

Competences in education: a confusion of tongues

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Abstract

Unmistakably, there is a growing interest in the concept of competence learning in various areas of education, training and professional development. Competences are commonly assumed to surpass the levels of knowledge and skills, while its surplus is thought to account for the effective application of the available knowledge and skills in a specific context. Unfortunately, along with this trend, the term 'competence' is being used in many different ways, causing quite some confusion. This paper reviews and discusses the concept of competences in education. It addresses the question how competences are thought to relate to knowledge, skills and attitudes, and analyses the meaning and validity of various claims about competences. It appears that the competence concept is quite troublesome. Using the method of *reductio ad absurdum* it is extensively argued that, from a scientific point of view, the term has no additional significance to the term skills.

Introduction

In recent years, the acquisition of competences has become a central issue in post-secondary education. The traditional emphasis on factual knowledge as such, does no longer meet the requirements of a changing society. Even the training of well-defined skills to apply this knowledge in an appropriate and productive way, seems to be insufficient to start as a professional worker (Kirschner *et al.* 1997). Employers demand graduates that are able to operate in complex environments, that is, environments characterised by ill-defined problems, contradictory information, informal collaboration and abstract, dynamic and highly integrated processes. The concept of competence is strongly associated with the ability of mastering such complex situations. It is assumed to surpass the levels of knowledge and skills, while its surplus explains the knowledge and skills to be applied in an effective way. Naturally, the word 'competence' is attractive for both educators and employers, because it is easily identified with valued capabilities, qualifications and expertise. What educator would not strive for 'competent' graduates, and what employer would ever refuse such 'competent' newcomers?

By now, competences are embraced by policymakers, educators and personnel officers as a new standard for curriculum design, training and professional development. In order to facilitate the development of the full range of competences required in employment, the Organisation for Economic Co-operation and Development (OECD) advocates an appropriate mix of academic (or remedial, or basic) education, occupational skills, and work-based learning. The European Union (EU), following the Treaties of Maastricht and Amsterdam, gives high priority to the verification and assessment of work place competences, since it is seeking to develop Employment, Human Resource Development and Lifelong Learning as the "pillars" of its economical policy. In many cases, now competence learning and

competence-based curricula are being introduced.

Unfortunately, the concept of competence is used in many different ways. It seems that its current meaning is based on common parlance rather than agreed definition, which easily causes a confusion of thoughts. While life was easy in former days, using only knowledge, skills and attitudes as exclusive educational objectives, today a new category is available to describe human capabilities.

In this paper, we will investigate the concept of competence and discuss its meaning and implications in education. First, we will review the topics of knowledge, understanding and cognitive skills. Next, we will present current interpretations of the competence concept. Finally, we will go into the important characteristics of competences and discuss the supposed differences between competences and cognitive skills.

Knowledge and understanding

Knowledge concerns the representation of facts, procedures, principles and theories in a certain domain. Also, the information from observations, experiences, beliefs and prejudices in everyday life, is referred to as knowledge. For instance, one may have the knowledge that yesterday was a rainy day, or that dogs are dangerous. In the literature, knowledge is referred to with a variety of terms (Kirschner *et al.* 1997): conceptual knowledge (Posner and Keele 1973), substantive knowledge (Gardner 1975), declarative knowledge (Anderson 1980), knowing that (Olson 1976, Salomon, 1981), propositional knowledge (Greeno, 1980). All these terms have in common that knowledge is regarded a quite stable entity that is the subject of learning, remembering and reproducing.

An important characteristic of knowledge is that it is easy to test whether or not a person possesses a specific set of knowledge. If someone fails in reproducing the knowledge in hand, it is concluded that the person lacks the knowledge. Note that here the assessment of the learner is expressed in behavioural terms. However, according to the experiments of Penfield (1959) and Nelson (1978) failure to recall may be just the result of an extreme large retrieval time: forgotten memories are supposed to be still available, but cannot be retrieved fast enough. Yet, from an operational perspective, the idea of behavioural testing seems to be quite reasonable, because irretrievable knowledge is not available to one's cognitive system.

Knowledge, however, should not be confused with understanding. Being able to reproduce information, does not necessarily presuppose understanding of the information. After all, it is not likely that a computer, displaying a recipe, has any understanding of cooking. Understanding represents our intellectual capability to use information in a sensible, meaningful way. Understanding is assumed to arise, when existing knowledge is to bear on a new situation. For example, if smoke emerges during cooking, we use our knowledge about cooking, fires and risks to evaluate the situation: we understand that something is going wrong and we draw a conclusion to take action. Though understanding seems to arise from interrelating various kinds of knowledge, it is not a typical human characteristic. It would not be too difficult for a computer program to provide 'meaningful' information about smoke related to cooking. Indeed, intelligent, adaptive behaviour of computer programs can be observed more and more. Rather than ascribing the computer an anthropomorphic understanding of the world, it puts the idea of human understanding into the perspective of automated behaviour. Indeed, human understanding should not be

mistaken for an intellectual process of supernatural dimensions. It arises from our extended knowledge of the world and our ability to interrelate this knowledge in new situations far better than any automaton could do.

Cognitive skills

While the concept of knowledge refers to the static entities that can be stored in and retrieved from memory, cognitive skills are associated with the mental operations that process this knowledge. In the literature, cognitive skills is referred to in a variety of different ways: procedural knowledge (Anderson 1980), intellectual skills (Gagné 1977, White and Mayer 1980), mental processes or mental operations (Snow 1978), knowing how (Salomon 1981), strategic knowledge (Renner and Marek 1990), cognitive strategies (Gagné, 1977). Although these terms may have slight different meanings, they all refer to mental processes that actually occur in the mind (or rather in the brain), while using, transforming or supplementing the available knowledge. Cognitive skills are highly associated with higher order activities like problem solving, reasoning, thinking, assessing, concluding and include the mental processes of analysis, synthesis and evaluation (Bloom, 1956) to produce a reordering or extension of the existing cognitive structure. Cognitive skills are by definition restricted to internal (mental) processes. Therefore, it is essential to disconnect cognitive skills from observable interactions with the outside world. Indeed, quite some cognitive activities have no behavioural consequences whatsoever. For instance, solving a mathematical (or the like) problem can be done, while gazing motionless out of the window or while lying in bed.

Yet, cognitive skills play an important role in the way humans interact with reality. Cognitive processes may give rise to various observational behaviours, causing a person to intervene in the environment, while performing planned operations and applying available knowledge. In reverse, the continuous flow of external stimuli produces new experiences and new knowledge that causes an ongoing adaptation and alteration of someone's internal, cognitive structure.

In skills training, usually a lot of repetition is involved. This allows the learners to gradually improve their performance levels in terms of speed, precision and fluency. As a consequence, skills performance will become more and more automated. For instance, experienced car drivers are hardly aware of the complex cognitive tasks they perform, while their inexperienced counterparts must consciously decide on almost any operation they carry out. Unfortunately, such pattern of increasing automatism or fluency tends to obscure the distinction between cognitive skills and the associated behaviours.

In contrast with knowledge, cognitive skills are difficult to test directly. Direct observation of the brain during cognitive processes is hindered by technical and ethical obstacles. But even if these obstacles would be by-passed, it is unlikely that the monitoring of billions of nerve cells would give a satisfactory explanation for sophisticated cognitive processes. The only way to test the mastery of a cognitive skill, is to provoke observational behaviours that can directly be linked to it. For this reason, learning objectives for cognitive skills are usually described in operational (behaviourist) terms. Clearly, this linking causes quite some confusion. Observational behaviours like crossing a street, are easily mistaken for cognitive skills: here, the relationship between cognitive skills and observational behaviour has a causal, or rather *sequential* character. First, there is a mental process: the observation of the

green crossing light is connected with the existing knowledge that a 'green light' means 'safe crossing'. Consequently, a decision is taken, that it is safe to start crossing. Next, this cognitive process gives rise to the actual behaviour of crossing the street. Note, that this idea of 'thinking before doing' is prototypical for modern rationalism. In practice however, we should realise that behaviour is often likely to precede the cognitive processes (first doing, than thinking), which - of course - may have some tragic effects when crossing a street. Reversal can also be observed in various learning models that start from the premise that material operations precede the acquisition of cognitive skills (Gal'perin and Leontjev 1972). For instance, abstract counting is learned best by using the abacus.

In many cases, the relationship between cognitive skills and behaviour appears to be simultaneous rather than sequential. This may hold for speech, which is supposed to represent the ability to construct meaningful sentences that are instantaneously operationalised: here, the behaviour is close to become a carrier for the mental operations. The process of 'thinking aloud' illustrates the idea of simultaneity. Naturally, such strong interdependence of cognitive skills and behaviour causes quite some confusion about the distinct meanings of the two concepts. Chomski (1965) recognised this problem and distinguished between the actual act of speaking ('linguistic performance') and the associated cognitive skills ('linguistic competences').

Ideas about competence

Quite some definitions of competence are available. To present an exhaustive inventory - if possible at all - wouldn't make much sense. Instead, we try to identify the most significant characteristics of competences that can be found in the literature. Many authors follow Chomski's (1965) approach by distinguishing between competences and performances (Cohen 1983, Evans *et al.* 1993, Langford and Hunting 1994). According to Chomski, linguistic competence represents the cognitive structure and rules that are necessary to produce speech. In contrast, linguistic performance refers to the way speech actually functions in practice when it is contaminated by external factors. For instance, a limited capacity of the working memory may cause a long sentence to end ungrammatically because the speaker has forgotten the sentence's initial set-up. Here, linguistic competence may be perfect, while linguistic performance is affected.

Chomski, taking up a functionalist perspective, assumes linguistic competence to be general and invariant, while - in contrast - linguistic performance is strictly individual and variable. Evans *et al.* (1993) extended Chomski's approach to the domain of human reasoning. Here, competence is defined as the ability of subjects to reason logically under ideal conditions, that is, the reasoning competence is prevented from being disguised by performance factors. They describe troublesome attempts to eliminate such performance factors to uncover competences. Anderson (1992) distinguishes between abilities and competences. Abilities represent the (operational) outcomes of psychometrical tests, while competences (again) represent the underlying cognitive functioning. Gronlund (1981), while elaborating on competence-based tests, uses the word competences as a synonym for operational skills (writing skills, computational skills, reading skills, etc.). Here, competences are not assumed fixed structures, but individual abilities that can be improved by training. Probably, the associated competence-based tests are equivalent with performance tests. Langford and Hunting (1994) used Chomski's definitions of competence and performance in deductive and inductive reasoning. While eliminating interferences by performance

factors, they found evidence that the competence of deductive reasoning is constructed rather than activated. In contrast with Chomski, they conclude that competences, that is, the basic cognitive structures, can be acquired by learning processes.

However, various authors use the word competence in a much broader sense, while starting from ordinary language. Competence is a highly valued qualification that accounts for the effective use of one's knowledge and skills in a specific, usually complex context. The basic idea is that the mastery of relevant knowledge and skills is no guarantee for successful performances in complex environments. Individuals should be able to select available knowledge and skills in such a way that efficient and effective behaviour occurs. This requires special 'abilities' that take into account the characteristics of a specific context (Ferguson-Hessler 1989, Scheeres and Hager 1994). Obviously, competences are needed to engage situations of intricate, multidimensional problems, where no straightforward approaches are appropriate. White's (1960) definition also refers to effective behaviour. He links competences with the idea of self-esteem: competence is regarded an outgrowth of what one feels after the successful completion of a task or course of study. Competence is interpreted as the result of a satisfactory 'effectance', which is the drive or motivation to have a manifest effect on one's environment. Some authors (Stephenson and Weil 1992) assume that competences also include attitude components, to cover self-confidence, motivation and persistence. In addition, some authors refer to strategic abilities rather than more or less automated routines (Gagné 1977). According to Barnett (1994), competences are to be associated with unpredictable behaviours in unpredictable and unexpected situations. Coping with such new situations in a creative way is assumed to be a critical part of the concept of competence. Barnett opts for an operational approach of the competence concept that covers skills, outcomes, transferability, enterprise and credit accumulation. Kirschner *et al.* (1997) join Barnett when defining a competence as 'the ability to make satisfactory and effective decisions in a specific setting or situation'. All of these considerations about competences as extended capabilities, refer to the idea of conscious and intentional decision making rather than to routine behaviours. In fact, competences seems to include metacognition, because competent individuals are assumed to reflect upon their knowledge, their skills and their functioning.

It should be noticed that the concept of competence is not exclusively reserved for education, but is widely used in the domains of professional practice, personnel management and business administration (Bos 1998). Prahalad and Hamel (1973) introduced the term 'core competences' to identify the competitiveness of companies. Here, competence is generally equated with individual or organisational characteristics that are directly related to effective behaviour or performance (McClelland 1973, Kelly 1993, Spencer and Spencer 1993, Reid 1994). A further analysis of this domain is beyond the scope of this paper.

Competence: the need for a distinct concept

From the above it is concluded that there are roughly two distinct denotations of 'competences' in education. From a theoretical perspective, competence is conceived as a cognitive structure that facilitates specified behaviours. From an operational perspective, competences seem to cover a broad range of higher order

skills and behaviours that represent the ability to cope with complex, unpredictable situations. This operational definition includes knowledge, skills, attitudes, metacognition and strategic thinking, while it presupposes conscious and intentional decision making. In the next sections, we will focus on this broad, operational competence concept, because of its present popularity in education. Figure 1 represents a schematic view of this common operational definition of competence, while taking into account that competence may both cover mental performance and observational behaviour.

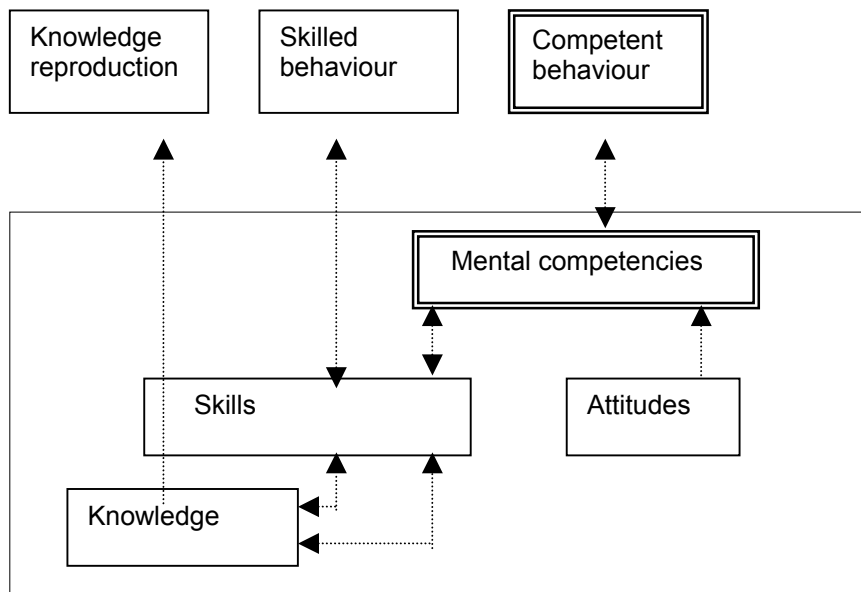


Figure 1 A competence model, according to common definitions.

The general idea can be explained as follows. The cognitive structure of an individual contains quite some knowledge, both theoretical and practical. This knowledge can be made available to the outside world by reproductive skills (speech, writing, pointing, etc.), or can become supportive to skills and the associated skilled behaviour. Human behaviours in standard situations are likely to become highly automated, though sometimes skills may demand conscious thinking. In complex,

non-standard situations competences are needed which combine knowledge, (cognitive) skills and specific attitude components. Competences comprise a mental component representing thought and a behavioural component representing competent performance. Competent behaviour is always associated with conscious thinking.

The need for a distinct concept that surpasses the levels of knowledge, skills and attitudes, originates from the observation that something 'extra' seems to be necessary to ensure effective and efficient performance. Individuals should be able to make the right choice out of many different, possible behaviours, by anticipating the effects of their interventions. In the end, one could wonder if such extra ability is principally different from an advanced, reflective, (meta-)cognitive skill. If competences indeed differ substantially from skills, quite some other questions emerge, concerning the way competences should be learned, how competences should be assessed, how competences relate to knowledge and reflective skills, how competences should be specified, and so on.

In the next sections, we will discuss various problematic aspects of the competence concept.

The problem of competence as a theoretical entity

While competence is directly linked with effective performance in complex situations, it is thought to serve as a causal factor for success. However, it must be concluded that the explanatory power of the competence concept is zero, because of its post-hoc character. While competence itself is an theoretical entity rather than an observational one, the causal law takes up the form of a mere definition: 'competent performance presumes competence'. Such causal law devaluates to a tautological proposition, because neither truth nor untruth can be determined. Whenever successful performance is observed, the word 'competence' is used as a label. For instance, managers that realise a complex reorganisation are by definition being called competent, doctors that successfully reanimate a road casualty are also by definition being called competent, and so on. All we know about the internal structure of competences is that it comprises knowledge, skills, attitudes and something 'extra' that is associated with a new, unknown (theoretical) dimension. It is not clear how this aspect of competence can be influenced and how its explanatory power can be tested. Consequently, competence is no more than a descriptive term that could easily be substituted with other terms like 'conditions for successful performance', 'divine expertise', 'magical touch' or any other word. The effort to build a causal theory on competences can hardly be called encouraging, because, unfortunately, conclusions about competence seem to coincide with its definition.

The problem of competence standards

When competences would be chosen as the ultimate objectives of education (competence-based education), they should be described in terms of well-expressed behaviours in well-expressed situations. If someone is labelled to be competent, this means that the performances are coming up to a standard (Barnett 1994). Such standards severely conflict with the idea that competences are associated with unique, complex situations and ill-defined problems. This may also have consequences for the assessment of competences: after all assessment is usually associated with reproducibility, which requires controlled conditions. Competence

defined as the ability to successful behaviours in non-standardised situations seems to violate the possibility of using competences as an educational frame of reference.

The problem of assessment

Assessment of competences should deal with reproducibility or, rather, with the prediction of successful future behaviours. As stated above, a well-defined and controlled test situation would not be suitable for addressing competences, because competences require ill-defined and unique environments. Once successful performance in such unique environment is assessed, it is not clear whether this guarantees successful performance in a new, but substantially different complex situation. From this, it may be concluded that assessment of competences should include the issue of transfer. Such testing would require various unique environments of sufficient complexity. This is not only laborious and costly, but it would also require a detailed insight in the structure and functioning of the competence concept. And yet, testing reproducibility in such complex processes would be quite a problem, because of the unique characteristics of each situation. Perhaps that's why a successful and celebrated filmmaker, writer or manager (which, obviously, are ascribed competence) may easily fail in a next project.

In addition, there is another problem involved with the assessment of competence. Competence, as a cognitive 'ability', is determined by observation of successful performance. Successful performance, however, may easily be caused by chance, while obscuring cognitive malfunctioning. To some extent, this also seems to hold for cognitive skills. Yet, when assessing cognitive skills, the focus on outcomes is supplemented with a focus on cognitive procedures or processes that refer to the conditions for success. This seems to be impossible for competences, because of its poor theoretical basis. Therefore, while referring to the logic of Aristotle ('modus tollens': denying the consequent), it is likely that only incompetence can be determined, not competence.

The problem of values

Competence has been associated with successful performance, effective use of resources and making the right choices. Clearly, 'successful' performance and 'right' choices refer to normative criteria. This doesn't necessarily mean a violation of clarity and objectivity. But it may easily give rise to arbitrary and, sometimes, undesirable standards. This happens exactly to be the case, when dealing with complex, non-standard processes in complex environments that involve many different actors, perspectives and interests. In such situations, success from the one perspective is usually counterbalanced by failure from another perspective. An extreme example would be the case of Adolf Hitler and the associated question for Hitler's competence. Here, again we touch on the problem that unique, complex situations do not go very well together with standardised, educational criteria.

The problem of stability

In coherence with the problem of values, competences may easily become subject of change. In retrospect, cheered, 'competent' managers, politicians or scientist are easily condemned, when effects of their actions appear to be in contrast with promises or pursuits. Politicians are usually inclined to strive for short-term successes to gain popularity. However, short-term successes may easily lead to long-term failures. Environmental issues might be a good example, here.

In addition, appreciation of behaviours may change in the course of time, due to changing societal attitudes or situational circumstances. This would allow for the degradation of someone's competence to incompetence, even when the person's abilities remain unchanged.

Barnett (1994) stresses that coping with profound societal, international and ecological change cannot simply be covered by the concept of standardised competences. In his view, no competences can be identified that carry us forward in a changing world, because no competences will tomorrow carry the value that they have today. So, competences may be stable as such, but become worthless in a changing world.

Finally, human performance itself may be subject of decay. Performance in new situations may even become worse, because of retention problems, problematic transfer of acquired competences or even because of gratuitous but inappropriate transfer.

Clearly, assessment of competences should include a perspective of time. This point refers to the lack of valid assessment standards in complex situations.

The problem of conscious thought

Naturally, the complexity and newness of a situation seems to provoke intentional and conscious behaviour. This conscious thinking concerns the selection, combination or adaptation of existing routines to meet the situation. In a competence-based curriculum, students are trained to increase the effectiveness and efficiency of their behaviours in complex situations. That is, thinking, judging and choosing relevant skills will pass off faster and the associated behaviour will become more fluent. Striving for increased speed and fluency implies, however, more automatism and less thinking. Paradoxically, such training of competences - if possible at all - would eventually degrade the competences to routine-like procedures that would not be very different from skills. When, in addition, we realise that many skills also require conscious thinking, any distinction between skills and competences seems to fade away.

Barnett (1994) argues that in education, conscious thinking occurs less frequent than we might presume. In his view, learning to 'obey' the standards as being identified by practising professionals, even obstructs the process thinking. Moreover, he states that competences are unable to handle the ideas of thought and understanding, because competences are usually defined from an operational perspective, that focuses on observational actions, outcomes and skills rather than underlying processes.

The issue of conscious thinking also refers to the unresolved problem of mind-body dualism as raised by René Descartes and the associated question whether human behaviour is 'reflective', that is, the result of a free will and understanding, or 'reflexive', that is, a collection of automated responses. But even without going into these topics, it is concluded that conscious thinking cannot be claimed to be the discriminating factor between competences and skills.

The problem of complexity

According to Kirby (1988), skills are more or less automated routines that allow to carry out well-specified tasks. This does not necessarily mean that skills be simple and straightforward. For instance, flying an aeroplane would require sophisticated skills. As the level of complexity increases, the mere presence of skills is supposed to be insufficient to explain successful behaviour. Probably, in bad weather conditions,

one might prefer a competent pilot above a skilled one. This raises the question, how the level of complexity is described to discriminate between competences and skills. In theory, the complexity of a certain task could be determined from the numbers of objects involved, their attributes, their interrelationships, the rules and processes involved and so on. But, apart from the laborious job, this would hardly be of any help, because the complexity of a task should always be assessed relative to the person involved. Consider the next problem: suppose that 13 sweets are available for 8 people; how many sweets would be left, if everyone is given one sweet? Clearly, such subtraction problem of two numbers will not be too difficult for an adult, using a simple routine, probably, without even much conscious thinking involved. Yet, for a four years old child, the task represents quite a complex case, that was probably never faced before. Quite some insight is needed to link the problem of sweets to the abstract system of numbers; knowledge about numbers should be retrieved and probably some strategic thinking comes up about how to approach the problem. Definitely, counting skills play a role, and a choice is to be made out of alternative computational procedures or routines. Possibly, after some time of puzzling, the child will be able to solve the problem. Although this case represents a well-defined, closed problem, all of these operations fit in the picture of competence very well, when viewed from the child's perspective. This example demonstrates that competences do not necessarily refer to the tasks, but rather must be associated with the characteristics and background of the person involved. Clearly, this hampers the use of competences as an independent frame of reference for educational systems. In addition, it seems to establish that competences are merely labels for immature skills, that still lack speed and fluency. According to the sweets problem, this means that sufficient training of the child would change a competence into a skill. It would also suggest to prefer a skilled pilot above a competent one. Such meaning of the word competence would even be contradictory to its meaning in common language, because it represents an appreciated qualification of the person involved rather than a disqualification. Yet, Mulder (1998), quoting Eraut (1994), points out that from an etymological point of view the word competence refers to 'sufficient in amount, quality of degree' (the Oxford English Dictionary). That is, competence is associated with a set of minimum requirements, just enough to do the job, rather than expert behaviour. It refers to an intermediate state between a novice and expert. This is also stated in the models of Fuller (1970) and Dreyfus and Dreyfus (1986) (also quoted by Mulder 1998) which regard competence as a stage that precedes the stages of proficiency and expertise.

From the considerations outlined above, we conclude that complexity cannot be used as an absolute criterion for the distinction of skills and competences.

The problem of subcompetences

In addition, another problem arises with the idea of complexity. Competences may be decomposed into contributing subcompetences. For instance, competently flying an aeroplane would include the subcompetences of taking off, landing, dealing with emergencies, and so on. Repeating such decomposition procedure, eventually would result in a hierarchical structure of conditional subcompetences, that become more specific and restrained the lower we travel down the hierarchy. Eventually, there will come up a stage, one might presume that subcompetences are identical to subservient skills. That is, there seems to be a gradual transition of competences into skills, while discrimination between the two types is not possible. But yet, while

maintaining the idea of skills being different from competences, we should realise that skills themselves can also be decomposed into a hierarchical system of sub-skills. Consequently, the entanglement of the skills hierarchy and the competences hierarchy produces a complex, confusing and inconsistent conceptual system that can hardly be taken seriously. Therefore, the distinction between skills and competences as different entities is highly unfortunate.

Conclusions

From the above, it is concluded that the concept of competence is a quite problematic one. It has been introduced by many authors as a new entity to explain certain behaviours in certain situations. However, the causal law that relates competence to competent performance, represents a tautological proposition that lacks any explanatory power. Therefore, competence is no more than an unclear label, that does not augment our knowledge and understanding of the world. By definition, competences are associated with successful behaviours in non-standardised situations; such definition seems to conflict with the use of competences as educational standards. Consequently, the assessment of competences and its predictive value for future performances is highly questionable. This also relates to the supposed instability of the competence concept and its strong value-dependency. With respect to the differences between competences and skills, we have demonstrated that conscious thinking cannot serve as a discriminative factor. Also, we have seen that the idea of complexity seems to indicate that competences are a subclass of skills rather than a co-ordinating category. Altogether, we conclude that there are two major problems with the competence concept. First, the competence concept tries to set cognitive standards for behaviours that essentially cannot be standardised. Secondly, from a scientific point of view, competences are to be considered to make up a sub-category of cognitive skills. That is, competences as a distinct category, different from cognitive skills, should be removed. Accordingly, the competence model of figure 1 has been modified in figure 2.

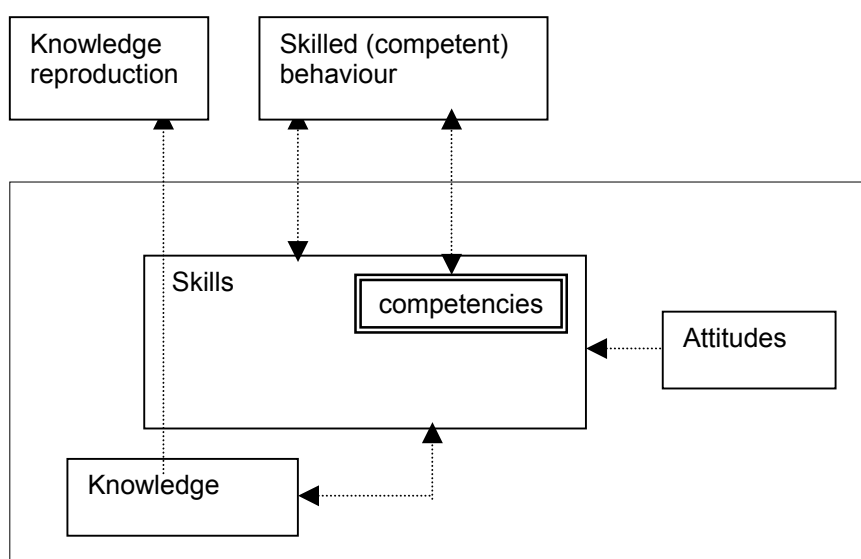


Figure 2 Competences as subskills.

Yet, the removal of competences as a distinct category of human abilities, does not mean that the term should be banned. There can be no objections to using the term competence as a label. Probably, the term can be successfully used for public relations purposes, because of its primary associations with quality and expertise. Likewise, the term competence could be reserved to indicate that the associated knowledge and skills originate from professional practice. However, from a scientific point of view, the term competences is too problematic and lacks a sensible and commonly accepted definition. Possibly, its use should be restricted to a class of cognitive subskills that are involved in coping with complex problems. Though the outcomes of this analysis may be disappointing for anyone concerned with competence learning, removal of the distinct category of competences seems to be the only way to preserve an integer scientific vocabulary. Fair enough, we could have guessed this on beforehand: after all, what other determinants of human abilities are available than *possessing* (knowledge), *feeling* (attitudes) and *doing* (skills)?

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