implies an even higher level of ability. Secondly, it is also interesting to note that competent is seen as the capacity to develop. So, a competent medical practitioner would be someone who can further develop, as in lifelong learning, keeping up with innovations in the profession and further specialize in a certain direction. Thirdly, the notion of legality comes in, which corresponds with the fact that the concept competent is also being used in law. In the dictionary it says that a witness can be declared competent. The opposite can also be the case: a witness can be declared incompetent, for instance based on personality disorders or intelligence impairment. But more generally, institutions can also be declared competent, which means that they have the right to perform certain tasks, or to take certain decisions. This holds for various local, regional, national and

international institutions which exert a certain power, such as governments, parliaments, courts of justice, committees and commissions. Fourthly, being competent also means being qualified, which implies that there should be a person, organization or institution which can decide whether an individual is qualified. In the context of this Volume this is obviously the educational institute. But beyond that, competence assessment organizations, accreditation bodies, inspectorates and ministries also play a role.

Now, what can be learned from this detailed analysis of the concepts ‘competence’, ‘competency’ and ‘competent’ as described in Webster’s Dictionary?

Briefly then, ‘competence’ is seen as resourcefulness, a quality or state of being, and a set of properties which enable transformation and performance in various ways, and ‘competent’ as having abilities or qualities in general, having the ability to function or develop, and being adequate or qualified.

So both concepts of competence and competent entail meanings of having and being, in the sense of having competence and being in a state of competence, and having abilities or qualities and being competent; in general this distinction can be summarized in that someone *is* competent, and *has* competence (and therefore possesses certain competencies).

In the descriptions of competence and competent there are references to properties, abilities and qualities. These are all plural, which are the competencies that together constitute competence.

Based on this linguistic analysis and previous scientific reviews, we propose to define the core concepts in this Volume as follows.

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

Competency is an element and characteristic of competence; e.g. this researcher has a 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 is the plural of competency; e.g. the framework of competencies of teachers

We do not define ‘competences’ here, although it is used in the mainly policy-oriented literature, for the reason mentioned above, which is that competence is defined here in itself as the generic state of being competent. Competences in the European Qualifications Framework (EQF) go against the definitions here, as a competency is seen as an integrated mix of knowledge, skills and attitude elements. For instance, as a follow-up on the previous example of entrepreneurship, the competency of entrepreneurship is here seen as a combination of knowledge domains on and for entrepreneurship, skills to identify and utilize business opportunities, and attitudes to pursue results and success and to create value. The EQF however has separated knowledge and skills, and even set competences aside (as we have seen above), as a result of which the whole notion of integrated capabilities in the definitions proposed here is demolished. Competences in the EQF are seen as levels at which graduates are able to perform tasks. At the lowest level they are expected to only perform tasks which are simple and are carried out under direct supervision and in a context which is very structured. At the highest (PhD) level candidates are expected to perform independently, add to science in terms of complex concepts and theories, and to show leadership in knowledge development.

1.4 Contexts and functions

As published already in a niche journal (Mulder 2001a) and in a report on a broad study on competence development in organizations (Mulder 2001b), there are several contexts in which the concept of competence is being used. These contexts include: 1. the organization; 2. personnel management; 3. human resource development; 4. the interface between education and work; 5. continuing professional development; and 6. sectoral education and training policy.

As will be clear, the use of competence-based instruments at the interface between *education and work* is precisely the topic of this Volume. The sometimes weak connection between the worlds of education and work can be made stronger by using agreed competence frameworks which reflect the demand for qualifications in the labour market, or more broadly in society, and the supply of educational programs offered by educational institutions.

The *sectoral training policy or economic structure policy* context is also relevant for vocational and professional education, as it defines the direction in which this will develop. A returning issue within sectoral training policy is to what extent vocational and professional education should be specialized. This debate is often influenced by the state of the economy. During times of recession, broad education is often recommended, especially in programmes for which there is little demand, as it will give graduates more opportunities for employment. Teacher education is a good example of this. During times in which it was hard to get a job in schools, teacher training colleges tended to broaden their curriculum so as to give graduates the opportunity to find employment outside education. In sectors experiencing labour

shortages, such as in engineering and production technology, sectoral employers' organizations may insist on narrowing qualifications and corresponding competence frameworks, both to bring graduates to the labour market more quickly and to reduce their mobility into other sectors. This happened for instance in the oil and gas industry where there was a shortage of specific welders and off-shore technicians. Unions are not usually keen on these width reductions, fearing lower wages, higher employability risks, and more vulnerability to labour contracting.

But the use of competence instruments is much wider, as we briefly elaborate below. At the level of *organizational strategy*, (boards of) directors and management take decisions about the future course of the organization, and in this decision-making process the core competence of the organization, competence levels of the workforce, and competence development consequences of change and innovation may play a role. Although the core competence of the organization is hard to change in the short term, it may be subject to re-assessment. The same holds for competence levels of the employees in the organization. Their collective competence is deeply rooted in all branches, but when qualification levels have to rise because primary processes are becoming more and more complex, whole groups of employees may need further education and training or face the risk of redundancy. This for instance happened in the health care sector where employees had to undergo massive training and development to keep abreast of developments in primary care.

In *Personnel management*, or Human Resource Management (HRM), it has been observed that selection, assessment and training practices often use different instruments. In selection, job responsibilities, required qualifications and competencies are often specified, whereas in assessment task performance and other competence frameworks may be used. It sometimes even happens that organizations use competence frameworks for the different job families and other competency lists for annual results and development meetings. Trainers often use their own toolkit to do training needs assessments to develop their training programs. These may or may not include competence frameworks. The merit of competence-based personnel management, and well-developed and agreed competence frameworks in organizations is that it can provide a common language for all HRM-practices, including selection and hiring, assessment and training and development. In practice there are elaborate examples of this; there are organizations in which competence frameworks play a crucial role in advertising vacancies, managing expectations of candidates who opt for certain positions, the preparation of a self-assessment or an assessment by an assessment bureau, the composition of learning trajectories towards qualifications for certain jobs, the evaluation of candidates for certain positions, the performance appraisal of employees via supervisor or multi-rater assessments, and defining priorities in personal development and performance improvement plans. Organizations that adopt comprehensive competence-based HRM embody statements of competence from occupational standards and all HRM systems and processes and link these to strategic organizational and business goals (see the figure from Leman et al. 1994 reproduced in Winterton and Winterton 1999: 15).

In *training and development* ample use has been made of competence standards, frameworks, dictionaries and models. They all serve as input for identifying learning needs. There are situations in which ready-to-use competence frameworks are adopted, but developing these together with co-workers may be more effective, because in this process the meaning of the competencies and the mutual expectations get clearer than in the implementation of competence frameworks developed by others. It is not so much a matter of not-invented-here, which causes issues in the use of pre-defined competence frameworks, but mainly a matter of joint understanding of what is and can be expected in terms of job performance and what is needed in terms of competence development. The process-oriented approach leads to more commitment for this development. Moreover, involving employees in the elaboration of a competence framework can facilitate identifying the boundaries of tacit knowledge and skills that are often more important in the execution of work tasks than the content of formally-defined competence frameworks (Polanyi 1967).

In the *professional development* context competence standards, lists, dictionaries, and frameworks can play a similar role as in education and training. They may be used to make an inventory of development needs, to guide the development development plans, and to assess progress of development. They however are also being used for registration, licensure and certification purposes. Certain professions have, or are in the process of creating, a register of professionals in which individuals are included only if they meet admission and assessment criteria. This holds for medical professionals, but the teaching profession is also proposing to use registers of qualified professionals. Typically, next to specified initial professional education further guided professional development, peer review and a mix of supervised professional practice and intervision is required. This can all be accumulated in a portofolio (digital or not), which can be submitted to accreditation and re-accreditation bodies responsible for deciding which individuals qualify for inclusion in the register. Lawyers, medical doctors, psychologists, can all be removed from the register based on non-compliance with continuing professional development requirements or demonstrably culpable misconduct verified by a court.

As is clear from this description, the contexts of using competence instruments like competence frameworks, competence assessments, competence-based training programs differ, but the competence development processes in these contexts are essentially the same. Students in vocational and professional education should be made aware of what role competence plays in the assessment of their portfolio when they are applying for jobs, in the evaluation of their interviews, the daily execution of job tasks, performance appraisals and elaboration of personal development plans. They should understand the importance of their competence profile for directing their process of career-oriented learning.

The functions of working with competence instruments are somewhat related to the contexts in which are being used.

Within corporate training, education, and development, competence instruments can have different performance improvement objectives: 1. alignment, 2. strategic, 3. communicative, 4. dynamic, 5. developmental, 6. employability, and 7. performance improvement.

Regarding *alignment*, the very purpose of using competence frameworks for curriculum development is to link learning outcomes, learning processes and assessment practices to expectations of graduate attributes or desired performance in society. A competence framework serves as the link between the collective demands of society and the profile of the curricula offered by the educational institutions involved (see chapter 11 on competence and the alignment of education and work in this Volume). The frameworks need not to be interpreted as rigid and minimalistic, behaviorally specified laundry lists of tiny competencies which can be checked off. Whereas early attempts to create competence frameworks typically involved such lists, current competence frameworks are of a much more holistic nature and are development-oriented, aiming at higher levels of learning and understanding, as well as the formation of professional identity.

In corporate training, education and development, a distinction is made between vertical and horizontal alignment. The difference between the two is that in vertical alignment, processes at various organization levels, such as the strategic, HR and training level, are being aligned, whereas in horizontal alignment various HR practices are being tuned, such as recruitment and selection; assessment and remuneration; and training and development. As already explained above, these practices are often implemented using different HR instruments, and competence instruments can be used to provide a set of tools and common language, the 'glue', to create synergy between these practices.

Developmental, employability and performance improvement functions are also applicable in the vocational and professional education context. Obviously, vocational and professional education is aimed at competence development of students, their future employability and continuous performance improvement.

However, within vocational and professional education competence instruments can also be used for realizing the other functions. In terms of *strategy development*, educational institutions can use the concept of core competence to direct organizations in the desired direction. Of course, intensive deliberation and decision making is needed to achieve sufficient consensus on this direction, as there are many competing visions on innovation in education. But focusing on the present and desired core competence of schools or colleges and the current and desired competence-base of professionals working in these institutions, can result in a strong but also realistic innovation process.

Competence frameworks, whether adopted or developed in-house, can be powerful tools in *communication* about current issues at work, plans for the future, and expectations of all involved. Competence frameworks provide ingredients for understanding one another, which is very much needed because many innovations remain hanging in the air: they are comfortably formulated in general terms, leaving room for interpretation and choosing to

adopt the innovations that appeal, which usually means those that involve little or no change in practice.

Working with competence instruments may also create a *dynamic* atmosphere in educational institutions, especially when taken seriously by management. In many business contexts, competence frameworks are defined around products and services being produced or delivered by the organization, and the roles in which employees are expected to contribute. A product manager may, for instance, be expected to be entrepreneurial. Or a salesperson may be expected to think systemically, which implies thinking not only about sales but also the production or delivery process, which is a recurrent source of tension between employees in sales and production positions. Functions have had the negative connotation of being inflexible, rigid, part of a function framework, tightly connected to task and performance descriptions, separating them from other functions, and as a consequence, discouraging cooperation. The ‘not-in-my-job-description’ complaint is frequently heard in organizations operating on functionalist lines. Working with roles and competencies creates the possibility to encompass organizational inertia caused by functionalistic work organization and task division. Joint responsibility for certain work processes can lead to dynamic working situations in which co-workers can take over certain tasks from each other when needed.

1.5 Competence-based and Competence-oriented Vocational and Professional Education

The title of this Volume is ‘Competence-based Vocational and Professional Education’. In this section the scope of this Volume is further explained. The title is deliberately not competence-oriented education. There is a significant difference between competence-based and competence-oriented education. Furthermore, the title includes vocational and professional education, also two distinct terms which reflect different education systems and occupational levels. It does not include terms like Technical-Vocational Education and Training (TVET), Career-Technical Education (CTE), Post-Secondary Education, Further Education, Community College Education, Professional College Education, Professional University Education, Academic Education, Workforce Education or Workforce Development (see Mulder 2012, for an elaboration of this), although the Volume conceptually includes all these education systems. Vocational and professional education is aimed at preparing future workers and professionals for the labour market, including entrepreneurs, who, rather than seeking jobs, will be creating them.

However, regarding vocational and professional education, a precautionary remark needs to be made. In many parts of the world vocational and professional education are actually perceived as no-go areas. The general opinion in those places is that students can better take a general education and look for appropriate employment opportunities afterwards and rely on workplace learning opportunities to develop their professional competence. However, there is a legitimate place for vocational and professional education, education which prepares

students for certain job families, occupations or professions. It is evident that there is no debate about the importance and status of educational trajectories for future medical doctors and specialists. On the contrary. However, vocational education should also have sufficient esteem. At a global level, large numbers of workers are needed to sustain and further develop society. This has rightfully been acknowledged by the United Nations Universal Declaration of Human Rights in article 26 on education, which states: 1. ‘Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit. 2. Education shall be directed to the full development of the human personality and to the strengthening of respect for human rights and fundamental freedoms. It shall promote understanding, tolerance and friendship among all nations, racial or religious groups, and shall further the activities of the United Nations for the maintenance of peace. 3. Parents have a prior right to choose the kind of education that shall be given to their children’ (Source: <http://www.un.org/en/documents/udhr/>).

The first section of this article 26 says: ‘Technical and professional education shall be made generally available’. This is a very strong statement in favor of vocational and professional education with all variations mentioned above. Both vocational and professional education can derive authority from that, although it is needed more in vocational than in professional education, since professional education is generally part of an integrated system of higher education. So, critics of vocational education should be confronted with the vision expressed by the UN Declaration of Human Rights. If policies and practices from the past regarding vocational, and maybe industrial, education, cast shadows over present systems of preparing adolescents for society in general and the labour market in particular, it is time to remember article 26, and see pride in occupations of graduates from vocational education, their professional identity, sufficient flexibility, and ample career and development opportunities. Development opportunities can be strengthened by creating continuous learning pathways for all students and removing barriers between secondary vocational and higher professional education, validation of competence based on learning results achieved during work experience and facilitating continuing professional development, not only by formal education programs but also by informal and non-formal learning trajectories, all of which will be discussed in other chapters in this Volume.

What then is the difference between competence-based and competence-oriented education? This distinction is similar to that between problem-based and problem-oriented education. If education is oriented towards something else, such as competence or problems, then there is a loose relation between education and competence or problems. Competence or problem solving is then the dot on the horizon which is the navigating destination. The way in which competence is being achieved can differ significantly and is not operationalized.

However, competence-based education goes a big leap further. In competence-based education, competence and competencies are the starting point of curriculum development, instructional activities and assessment practices. Occupational profiles and competence

frameworks tend to define curriculum development, and from this, core occupational tasks or themes can be identified which can become the organizing units within the whole curriculum. Science and social science subjects can be linked to those core tasks or themes, and can be integrated in the teaching of these tasks or themes. For instance in a study program on food quality management, a course can be centered on a food crisis, in which epidemiology, food process design, food safety management, food law, crisis management, communication and marketing can come together. This kind of curriculum development, in which core occupational tasks or themes are identified and taken as the starting point for educational development, can lead to more authentic and holistic education, which prepares students to perform effectively in critical occupational situations, and likewise to a more authentic assessment. Competence-based education requires a more intensive curriculum rethinking process than competence-oriented education. The risk of employing a competence-oriented education approach is that the education program merely pays lip service to actual professional practice, leading to graduates who are still ill-prepared for the labour market and have difficulty adding value in their jobs. This does not imply that competence-based education should narrowly focus on specified occupational profiles. That is why we speak about competence-based education and not about competency-based education. The latter is associated with a more narrow focus and specific performance related education. In competence-based vocational and professional education sufficient attention has to be paid to complex problem solving, creativity, entrepreneurship, interdisciplinarity, higher-order thinking skills, computational skills and mindfulness. Various chapters in this Volume address these competence domains.

The title of this Volume does not include the term training, although it is often used in the field of vocational education, like in the name of Cedefop, the European Agency for the Development of Vocational *Training* and in the title of *JVET*, the Journal of Vocational Education and *Training*. We do not object to using the term vocational training, however, we do emphasize that in this Volume we have a broader conception of education and development for vocations, occupations, professions and society in general. Training (in terms of industrial training) has the connotation of being aimed at preparing students or employees for specific present jobs, whereas in education (in terms of liberal education) students are being prepared for the future society, including for jobs that may not even exist at the time students are getting their education. Some of them may go to very different fields of work, or will develop completely new products, processes or services, which may create new types of work so far unknown. So it is important to keep in mind when reading or using this Volume, that we advocate a broad – but labour market relevant – preparation of students for society, also because of the rather dynamic relationship between cohorts of graduates, their first employment and their later careers. Education programs should never function as fish pods, in which graduates are trapped without an opportunity for vertical or lateral mobility in education and the labour market.

1.6 Three waves of CBV and PE

In the discussion about competence–based education, three different views can be distinguished (Mulder 2014):

1. Competence and functional behaviorism;
2. Competence and integrated occupationalism;
3. Competence and situated professionalism.

These views are all connected with major pitfalls like fragmentation, performatism and holism. If in discussions, these three views are not taken into account, the discussions end up in total confusion or radical disagreement, because it is evident that critics of functionalistic and behavioristic education will never agree with proponents of the view of integrated occupationalism since the two are based on different philosophies of education. The same hold for the difference between the views of integrated occupationalism and situated professionalism. Core thoughts in functional behaviourism are that behavioral analysis should be the foundation of curricula, that education should be composed of specifically defined small tasks, and that successful task performance needs to be rewarded. Basic ideas behind the view of integrated occupationalism are that knowledge, skills and attitudes need to be addressed together in education. Knowledge transfer has always been the essence of education, which during the previous decades turned into knowledge construction in cooperative contexts as the socio–constructivist movement. But gradually it became clear that knowledge was not enough, and that sound practice was needed, for which students have to master skills. Furthermore it was said that education without personal development is undesirable, hence the emphasis on citizenship competence and social responsibility. Personal identity development should be based on knowledge and skills formation in education; the three should be linked together, which has strong implications for the design of learning tasks. These tasks should pay attention to the development of relevant skills, supporting knowledge and the connected professional attitudes in the deployment of skills, but also by which the whole vocation or profession is constituted. So this view includes the essence of professional identity development in education. Graduates from vocational and professional education should experience pride in their profession.

The notion behind competence and situated professionalism is that education has often been seen as context–free, whereas knowledge only gets meaning within a certain context, and that the meaning of competencies is context or situation specific. A good example of this is that being entrepreneurial differs a lot between a secretary of a work unit and the CEO of an international company. In education this view has led to the concept–context movement, which means that disciplinary teaching content should be linked to contextual use of that content. This so–called realistic teaching is also not without critical appraisal. These three views are obviously pure views. In practice they will rarely be found as such. Contemporary practices of competence–based vocational and professional education comprise various mixtures of all three approaches, as will become evident in the course of this Volume.

There is another fundamentally different practice or use of the competence construct. The difference is quite visible in competence frameworks that have been developed. Essentially two fundamentally different ways of operationalizing competence can be distinguished:

1. behavior-oriented generic competence; this practice emphasizes generic content- and context-free competence statements. A good example of this is the competence framework for the management profession (see Bartram 2005). Bartram reviewed studies which in total include thousands of managers, to find the relationship between competence and performance, which can be established with sufficient criterion differentiation. The result of his research is a competence framework which covers all competencies of management behavior. The generic competencies are defined and cover a series of also defined more specific competencies.
2. task-oriented specific competence, which does not necessarily need to be narrowly defined. A good example of this competence modelling can be found in the medical profession (Frank and Jabbour et al 2005; see also the chapter of Ten Cate in this Volume). This competence framework comprises generic and specific competencies, with a behavioral and content specification of what medical specialists need to be able to do. It contains task-related specifications of protocols, professional behavior, skills and attitudes.

As seen above, we can also make a distinction between different geographic areas, such as the UK, in which the vocational qualifications approach was, and the skill development approach is predominant, France, which focuses on *savoir*, *savoir-faire* and *savoir-être*, Germany, with its focus on *Beruf*, *Lernfelder* and specified competence domains in the Dual system, and the Netherlands, with a comprehensive notion of competence as the integrated set of graduate attributes of knowledge, skills and attitudes (Brockmann, Clarke and Winch 2011).

1.7 Questions of the Volume

In sum, theories, policies, practices and outcomes of competence-based vocational and professional education vary a lot internationally (Mulder, Weigel and Collins 2007). Our ambition is that this Volume will provide a thorough introduction in the theory, policy, practice and outcomes of competence-based vocational and professional education.

Essential questions that will be addressed in the Volume are the following:

1. What are the key drivers for the competence movement and competence-based education? (e.g. labour market needs; rapid and profound changes in work processes; permeability of vocational, professional and higher education; recognition of education-independent competence development; self-regulation of career development?)

2. What are the key dimensions by which conceptions of competence differ? What are the theoretical backgrounds and origins?
3. Are international and national policy debates on the competence-based education agenda sufficiently focused and coherent?
4. What is the value-added of competence-based education for increased alignment of education and the world of work and the transition of graduates into (self-) employment?
5. What is the role of competence frameworks and standards in the re-design of vocational, professional and higher education programmes?
6. Which models for competence assessment are helpful for the measurement of student achievements in vocational, professional and higher education programmes?
7. What are distinct regional/national approaches of competence-based education and development (the UK, Continental Europe, the US, Australasia, Africa)?
8. What is the state of research regarding competence-based vocational, professional and higher education and what outcomes can be reported?

Many of these questions are being addressed in the various chapters in this Volume. In the last chapter an attempt will be made to answer these questions and to arrive at a general conclusion regarding the state of and prospects for competence-based vocational and professional education.

1.8 Parts and chapters

This Volume consists of four parts and 49 chapters. The composition of the Volume and its chapters will be introduced in this section.

Conceptual Foundations, Concerns and Perspectives

Part I of the Volume includes chapters on various conceptual foundations of competence-based education philosophy, including chapters which express concerns regarding competence-based education and suggest alternative perspectives on education. It finalizes with an integrated view on competence-based education and a theoretical view on alignment of the worlds of education and work, which is particularly important in vocational and professional education, and the overarching theme of the series in which this Volume appears.

In Chapter 2 Billett distinguishes three interrelated domains of knowledge that constitute competence, which he sees as broadly equated to the generation of expertise: canonical knowledge of the occupation, particular situational knowledge and the personal domain of knowledge. He elaborates the third domain, the personal domain of knowledge, analyses how personal competence domains are linked with personal learning experiences and describes the influence of personal mediation, active mimetic learning and individuals' personal epistemologies on competence development.

In Chapter 3 Vonken goes into the roots of competence theory and stresses that competence is a social construct. He discusses competence from the perspective of the contributions of Chomsky and White, and others. He argues that a better theoretical foundation of the construct of competence is needed, and he provides that based on action theory. In doing so he goes into the relationships between types of action, performance, situation and competence.

In Chapter 4 Evers and Van der Heijden explore the relationship between the concepts of competence and expertise. This relationship is often questioned as both would be fundamentally different. In our view that is not the case, as is confirmed by this chapter. Coming from the field of professional expertise research, Evers and Van der Heijden mainly elaborate the notions of expertise and expertise development, and prefer to stick to their own terminology, which, as said, does not conflict with the competence terminology at all. This is reassuring, because based on this chapter we maintain our position that competence and expertise are highly synonymous, and that the research background of authors predisposes them towards preferring to use the concept of competence or that of expertise.

In the next series of chapters critical views are elaborated, even to the point of arguing that competence-based vocational and professional education, professional development or the development of expertise should be based on other education-philosophical foundations. It is good to have these critical opinions in this Volume, otherwise it would not tell the whole story about the competence movement in education. Various authors have been warning of the problems assumed to be inherent to competence-driven education approaches, many of which are cited in the chapters in this Section.

In chapter 5 Cairns and Malloch write that the term competence which emerged has multiple meanings and that competence-based practices in education and learning differ. The term capability became more popular, as a kind of synonym of competence. Also the plural capabilities was used, both related to capacity and capacities. Note that in the definition of competence given in chapter 1 capability is included. There competence is seen as capability to perform. Next the authors proceed with linking capabilities with graduate attributes. To a certain extent competencies, capabilities and graduate attributes are equivalent concepts. The chapter is concluded with an explanation of the nature of 21st century learners who need agility to cope with a world in which change continues to accelerate.

In Chapter 6, Bagnall and Hodge advocate an alternative epistemology for the development of vocational and professional education, this being progressivism, based on constructivist epistemology. In his chapter they broaden the theoretical perspectives on competence further by distinguishing four competence-based approaches: disciplinary; constructivist; emancipatory; and instrumental, which in their view are based on competing instrumental epistemologies. The result leads to quite different views on the understanding of competence, competence development, learning, the purpose of competence development for human well-being, education, and assessment. The fact that conceptions of competence are rooted in

competing paradigms implies that there are fundamentally different views on its worth. Bagnall and Hodge state that the appeal of competence-based approaches of education and development is caused by the current global emphasis on performance-based education and assessment, which is criticized by many who have significant objections against this dominant view on education. Bagnall and Hodge do not believe in hybrid conceptualizations of competence, in which instrumental interpretations of competence are linked with conceptions from non-instrumental epistemologies.

In Chapter 7 Hyland criticises the competence-based education philosophy in a fundamental way. He advocates the original inclusive notion of Buddhist mindfulness (and not the superficial and commercialized version of that, which he calls McMIndfulness) as the foundation of any vocational and professional education program, and would like to see principles of mindfulness implemented in workplaces. For him, the distinction made in Chapter 1, between various conceptualizations of competence is irrelevant, it still is competence. So long as there are 'pre-specified statements to be assessed by performance criteria with the aim of achieving competence outcomes, then it is a paradigm case of a CBET system' (personal communication), and therefore Hyland rejects any form of competence-based vocational and professional education.

In Chapter 8 Day extends the critical view on competence-based education to teacher professional development. He argues that competence in itself is an 'essential characteristic' of teachers, and, therefore, that it represents only a base-line level of professional expertise. This reflects the levels of expertise development as proposed by various authors, in which competence is the minimum-level of professional expertise, whilst there are several next levels of expertise. Day's concern is that there is too much policy emphasis on measuring and comparing narrowly defined educational achievement, national qualification frameworks and standards for teachers, testing and evaluation of effectiveness in terms of value added. In essence, he suggests that competence should not be the dominant aim of education nor should it be conceptualized too narrowly. This also holds for teacher professional development.

In chapter 9 Avis follows this with a critical-societal analysis of cognitive capitalism. He addresses competence in relation to workplace learning, the pedagogy of vocational education, knowledge and transformation. He places the discussion about competence-based vocational and professional education, and the conceptualization thereof, in a wider historical and socio-economic context, which is characterized by fundamental change: many traditional certainties are gone, new inequalities have come to the fore, especially in societies in which neo-liberal politics dominate. He suggests that disciplinary knowledge together with workplace learning can empower marginalized groups by providing 'really useful knowledge'.

In Chapter 10 Hager, understanding criticisms of the concept of competence, advocates an integrated view of competence. He differentiates behavioristic and generic understandings of competence and states that there are difficulties in both. The integrated view on competence as he suggests combines key occupational tasks and the formulation of attributes which are

necessary to perform these tasks. This view includes the context of the work situation. Hager specifically addresses the critical appraisal of competence-based education approaches, concluding that the integrated approach resonates well with current developments in educational and learning sciences, such as practice theory and complexity theory.

In Chapter 11 Mulder goes into an essential feature of competence-based vocational and professional education, which is the alignment of the world of education and the world of work. This alignment typically takes place via competence frameworks for disciplines, sectors or professions. The development and enactment of these frameworks is a political process in which various stakeholders are engaged. A competence framework therefore is always a trade-off between different interest parties, including education. The chapter also holds that competence frameworks need to be interpreted by the relevant players within the education system, based on their educational philosophy. It is suggested that the theory of strategic alignment in education is expanded with the component of competence frameworks which serve to align educational outcomes, learning processes and assessment strategies. The chapter concludes with a description of research on competence frameworks.

Competence-based education as a global innovation

Part II of this Volume addresses competence-based education as a global innovation. It consists of chapters from different parts of the world where competence-based education was invented or introduced. The series of chapters is not meant as a full account of what happens in terms of competence-based education around the world. Such an overview would require a veritable encyclopaedia, because very many countries have implemented some form of competence- or outcome-based education. Instead, the chapters serve as reviews of the literature, policies and practices in the given countries. There are chapters from four regions: North America, Europe, Asia and Africa. An account of the developments in Australia is also integrated in Part I of this Volume in the chapters of Cairns and Hager.

In Chapter 12 Barrick starts with the description of competence-based education in the USA, where this educational innovation began. Barrick claims that competence-based education evolved during the last 100 years, and that it started to take form in the 1960s. He states that the original reference to this innovation was ‘competence-based’ education, whereas this gradually changed into ‘competency-based’ education, but that there is no difference in meaning. Within the changing socio-economic context, high schools in the late 19th century started to prepare students for the world of work and society, and their mission became to help students to ‘achieve *competence* through developing prescribed *competencies*’. In his chapter Barrick then describes the current concept and practice of competency-based education. He also notices that the actual terms of competency and competency-based education may not show up in educational legislation, but that the vision behind competency-based education still forms an integrated element of curriculum development, instruction, and assessment of learning.

In chapter 13 Stokes describes the development of competence-based vocational and professional education in the UK, identifying the paradigms and political traditions on which the competence movement in the UK was built. Stokes contends that these have had a major impact on management, organization and related competence approaches which were linked with commodification, marketization and socio-politics. It is clear (as noted in Part I in this Volume) that there have been various reactions to the competence movement, with heated discussion dividing opinion into opposing camps. The chapter includes a case study describing the introduction of a competence framework in an organization. The chapter then describes the implications of the analysis and potential future competence-trajectories.

As a follow-up on the British developments, in Chapter 14, Evans and Kersh explore competence development in workplaces, which is seen as necessary to establish a learning society and to provide the working population with a high level of competence. To realise this, lifelong competence development going beyond initial education and training has to be the standard.. The authors see competence development as essential for a ‘sustainable working life’ and for the ‘organizational development of workplace environments’. They regard self-sustainability, creativity and developmental competence as essential in the current societal context. Taking into account the complexity and contextual specificity of competence, the authors go into the tensions of national competence frameworks in the UK and the policies and practices regarding competence development in workplaces, which is very much related to notions of quality of work, organizational dynamics and motivation.

In Chapter 15, Weber and Achtenhagen state that competence-based vocational issues need to be understood from a national perspective. Therefore, they start the chapter with describing cornerstones of the German VET system. Next they summarise the genesis of German VET and go into the process of negotiation of goals and competence domains for VET by the German VET stakeholders, corresponding instructional consequences and former assessment shortcomings. For overcoming the pitfalls in VET the authors introduce the governmental-driven VET-PISA feasibility study as well as studies on cross-national comparisons for overlaps in VET competence and studies on technology-based authentic assessments. Furthermore, they present the nation-wide pilot ‘ASCOT-Initiative’ for modelling and measuring competencies in the fields of engineering, health, care and business in VET. An example in the field of intrapreneurship education complements the chapter.

In Chapter 16 Le Deist describes the development and implementation of competence-practices in France during the last 30 years. The dominant conceptualization of competence in France includes: 1. theoretical knowledge, 2. functional competencies and 3. social or behavioural competencies. The competence movement in competence-based vocational and professional education in France is dominated by the state. Specific state-recognized qualifications are key to finding employment and making a career. This is quite different from other countries. The French use of competence models is compared with other countries in Europe and the rest of the world. Like other countries within the European Union, France is struggling with the alignment of its vocational qualifications with the European Qualifications Framework. The replacement of the logic of qualifications by a logic of competence appears

to present a challenge in this context. The chapter concludes with an analysis of the meaning of competence for vocational and professional education in France.

In Chapter 17 Tütlys and Olav Aarna address the development and implementation of competence-based education in two Baltic states: Lithuania and Estonia. These relatively new EU member states have made an effort to implement various EU policies regarding vocational and professional education in the process of complying with EU educational cooperation policies like the Copenhagen process, which resulted in the reform of the national qualification systems. The chapter reviews the genesis of the competence-movement in both states, and describes the development of their National Qualifications Frameworks. It is apparent that competence was the core concept behind the curriculum reforms. The countries exhibit interesting differences in terms of competence-based education in that Lithuania has a rather centralized and state-led approach, whereas Estonia follows a more differentiated approach.

In Chapter 18 Ronchetti addresses the introduction of competence-based education in Italy. The shift towards competence-based education is a radical change, because the education system in Italy has long been based on the idea that transmission of knowledge is the key rather than the effective use of operationalized knowledge. In Italian education policy development major contradictions can be observed. The chapter describes the development of the Italian school system over the last twenty years, emphasizing the introduction of competence-based education in vocational and professional education, in the context of wider developments in other education sectors.

The following chapters represent a number of Asian and African approaches.

In Chapter 19 Fan gives an overview of the introduction of competence-based education in China. He states that the developments in China were based on studies of Western competence theories and practices, which appeared to be quite confusing. As happened in the West, Chinese experts moved the field of competence-theory from behaviouristic to integrated approaches, although a preferred dichotomy in competence clusters was maintained: the differentiation between hard and soft competencies. Hard competence relates to professional requirements, whereas soft competence represents generic competence needed for citizenship, flexibility and career development. There seems to be a general understanding that narrow competence-based education is insufficient for preparing graduates for future society. A '4 bodies and 4 fields' hypothesis and a model of '3 kinds of education' are common place in the development of technical-vocational education and training.

In Chapter 20 Panth and Rodriguez review the developments in competence-based training in South Asia. In their view this innovation is the leading approach in education for the development of a multi-skilled and adaptable workforce. As in the mainstream competence-based education philosophy, it is perceived of as potentially closing the gap between education and the labour market, which is not insignificant considering the expectation according to the authors that this regions will cover 40% of the total global workforce in the

coming decades. It follows the developments elsewhere regarding the formulation of occupational standards and national qualifications frameworks, which is complemented with the development of quality assurance systems, as well as the implementation of competence based vocational and professional education.

In Chapter 21 Viet reviews the development and implementation of competence-based education in Viet Nam. Viet Nam, as part of the ASEAN Economic Community (AEC), which has adopted the ASEAN Qualifications Reference Framework (AQRF) in 2015, is following the international policy developments in vocational and professional education. Part of this it introduced competence-based and outcome-based vocational education. It struggled with similar issues as Western countries did. Viet suggests various areas of development to proceed with the improvement of the implementation of competence-based education in Viet Nam regarding outcome-based curricula, modules based on competence standards, and performance and assessment tools.

In Chapter 22 Van Halsema writes about the introduction of competence-based vocational education (in Africa most often referred to as technical-vocational education, or TVET) in Rwanda. He states that many African countries see the development of TVET as a way to realise economic growth. The main reason for choosing a competence-based strategy in the development of TVET is the putative contribution to the alignment of education and the world of work. The country of Rwanda is chosen as an exemplar of African countries wishing to improve vocational and professional education. Four years of experience with the process of setting up a system of competence-based TVET within the framework of national workforce planning has shown that this is not easy process. ‘Transitional noise’ as the author states, has hindered the implementation process. However, there are also signs that practical learning and creativity in TVET have improved. Van Halsema concludes the chapter with recommendations for governmental policies regarding decentralization of TVET development and diversification in the employment strategy.

Competence and Key Aspects of Education Systems

Part III of the Volume is divided in four sections. The first is on generic competence frameworks for education systems. As stated in chapter 11, having these frameworks is a key component of competence-based education.

In this first section, in Chapter 23 Perrenet, Borghuis, Meijers and Van Overveld explain their model of Academic Competencies and Quality Assurance (called the ACQA framework) which was originally developed at the Eindhoven University of Technology. The model comprises seven competence domains and four academic thinking and acting dimensions. Every competence domain comprises a number of competencies whereby a distinction is made between the bachelor and master phase of academic programs. The authors describe the application of the model for various educational purposes such as the comparison of intended programme results to learning results of students, and the evaluation of the differences

between program management policy and programme implementation. The first results of the evaluation of the model reveals that the quality of the ACQA framework is quite good in the evaluation of programme profiles.

In Chapter 24 Wesselink, Biemans, Gulikers and Mulder describe the expectations with regard to competence-based education. However, like Lassnigg in chapter 30, they observe a staggering lack of evidence of the effectiveness of competence-based education. They attribute that to the complexity and heterogeneity of this innovation, which makes that national or international effectiveness studies into competence-based vocational and professional education are enormously difficult if not impossible. They emphasise that it is necessary to take the design of the curriculum, teaching, learning and assessment into account when trying to find out if competence-based education works. They suggest to consider summative assessment, to identify related practical learning situations, to formulate relevant personal learning questions, to compose corresponding learning activities and materials, and to put these together in a personal learning environment, when designing competence-based vocational and professional education, and to take these steps into account when evaluating this education in practice.

In Chapter 25 De Jong, Corten and De Jong describe the development of a laddering competence framework (4Cyourway) which is meant to give insight in the consecutive stages of competence development. Since generic competence statements derived from behaviour-related competency frameworks (such as of Bartram) can be applied at different levels of vocational and professional education, the question is what the meaning is imputed to those statements at each level. For example, analysis competence means quite different things at preparatory secondary vocational education compared with in HE. The authors give three examples of studies in which the framework is applied as a diagnostic instrument for student perceptions of their own level of competence. The studies show that the framework can be used as an instrument to determine the development level of competence. A description of an example of a practical application, its impact and the usefulness of the framework complement the chapter.

The second section of this part of the Volume concentrates on recognition, assessment, quality management and effectiveness. In Chapter 26, Bohlinger reviews the literature and developments in the field of the validation of competence development, or in her terms, the recognition of prior learning (RPL). RPL comprises the identification, assessment, and recognition of competence which a learner acquired. Competence acquisition can be realized in a wide range of learning situation, and RPL typically looks at competence gained in informal and non-formal learning settings. An important feature of RPL is that it recognizes competence apart from the formal education structure, which is especially important for low-skilled workers and unemployed. Experience, duties which were carried out, responsibilities which were held, and the results of often a multitude of learning events can be expressed in (parts of) formal qualifications. In most cases this is very much appreciated by the target group as a token of recognition.

In Chapter 27 Van der Vleuten, Sluijsmans and Joosten–Ten Brinke address and review the field of competence assessment as part of learner support in education. They point at the key features of recent educational innovation, the shift to outcome–based education, the inclusion of labour–market relevant professional skills and generic competencies in educational programs, and the trends towards student–centred, active and self–directed learning. Assessment has been following these trends, and now includes the authentic assessment of complex competencies. The chapter differentiates between and describes three approaches of assessment: assessment *of* learning, assessment *for* learning and assessment *as* learning. The chapter concludes with an analysis of quality criteria for assessments, and observes that every assessment method has its strengths and weaknesses.

In Chapter 28 Blömeke explores the quality assurance of competence assessments. The chapter forms a bridge between the previous one of Van der Vleuten et al on competence assessment as learner support in education, and the next one of Barabasch on quality management of competence–based education. Blömeke discusses the limitations of the use of classical test theory (CTT) in competence assessments in vocational and professional education, describing the applicability of generalizability theory and item–response theory (IRT). A number of examples are given from the context of competence–based vocational and higher (professional) education. After summarising the problems experienced with implementing competence assessments, Blömeke shows the value of IRT and generalizability theory to monitor the quality of competence assessment in vocational and professional education.

In Chapter 29 Barabasch discusses the problem of quality of VET from a European policy development perspective. Since most EU member states have introduced some versions of competence–based education, assessing the quality of vocational education institutes includes the assessment of their version of competence–based vocational education. Distinguishing two ways of assessing VET quality, through assessing educational achievement or accrediting educational institutions, the chapter elaborates on the measurement of quality of VET in general. As said, this includes the assessment of the quality of the implementation of competence–based education. She describes and discusses the policies, procedures, rules, criteria, tools and verification instruments and mechanisms that have been developed at EU level for quality assurance of VET.

In Chapter 30 Lassnigg assesses the empirical evidence for outcomes of competence-based education envisaged by policy-makers. He does this by a review of the research literature as documented in educational databases which cover academic publications and more practical material. The searches were generic, and included not only specific competence-expressions, but also terms like ‘outcomes’ and ‘learning’. Similar to the findings of Wesselink et al, the disappointing conclusion of this exercise is that there is hardly any evidence for the effectiveness of competence-based education. Whether this is an artefact of the operationalization of the outcomes of competence-based education or not, it seems that there is only very little attention to testing the policy assumptions that competence-based education

is a worthy educational innovation. Since this conclusion is quite disturbing, it is recommended that more effort is made to prove (or falsify) the putative added value of competence-based education initiatives.

The third section of this part of the Volume concentrates on areas of learning, knowledge and skills. In Chapter 31 Gessler goes into the German concept of Areas of Learning (*Lernfelder*), placing this within the historical context of German VET, and refining the analysis offered by Weber and Achtenhagen in chapter 15. In response to their apparent labour–market irrelevance, certain VET subjects were removed from the curriculum and Areas of Learning were adopted instead. Areas of Learning became a structural principle of curriculum frameworks in VET in Germany, which had implications for curriculum development and revision, the organization of VET, school–company cooperation and vocational teacher competencies. The changes resulted in the introduction of work–centred and competence–based education in the school components of VET. In the German context competence to act is broken down in three dimensions of competence, specialised technical competence, self–competence and social competence, and in three transversal types of competence, communicative competence, methodological competence and learning competence. The chapter then focuses on the concept and design of competence–based VET and the pedagogical foundation of the Learning Fields approach.

In Chapter 32 Dietzen addresses the heated debate on the role of knowledge in competence–based education practices, identifying fundamentally different views on this, resulting from opposing theoretical and epistemic interpretations of the concept of competence. She distinguishes holistic and cognitivist view on competence, which attribute different roles to knowledge as being more embedded in practice and more tacit versus systematically acquired and explicit. Both have important consequences for the assessment of professional competence and the pedagogical implementation of competence–based vocational and professional education in terms of informal learning versus systematic–subject learning. The chapter concludes by questioning whether the social–constructivist and cognitivist perspectives can be reconciled in a single approach to competence–based vocational and professional education.

In Chapter 33 Nägele and Stalder discuss the skills domain, which is part of competence. Skills can be treated as a separate domain, as in the complex cognitive skills literature, but also as an integrated component of professional competence. Either way, transferable skills are a key for effective performance in vocational and professional contexts. In the preceding chapters many of these skills, in broader terms of competence domains, have been presented and discussed. The authors state that transferable skills development and use is strongly related to social factors such as motivation, personality characteristics, social context and circumstances. Therefore, it is sometimes difficult in practice to transfer so-called transferable skills to other situations. However, by including guidance and reflection in skills development, the transfer value may be augmented. The chapter stresses the importance of these factors in vocational and professional education.

The fourth and final section of this part of the Volume, deals with support for teachers, teaching and learning. In Chapter 34 Runhaar addresses the double layer in competence-based education, which is the competence development of teaching teams who are responsible for the design and implementation of this innovation. She emphasises the team-component of competence-based education and states that learning to teach in a competence-based education environment needs to be a team effort; hence she views this learning as team learning. In team learning, she argues experience is essential. To make competence-based education a success, team engagement is necessary. The chapter examines factors influencing team engagement in team learning processes and concludes with the observation that HRM can systematically influence those factors and in that way stimulate team learning.

In Chapter 35 Nokelainen, Kaisvuo and Pylväs discuss the concept of self-regulation in relation to competence in workplace learning settings. The intention of the chapter is to establish the link between the ‘multifaceted and holistic approach to competence’ and self-regulation. Furthermore, the chapter shows the role of self-regulation competence in generic vocational competence development in theory and practice.

In Chapter 36 Sailer, Hense, Mandl and Klevers place competence development in a workplace learning setting, which is a fundamental part of VET, both at the pre-service and in-service phases. They stress the importance of motivation (introduced in Chapter 1 as a major factor contributing to performance) for the actual use of competencies in practice. They contend that gamification can contribute to that motivation and thereby to competence development and actual competence gain. Examples of introducing gaming elements in work-related learning situations which can stimulate competence development, autonomy and relatedness mentioned by the authors are points, badges, leaderboards, levels, or virtual rewards. The Chapter goes into gamification as a means for stimulating competence and motivation. A study in the field of intralogistics is presented which shows promising results in this respect.

In Chapter 37 Noroozi and McAlister address another key domain pertinent to the support of learning in competence-based vocational and professional education contexts, which is scaffolding argumentation competence with the aid of software tools. The authors describe representational guidance tools, digital dialogue games, and micro and macro scripting approaches which can assist in scaffolding the acquisition of argumentation competence. This chapter furthermore goes into the conditions under which the tools and approaches can be effectively used.

Competence Domains

Part IV of this Volume addresses a series of competence domains in which various studies have been conducted. These domains are 1. discipline-oriented competence domains and 2. transversal competence domains, many of which are currently called 21st century skills. Both categories of competence domains have gained much attention during the last decade. The interest in domain-specific competence modelling and measurement is initiated by decisions

to implement competence-based education on a systems scale, such as in vocational and professional education in Germany, and by reflections on the importance of generic competences that cut across various disciplines and which are important as part of the graduate competence portfolio in the future.

In the first sub part, in Chapter 38 Ștefănică, Abele, Walker and Nickolaus give a review of research on professional competence in the field of technology. They describe research results on structures of competencies and proficiency scaling, and trends in competence measurement. The chapter concludes with a review of factors that predict professional competence development. Key messages in this chapter are that professional competencies are multi-dimensional constructs, at the end of the apprenticeship not all participants meet the standards set, authentic simulations are a valid competence assessment method, and professional knowledge is the key predictor of problem-solving capability.

In Chapter 39 Spöttl and Musekamp investigate competence modelling and measurement of engineering mechanics, which is a subject in the study of mechanical engineering in HE. According to them is still difficult to assess the achievement of education in this field because valid competence frameworks are lacking. Focusing on the knowledge domain of competence, and the cognitive performance of students, they state that for competence diagnostics a competencies model and adequate test instruments are required. Their chapter proposes a competence model of engineering mechanics. This model, and the outcomes of the study they describe, can be used for teaching and assessment.

In Chapter 40 Wuttke and Seifried give a review of work done in modelling and measurement of professional competence of teachers in Germany. They found that German pre- and in-service teachers have competence shortages. The chapter also observes past issues of lack of conceptual clarity in competence definitions which hampered the development of a successful teacher competence model and system for assessment. The chapter then goes into recent developments of modelling and measuring teacher competence in which central competence facets play a key role. Professional teacher competence is now seen as a composite of professional knowledge as well as beliefs, motivation and self-regulation. In the last section the authors present research on teacher competence modelling and measuring which shows that what pre-service teachers miss most is subject-matter knowledge and pedagogical content knowledge.

In Chapter 41 Ten Cate presents competency-models which are being widely used in medical education. He defines competency-based medical education and medical competency in line with the general definitions given in chapter 1, expanding the definition of competence-based education with levels of proficiency. He also stresses the individualized and time-independent character of competence-based education. Students can finalize certain parts of education as soon as they reached the pre-specified level of proficiency for certain competencies. The person has shown that he/she can perform a given task and gets the right to perform that task. During the implementation of competence-based medical education various conceptual, psychometric and practical issues arose, which have been addressed. Two key developments

which address these problems are described: milestones for evaluation and monitoring and ‘entrustable’ professional activities which are related to the tasks within medical practice.

The second section in this part of the Volume is concerned with transversal competence domains. In Chapter 42, Pavlova goes into the domain of vocational and professional education for sustainable development, describing the way competencies in the green sector are integrated in this education sector in various countries in Asia. She states that is a general belief that green competencies need to be included in the curriculum of vocational and professional education, and presents a model for greening this education sector. She also contends that values and attitudes need sufficient attention in the process of preparing education and graduates for a green economy, and that governments have a crucial role to play in this process. The chapter is concluded by a case study from Hong Kong.

In Chapter 43 Neubert, Lans, Mustafic, Greiff and Ederer explore the question of whether research on complex problem solving is fruitful for vocational and professional education research and vice versa. The authors go into competence assessment issues, especially regarding procedural aspects of competence, ‘wicked’ problems, and domain-specific knowledge, which are all relevant for complex problem solving. The authors give examples which indicate the importance of cross-fertilization of competence research on the one hand, and complex problem solving research on the other hand.

In Chapter 44 Harteis starts with the observation that current society asks for professional competence, which is in line with the general thinking in this Volume. The chapter builds on expertise research (which is introduced in the chapter by Evers and Van der Heijden) and sees excellence and intuition as essential characteristics of professional competence. At first Harteis explores and reviews the scientific foundations of excellence and intuition which he sees as essential elements of professional competence. Next, he goes into theories of intuition to discuss the development of intuition competence. The chapter concludes with a review of possibilities to support intuition competence development and formulating suggestions for this development in competence-based vocational and professional education.

In Chapter 45 Toutain and Fayolle go into entrepreneurship competence. Entrepreneurship is getting more and more important given the wave of neo-liberal politics and the related reliance on independence and self-managed self-responsibility. Essentially it is a competence domain for the post-welfare state. In that respect entrepreneurship, including having an entrepreneurial attitude, is a key competence for essentially all graduates. Toutain and Fayolle state that for vocational and professional education attention should be given to entrepreneurial attitudes and behaviours, as well as for the actual start-up of enterprises. The chapter reviews entrepreneurship education in relation to entrepreneurial competence, and offers a framework of reflection on competence-based entrepreneurship education. It distinguishes two sets of competencies: technical competencies and soft skills. The authors advocate entrepreneurship to become a vested competence domain in education.

In Chapter 46 Popov, Brinkman and Van Oudenhoven go into the domain of cross-cultural communication competence. In their opinion graduates need to have global competence, which means that they need to possess knowledge, skills and attitudes that will enable them to work effectively with colleagues from different cultural backgrounds. Their main question is how global competence can be developed in education by focusing on international student mobility. The chapter reviews theory and research on pedagogies for developing global competence and as such helps educators to establish education that fosters the acquisition of this important competence domain.

In Chapter 47 Seeber and Wittmann give a review of the state of the art of research in the field of social competence. Social competence, as entrepreneurship and intercultural competence is a key field for effective performance. In the context of vocational education and training the authors find it important to see social competence as a personal capacity which enables graduates to act in accordance with requirements which evolve from work. The authors give an overview of various approaches to define social competence and the implications thereof for vocational and professional education. Next, social competence measurement and modelling are described. Distinctions are being made for jobs in sales and services, and social and health care. The chapter is concluded with a review of the research literature on social competence in vocational and professional domains, and suggestions for further research are given.

In Chapter 48 Yadav, Good, Voogt and Fisser discuss the last key transversal competence domain, computational thinking. They equate computational thinking with a set of problem solving skills which enhance analytical ability. Since computational competence is a domain which is also relevant in primary and secondary education, the authors first address that sector. Then they discuss the relevance of this competence domain for vocational and professional education and training, and underline the importance of integrating digital literacy in vocational and professional education programs. The chapter concludes with suggestions for further research, and the view that computational competence is an essential competence domain for graduates to survive in the current technological society. It also raises interest in information technology and stimulates inquiry.

Conclusions and Discussion

The last Chapter, Chapter 49, addresses the key questions asked in Chapter 1 of this Volume, and goes into several key issues which emerge from the various parts and chapters. The overall conclusion based on the work brought together in this Volume is that much has been achieved by the competence-movement in vocational and professional education, but that the critical analyses have to be taken very seriously, not to devastate the new integrative and holistic approaches of competence development, but to take them into account as much as possible, to overcome the challenges this education innovation faces.

1.9 Purpose of this Volume

This Volume is meant to clarify the manifold meanings of and approaches regarding competence-based education, to show the diversity, to explain the backgrounds of the differences so that scholars and practitioners will be better informed about this. It should help making the different views on competence and competence-based education transparent and to bridging the opposing positions. The Volume should inform debates on competence-based vocational and professional education in a comprehensive way, and serve as a basis for further improvement of competence-based vocational and professional education policies and practices, development of competence theory and carrying out of research. Its ultimate mission is to improve the quality of vocational and professional education for the sake of establishing a competent global workforce.

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