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Competence-based education to develop digital competence

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ABSTRACT

The competence approach to learning and teaching has been described by several theoretical models. These formal models are often not integrated with concrete educational activity. On the contrary, this article proposes a practical implementation of the competence approach in education. The model of reference is the Comprehensive Competence-based Education framework, defined for the vocational education and used to analyse the curriculum of some vocational schools in the Netherlands. The framework is here applied to Digital Competence. This specific vocational domain represents the field where the applicability of framework has been tested. Moreover, this is used as a starting point for the operationalisation of an educational model for the digital competence.

Keywords: *Principles for Competence-Based Education - Digital Competence – Authenticity - Integration of Disciplines - Lifelong Learning*

La didattica per competenze per lo sviluppo della competenza digitale

L'approccio per competenze all'apprendimento e all'insegnamento è stato descritto attraverso diversi modelli teorici. I modelli formali possono dar luogo al significativo e diffuso problema della mancanza di integrazione con l'attività educativa concreta. L'articolo, al contrario, contiene la proposta per una implementazione pratica dell'approccio per competenze. Il modello di riferimento è il framework Comprehensive Competence-based Education, definito per la formazione professionale e utilizzato per analizzare il curriculum di alcune scuole professionali nei Paesi Bassi. Il framework è qui applicato alla Competenza Digitale. Questo dominio specifico è il campo in cui è stata messa alla prova l'applicabilità del framework. Oltre a questo, viene suggerito il punto di avvio per l'operazionalizzazione di un modello educativo per la competenza digitale.

Parole chiave: *Principi di Didattica per Competenze - Competenza Digitale – Autenticità - Integrazione di Discipline - Formazione Continua o Permanente*

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Introduction

Digital competence is one of the eight key competences for lifelong learning and is essential for participation in our increasingly digitalised society (Ferrari, 2013). The definition of what digital competence entails is emerging. According to Ilomäki, Kantosalo and Lakkala (2011) the term competence is more used than skills, reflecting the needs for a wider and more profound content of the concept. In accordance, Calvani, Cartelli, Fini and Ranieri (2008) emphasize that the focus should not solely be on technical skills, digital competence should entail a critical understanding of technologies, a cognitive and cultural background, and in particular the ability to select and manage information, along with relational and ethical awareness. So, digital competence is not the result of simple elements of ability or instrumental knowledge, but rather a complex integration between cognitive processes and dimensions as well as methodological and ethical awareness (Calvani et al., 2008). And according to Calvani et al. (2008) the concept of digital competence should be preserved from any possible reductionism. In fact, digital competence is: 1) a multidimensional concept (integration of abilities and skills of cognitive, relational and social nature; 2) a complex concept (this means that it is not completely quantifiable); 3) an interconnected concept (it has strong relationship with competencies with which it overlaps as reading and problem solving, for example) and 4) a concept sensitive to the socio-cultural context (depending on the kind of training, digital competence has to be operationalized). As we shall show in the remainder of this chapter, this definition resemblances with the definition of competence in general.

So, how should we define digital competence? The European Commission (see Punie & Cabrera, 2006) has defined digital competence as involving the confident and critical use of Information Society Technology for work, leisure and communication. Knowing this, in this chapter we use Ferrari (2013) as a starting point. She identifies five areas of digital competence:

1. Information: identify, locate, retrieve, store, organise and analyse digital information, judging its relevance and purpose.

2. Communication: communicate in digital environments, share resources through online tools, link with others and collaborate through digital tools, interact with and participate in communities and networks, cross cultural awareness.

3. Content-creation: create and edit new content (from word processing to images and video); integrate and re-elaborate previous knowledge and content; produce creative expressions, media outputs and programming; deal with and apply intellectual property rights and licenses.

4. Safety: personal protection, data protection, digital identity protection, security measures, safe and sustainable use.

5. Problem-solving: identify digital needs and resources, make informed decisions as to which are the most appropriate digital tools according to the purpose or need, solve conceptual problems through digital means, creatively use technologies, solve technical problems, update one's own and others' competences.

Although this model does hardly show the multidimensional, complex, interconnect and context sensitivity as mentioned before, this one is the starting point for this chapter.

We realize ourselves that on national levels different frameworks could be developed as OECD recommends that governments should make effort to identify and conceptualize the required set of skills and competencies, and then incorporate them into the educational standards (OECD, 2010). This results in the fact that, according to Ilomäki et al. (2011), digital competence (DC) is more or less a political concept, reflecting beliefs and even wishes about future needs, and has its roots in the economical competition in which the new technologies are regarded as an opportunity and a solution. In research, however, the concept is still seldom used. An important question is how to develop these areas of competencies and underlying competencies knowing their multidimensional, complex, interconnected and socio-cultural sensitive context? In the field of vocational education research has been done on how to develop competencies with this complex, interconnected and socio-cultural characteristics. One of the outcomes of this research, that could be helpful here is the framework of competence-based education (CBE).

During the last two decades, CBE has gained in popularity because it is expected to stimulate learning that prepares students properly for the world (of work), for today's society (Velde, 1999; Mansfield & Mitchell, 1996; Westera, 2001) and for follow-up education. CBE requires that the knowledge, skills and attitudes (e.g. competencies) to be taught in an educational programme are those required by entrepreneurs or employees to perform successfully in the related job or occupation (Watson, 1991). Of course not all educational programmes educate students to immediately start in the labour market (e.g. general secondary education or preparatory university education), but one can imagine what kind of competencies are necessary in relation to a particular field (e.g. digital competence) to make the competencies that have to be developed meaningful. The competencies that should be developed should be made meaningful and practical to these students.

In this chapter we want to distil lessons from the developments in competence-based vocational education and apply it in the field of digital competence. We start with a more general introduction about competence and competence-based education, mainly applied in the situation of vocational education. This is followed by a description of a framework for competence-based education and finally this framework is applied in the field of digital competence. The chapter concludes with some important points to recall when starting to develop education for digital competence.

Introduction to CBE

CBE is a popular educational innovation in vocational education in many countries because it is expected to better prepare students for the current and future labour market and for society as a whole and by making education more authentic and attractive for students because of which less students are assumed to quit education before attaining their diploma (Biemans et al., 2004). According to Watson (1991) the rationale for competence-based learning is that it is more cost effective, more relevant and more self-satisfying in respect of traditional forms of vocational education, for students and teachers.

But CBE is a container concept, has different manifestations and there is no consensus about what is exactly meant by it, neither in theory nor in practice: CBE is often used as a catch-all term comprising many different forms of education (Van der Klink, Boon & Schlusmans, 2007). Available definitions differ widely and most of the definitions have been formulated from more a theoretical than an empirical stance (Van den Berg & De Bruijn, 2009). Despite the conceptual confusion, CBE is applied in educational practice on a large scale in many different countries (Mulder et al., 2007). So, firstly we want to provide insight into what is meant with CBE. To this end, the next section contains an exploration of what is meant with competence and CBE from a theoretical point of view. Secondly, we want to share a model for CBE. The comprehensive framework is used as a starting point to further elaborate on pedagogical-didactical guidelines that suit DC.

Conceptualisation of competence and CBE

The way competence-based learning is operationalised depends on the conceptualisation of competence. Several scholars (Mulder, 2014; Delamare Le Deist & Winterton, 2005; Winterton, 2009; Biemans et al., 2004; Wesselink, 2010) have presented frameworks in which the different conceptualisations of competence are elaborated. Based on these overviews we came up with the following conceptual development of competence. In general three main conceptualisations of competence can be distinguished: behaviouristic, generic and holistic. Many authors warn that the conceptualisations of competence in behaviouristic and generic traditions fall short in addressing the developmental and situated nature of professional practice (Billett, 1996; Brown et al., 1989). In contrast with the first two conceptualisations, the holistic conceptualisation focuses on the development of capabilities of workers (or students) in relation to professional practice contexts. The behaviouristic conceptualisation of competence suffered the pitfall from long and detailed lists of task elements, which appeared not suitable for curriculum development and lacked the human factor that is ought to be important to perform successfully. To illustrate this, we share a statement from Hyland (1995). He argues that the increasingly powerful influence of the CBE strategy with a

behaviouristic underpinning is responsible for the marginalisation and neglect of moral education at VET schools. This approach has been described as "morally impoverished" and, if it allows for the discussion of values at all, it generates a generally uncritical and highly technicist future workers. According to Hyland (1995) something like "moral competence" is recommended largely as a means of ensuring that young workers develop the values and personal qualities required by employers, but which are invisible in detailed task analysis as they are the basis for the behaviouristic approach.

The behaviouristic conceptualisation originates from the United States of America where competency (notice the last letter) was a well-known concept, already in the early 1960's and 1970's. In the USA in the 1960's performance-based teacher education was labelled as competency-based education (Olesen, 1979). During those years competency-based education was characterised by detailed analyses of behavioural aspects of professional tasks. Tasks of professionals were described in detailed lists of fragments and assessable elements. Although this was in the 1960's and 1970's, in the USA the concept of competency is still characterised by a rather detailed and fundamentally behavioural approach (McClelland, 1998). Also in UK and in Australia one can recognise a similar conceptualisation of competence within the national vocational qualification frameworks (Eraut, 2003; Hager, 2004).

Was the pitfall of the behaviouristic conceptualisation the level of detail, the most important drawback of the generic approach was the lack of relationships with contexts. The generic conceptualisation of competence could be seen as a response to the behaviouristic tradition, because the generic approach wanted to overcome the detailed lists of competence-aspects with generic competencies. The generic conceptualisation, resulting from human resource activities in professional organisations, originated from the wish to distinguish between average managers and excellent managers (Eraut, 1994; Boyatzis, 1980). Central in these studies was the identification of generic competencies defined in terms of personal qualities or traits, as for example, critical thinking capacity or problem-solving capacity, which could distinguish between excellent and average performers. A difficulty with this model is that it assumes a single type of good practitioner, independent of context, which is not very likely (Eraut, 1994). In the light of realising education based on generic competencies, Gonczi (1994) describes major critics on the generic conceptualisation: there is a lack of evidence as to what extent such "generic" competencies really make the difference between excellent and average performers; there are reasonable doubts about the transferability of competencies from one situation to another; there are serious doubts about the learnability of these competencies, and the lack of relationships with concrete situations. Because of these reasons, the generic conceptualisation makes it problematic to develop meaningful curricula. It is too general and lacks clear relationships with professional practice in which the development and assessment should take place.

Biemans et al. (2004) indicate that more and more the interpretations of competence represent an holistic conceptualisation. Within this tradition the concept of competence is defined as follows:

> competence is the integrated performance-oriented capability of a person or an organisation to reach specific achievements. These capabilities consist of clusters of knowledge structures and cognitive, interactive, affective and where necessary psychomotoric skills, and attitudes and values, which are conditional for carrying out tasks, solving problems and effectively functioning in a certain profession, organisation, position and role. (Mulder, 2001, p.76)

This definition reflects the complex, socio-cultural (i.e. context) and interconnected (i.e. integration of knowledge, skills and attitude) character of DC.

In this regard, Hodkinson and Issitt (1995) identify two conceptualisations of holism. The first conceptualisation concerns the integration of knowledge and understanding, skills and attitudes of the individual that are meaningful for someone who is (becoming a) practitioner or who is performing in an occupation. Knowing the work of Calvani et al. (2008), digital competence is not just about skills, it is about the integration of cognitive, methodological and ethical awareness and therefore, digital competence in this tradition fits very well in the holistic competence definition. This aspect of holism shows similarities with integrated occupationalism, a conceptualisation of CBE defined by Mulder, 2014. In this approach sets of knowledge, skills and attitude, which are needed in the occupation or occupational core roles are distilled from practice and guiding the curriculum (design). According to Mulder (2014) current vocational education policy is aimed at implementing competence-based education practices in which it is stressed that knowledge, skills and attitude should be integrated in the curriculum, teaching, learning and assessment; in present qualification frameworks and competence-based education models it can be seen that attempts have been made to link core roles and work situations, work processes, and competencies. Mulder (2014) calls this approach occupational because a lot of effort is spent on the demand side of education; the needs in the labour market or in other words the expected relevance (not necessarily being the labour market in the case of DC) are considered to be leading in the articulation and definition of the functional specifications of education.

The description of these competencies is based on the expected relevance in practice, however that does not necessarily mean that the training and learning also takes place in the appropriate situations. That leads us to the second dimension of Hodkinson and Issitt's holism (1995) and this relates to the fact that education and assessment processes should take place in relevant practical situations. Moreover, competencies should be practiced and displayed in a context with an appropriate level of generality or holism (Hodkinson & Issitt, 1995). This dimension shows similarities with another approach of Mulder and which he calls situated professionalism. Reading Mulder (2014) he states that this approach is based on the

observation that competence only gets meaning in a certain context, in which professionals interact with each other. In vocational education practice this approach is underrepresented, however in cases where students are asked to fulfil an authentic assignment in the realistic situation of an assigner, situated professionalism is at stake. In the framework of DC, this would mean that students get authentic assignments in the field of DC to develop and show their DC. By means of these authentic assignments they need to gather the necessary knowledge and skills.

To complete Mulders' framework one other approach should be explained, namely behavioristic functionalism. The basic idea of this approach of education and professional development is to specifically determine the discrepancies between mastery of actual and desired specific competencies, which often resulted in training sometimes miniscule skills (compare with behavioristic approach of competence). In the next section we will discuss a framework of CBE that is based on the holistic approach of competencies and share characteristics of integrated occupationalism and situated professionalism.

CBE models and implications for pedagogical-didactical design

According to Biemans, Nieuwenhuis, Poell, Mulder and Wesselink (2004), true implementation of CBE in the holistic conceptualisation has consequences for the learning arrangements for the students in the curriculum (the planned learning and corresponding instructional activities). One of the possible pitfalls of CBE, as described by Biemans et al. (2009), is related to this issue. They claim that specifying the competencies to be acquired by students does not automatically result in the design of effective learning arrangements. Planning, designing and implementing effective ways of competence based learning that integrate relevant knowledge, skills and attitudes (i.e. integrated occupationalism) and take place in realistic meaningful situations (situated professionalism) require specific attention (cf. Delamare Le Deist & Winterton, 2005). Watson (1991) cites Grabowski (from 1981, p. 7) and says: "It is relatively easy to develop lists of competencies, (it is) very time consuming and expensive to develop the training and evaluation packages based on these competencies". So, as done up till now, just coming up with a list of competencies (as done by Ferrari, for example) does not guarantee that students actually develop these competencies. Something should change also in teaching and learning processes. Yet there does not exist a common CBE framework in Europe, let alone in the world. Despite initiatives like European Qualification Framework (EQF) there is still no consensus on what competence entails (Winterton, 2009), let alone that there is consensus on the way competencies should be developed.

So, it would be helpful for both the scientific and the practical communities to describe what CBE entails. In the following section we will present one framework for CBE developed in VET. But considering the applied character of the digital competence, this framework could be a source of inspiration for coming up with a pedagogical design for DC development.

Competence-based education can be typified by its dual character. Watson, already in 1991 painted the dual character of CBE. On one hand it is about competencies: 1) role-relevant competencies that include standards; 2) competencies are specified to students prior to instruction; 3) criterion-referenced measures are used to measure the achievement of competencies and 4) a system exists for documenting the competencies achieved by each student. On the other hand, in order to achieve maximum flexibility, CBE incorporates some form of individualised learning: 1) individualised materials and methods are used in instruction; 2) learning time is flexible and 3) learning is guided by feedback. The theoretical framework to be discussed shares the same duality.

The CBE framework at stake originates from research of Sturing, Biemans, Mulder & De Bruijn (2011), which builds on a previous model developed by Wesselink, Van den Elsen, Biemans and Mulder (2007). This model is, as far as we know, the only model that describes different levels of implementation (from not competence based to completely competence based). The full implementation level is considered as the completely competence-based level. Therefore both the design principles and the last implementation level stage will be presented. Sturing et al. (2011) call their model a model of comprehensive competence-based (vocational) education (CCBE) and this model was validated in senior secondary vocational education by both educational experts and teachers. Both groups could position their educational programme within the model and they were able to make underpinned choices on what to develop next.

The model contains ten essential design principles, here adjusted towards the context of DC:

1. The study program is based on core tasks, working processes and competencies (the qualification profile or educational standards as OECD, 2010 calls them).
2. Complex and authentic core problems are central.
3. Learning activities take place in different concrete, meaningful authentic situations.
4. Knowledge, skills and attitudes are integrated.
5. Students are regularly assessed.
6. Students are challenged to reflect on their own learning.

7. The study program is structured in such a way that the students increasingly self-steer their learning.
8. The study program is flexible.
9. The guidance is adjusted to the learning needs of the students.
10. In the study program attention is paid to learning, career and citizenship competencies.

For each design principle, five implementation levels are described (referred to as "not", "starting to be", "partially", "largely" and "completely" competence-based). Thus, in its most elaborated form, CCBE is defined by the descriptions of the fifth implementation level ("completely" competence-based) of the ten design principles (Sturing et al., 2011):

1. During the development of the study programme the qualification profile or educational standards is at all times used and the programme is synchronized with practices and developments in the profession or real world. Teachers are familiar with the qualification profile.
2. Complex authentic core problems are at all times central to the study programme and are assessed in many different contexts. The complexity of the problems increases during the study programme.
3. Participants always work (both in and outside school) individually and in teams on learning activities that take place in various meaningful, concrete practical settings. A link is always made between classroom learning and learning through practical experience.
4. Knowledge, skills and attitudes are always integrated in the learning process. Knowledge, skills and attitudes are assessed as an integrated whole.
5. Assessment takes place before, during and after the learning process and is both qualifying and focused on the competence development of students. Students determine the timing and format of assessment themselves. Vocational practice is at all times involved in the assessments.
6. Students are at all times challenged to reflect on their learning, the learning outcomes and the occupation.
7. The study programme offers at all times possibilities for self-steering. Students design their own learning process. The students' self-steering of their learning process increases during the programme. Each student is ultimately self-responsible for his/her own learning process.

8. The study programme is flexible and planned with the coach based on the characteristics of the student.

9. The teacher is a coach, mentor and expert. The teacher offers varied guidance which at all times is adjusted to the learning needs of the students. Students are stimulated to help each other.

10. Attention is paid at all times to learning, career and citizenship competencies during the study programme. These competencies are integrated in the study programme.

Translating competence-oriented learning goals into actual learning arrangements - for example, in this case, the digital competence - taking place in different authentic situations, is crucial in the implementation of competence-based education. If CCBE implementation gets stuck at the preparation phase and/or does not get carried into the execution phase of actual learning arrangements, true innovation will fail and realisation of the expected benefits will not be possible (Biemans et al., 2009). Therefore, in the next paragraph we will operationalize some of the CCBE principles in the field of digital competence to offer more concrete guidelines that can support the design of learning arrangements of digital competencies.

From a theoretical model to a model specific for digital competence

We try to define a framework for an educational process or curriculum able to support the development of the digital competence, following the principles of the competence-based education. That is, we draw the characteristics requested to an educational process for DC which is CCBE compliant. As we said in the previous part, the CCBE model includes 10 principles: some of them are more oriented toward the curriculum aspects, some contain instructional points. In this part, we refer to four principles of the model, which are most interesting for developing digital competence and are important for the first steps towards competence-based education (Wesselink, Biemans & Mulder, in press): principles 1 and 2, which address the main references for the curriculum and are linked to concrete competences; principle 5, which requests a realistic assessment environment; and principle 10, which refers to the lifelong learning. Whereas three of the principles are “curriculum” oriented, the principle 5 is “instruction” oriented. The variables provided by the model will be specially used as a reference for a possible implementation of a DC curriculum.

Principle 1: the competencies on which the programme is based are defined

A profile or set of competencies has to be adopted or defined as a reference on a regular basis. In the field of the digital competence, it seems quite easy to assume the ECDL, the EUCIP or, more specifically for the vocational education, the EQF, as a term of reference. Here the discussion is not about which is the best profile to adopt. Rather, it is important to have a clear and accessible definition of competence. Not having a clear and shared definition of competence is one of the major pitfalls in developing CBE, Biemans et al., 2004) and can cause a lot of delay if some stakeholders have a different interpretation of (digital) competence. A definition could be built by composing elements from different sources, or by defining them from scratch. This is the first variable to check: a competence profile has to be clearly adopted by any programme for developing digital competencies. As an example of profile to refer, we can take the digital competence framework (Ferrari, 2013), also called DIGCOMP framework, which details 21 competences.

The information and communication technology field is permanently interested by innovation, related for example to the hardware, the software, the physical and logical connections and the extension of users involvement. As a consequence, the programme needs to provide a renewing of the profile, which has to be as dynamic as the real digital world is. Since the education cannot be conditioned by all the technological evolutions in the field, some choice has to be taken. So, it is important to follow the evolution of the core problems (see *Principle 2*, later on), which probably will not change really frequently. To accommodate these changes, direct contact with the field of work or with the latest developments is important.

To have a competence profile is only the starting point, but it is not the full accomplishment of the first principle. The usage of the adopted profile can characterise in different ways the design of the programme, which should give references, more or less directly, to the profile. The more frequent are the references to the competence profile used in the programme, the more value has the second variable characterising the first principle, and the higher is the implementation level reached by the programme. And the profile should be integrated with the other elements of the curriculum at stake. In a lot of cases, DC is not a goal in itself. Rather, DC is more often a competence that is applied in other professional areas. In these cases there should be a clear link between these fields and DC.

Principle 2: core problems are the organising unit for (re)designing the curriculum (learning and assessment)

The second principle suggests also to rethink the organisational setting of the educational activities. When the curriculum is organised with the aim to follow the defined competencies,

the single subject disciplines are no more the only or the main context in which the curriculum has to be defined. Then, it is important to identify the issues which are more relevant to develop the referenced competencies. These issues, called here core problems, can be used as an effective driver to restructure or, in other situations, to reorganise the programme. One result could be, for example, a better integration between the theoretical and practical activities, developed in a particular subject. But another solution, perhaps not easy to reach, could be the integration among different disciplines. Core problems should have resemblance with the world of work or applying DC in real life, because this makes the transfer from school to the real world less complicated. The first variable of the second principle measures the importance of the role of core problems in the development of the curriculum. Going back to the DIGCOMP framework, the core problems cannot be associated to the five areas of competence. Rather, for each area have to be defined specific core problems (e.g. building a website).

After the identification of the core problems, the realisation of the competences development must be supported. This means that the assessment of the competence development, reached by the learners, must be related to the core problems, identified as important in the curriculum. Assessment is always guiding the learning process of the learner and therefore the assessment should also resemble the core problems. By the second variable of the second principle we can understand at which level the assessment, planned in the curriculum, fits the core problems. For example, if the whole set of assessments provided in a curriculum are clearly related to the core subject, the curriculum can be defined as completely competence based, in relation to this principle.

Principle 5: Learning activities take place in a range of authentic situations

The context of the learning activities must be meaningful, to increase the meaning and the result of the learning experience. Competence-based education asks for an environment of a more realistic level, compared to traditional education. On the one hand, the idea of an authentic environment is not new, sometimes suggested for an authentic evaluation; on the other hand, it is not easy to arrange, all along the realisation of a curriculum, the whole set of elements of a concrete and real situation. Authentic situations make the learning activities meaningful to the students and they have less problems with applying the lessons learned in real practice.

Nevertheless, in order to be compliant to this principle, the values of three variables must be measured for the curriculum: authenticity, variation, and connection with the learning in practice. In the field of DC, it is not always accepted that these are characteristic of a competence-based education. It can easily accepted that the learning of practical activities, or the achievement of the operational competences, are reached in a realistic environment.

But sometimes, when the DC of the curriculum is nearer to the territory of computational thinking, the role of the authentic, realistic activities could be less appreciated, because more theoretical elements seem more important to stress. As a result, the provision of a realistic learning environment could be intended as an oversimplification of more relevant and clean concepts, which must be served in their pure definition. The risk of such a reaction is not only to go back to the traditional transmission of knowledge, but mostly to lose the opportunities offered by a realistic learning situation, in order to obtain a stronger involvement of the learners and let them understand the social relevance of their learning.

The DICOMP framework refers to the problem-solving as one of the five areas of competence. Moving to the details, the four competences of this area are all connected to a technical environment. This suggestion of the DICOMP framework could help to maintain a more realistic approach, in the definition of the curriculum.

Principle 10: A basis for students to achieve an attitude of lifelong learning is realised

The acquiring of an adequate digital competence can be used as a skill to enter the labour market. A minimum level of digital competence is required, for many job positions. And the range of the sectors looking for these skills has been extended during the years, as well as the kind and the level of the job. In the initial situation, the digital competence was a specific skill, mainly required in almost isolated and specific contexts of technicians. Nowadays, the prevalent meaning of the term is related to the more general and basic skills, enabling computer users to access to the tools and the applications of ICT, in an appropriate and fruitful way, at work and for leisure. According to the first variable of this principle, the curriculum should support the learners to develop the awareness of their identity, in terms of present and future professional evolution, related to the various opportunities and chances offered by the growing relevance of ICT in the labour environments.

The technological evolution and the gradual extension of the context in which digital competences are required – from a specialistic environment, through a general working-situation, to the present extended usage required to the citizens, also for the access to basic services, private or public – suggest to enlarge the focus of the study. The curriculum has to pay attention to the support of the today learners, but has also to prepare them to their future learning (and problem solving – see Ferrari, 2013). As a consequence, the curriculum must be capable to support the development of the meta-competences, in particular the learning-to-learn which plays a key role in the digital competence scenario. The second variable of the 10th principle let to represent how a curriculum is capable to develop and to support the learning competence of the learners. More than other competences, this is the enabling factor for the life-long learning. Some elements of this attention are provided also by DIGICOM

framework. In the Annex V of (Ferrari, 2013), the author proposes an interesting mapping, highlighting the relevance of the digital competence for the other seven key competences for lifelong learning. For the key competence "learn to learn", different links with several digital competences are proposed in the framework. The links are related both to the competences of the Information area, and to the Problem Solving area.

Conclusion and discussion

It is important to design learning environments in which students experience what the essence is of DC. They have to face up to what it is to make ethical choices and decisions. This is something they have to experience and which they cannot learn from a book or lecture. And as far as possible, DC should be taught within the context of the study field. DC as such does not have really interesting meaning for a lot of learners, but in relation to other elements of the study field, it becomes meaningful for all of them.

The nature of DC itself is abstract. The competencies only get meaning when they are applied in a realistic situation. Also for students from general secondary education one can think of realistic or even authentic situation. This is not solely reserved for vocational education. Students are involved in Facebook, Instagram, chats, etc. and they encounter dilemma's. Based on these realistic and authentic situations, education for DC gets meaning for the students and they will develop DC.

The attention in the selection of principles, to be discussed in the light of digital competence, was mainly focussed on creating authentic situations. As we described in the beginning of this chapter, there is another significant characteristic of CBE, flexibility. The individual student should be able to work and learn on its own pace. In the field of DC this is even more true. Some students are really competent and have all necessary DC in a proficient state (because of their own interest or extra-curricular activities). Some students do hardly have any experience and can be called almost digital illiterate. So, according to principle 7, the student should be able to self-steer their learning and learn on a level that is appropriate to him or her.

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