Chapter 9
Designing Competence-Based Vocational Curricula at the School-Work Boundary

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9.1 Introduction

A shift has taken place from education based on knowledge transfer towards education that takes learning outcomes (i.e. competencies) as a starting point (Cedefop, 2009; Wesselink, 2010). Learning outcomes can be defined as statements of what a learner knows and understands and is able to do after completion of learning trajectories. In many countries these learning outcomes are labelled 'competencies'. According to an international overview, in the Netherlands a competence is seen as 'the ability to successfully meet complex demands in a particular context through the mobilisation of psychosocial prerequisites' (Rychen & Salganic, 2003, cited in Cedefop, 2009, p. 13); this could be considered a 'holistic approach' according to Biemans, Nieuwenhuis, Poell, Mulder, and Wesselink (2004) and Winterton, Delamare-Le Deist, and Stringfellow (2006). In 1999, the advisory committee on education and the labour market (ACOA) of the Netherlands published a proposal entitled 'The shift towards core competencies' (ACOA, 1999), signalling a change of emphasis towards competencies – as opposed to academic disciplines (e.g. maths, history or science) – as a starting point for the design of VET programmes (Mulder, Weigel, & Collins, 2007). Learning programmes that are designed this way are collectively known as competence-based education (CBE). An important factor in

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CBE's popularity is the expectation, held by many VET stakeholders, that its introduction could close the gap between education and the workplace (Biemans et al., 2004). It is expected that VET graduates will experience less teething problems when starting work, having already enjoyed professional practice experience and having developed competencies (Velde, 1999). Said competencies are relevant when dealing with increasingly complex environments which are characterized by ill-defined problems, contradictory information, informal collaboration, and dynamic and highly integrated processes (Cremers, Wals, Wesselink, Nieveen, & Mulder, 2014; Kirschner, Van Vilsteren, Hummel, & Wigman, 1997).

In this chapter, CBE will be studied with respect to the 'curriculum', which can be defined as a 'plan for learning' (Van den Akker, 2003), and it will offer a review of what competence-based education entails; from the design of a competence-based curriculum (intended), to the interpretations of these curricula by stakeholders (implemented), and the actual outcomes of these curricula (attained). Most of the research presented in this chapter deals with either the intended or the implemented curriculum, since attained curricula are not yet widely studied across the different domains of VET (see Van den Berg & De Bruijn, 2009). VET-institutes are working on extensive programmes for CBE development and implementation, so CBE is work in progress, but said programmes need to be redesigned in their entirety before their effects can be measured (Van den Berg & De Bruijn, 2009). Although that statement hails from 2009, to the best of our knowledge, it still holds true. The peer reviewed research results available to us only include specific parts of CBE (e.g. assessment, see Baartman & Gulikers, 2017) or lie outside the domain of vocational education (e.g. medical education). In VET studies, the effects of fully implemented CBE have either not been studied widely or study results remain unpublished as yet.

This chapter then continues with a brief historical overview of the rise of CBE in the Netherlands, followed by a review of current practices and research on the status quo of CBE in Dutch VET. The review utilizes peer-reviewed research papers as well as more practical, so-called 'grey publications'.

9.2 CBE in The Netherlands: A Brief Historical Overview

There has been a growing emphasis on work-based learning in the Netherlands since the early 1990s. This came about as a response to criticism that VET-institutes offering three to four year fulltime vocational education,[1] insufficiently prepared students for the workplace (Brandsma, Noonan, & Westphalen, 2000; Brockmann, Clarke, & Winch, 2008; Cedefop, 2009). Young people were affected most, as their migration into the workforce was hindered by a lack of workplace experience and a failing to meet new work requirements. The fulltime vocational courses within the Dutch VET-system were considered too 'academic' and 'not realistic' (Cedefop, 2010).

[1] Vocational education at level 4/5 of the European Qualification Framework.

In 1996, the Education and Vocational Schooling Act (Wet Educatie en Beroepsonderwijs, WEB) passed into law (Cedefop, 2012) and one of the act's focal points was integrating the apprenticeship system into the formal educational system. All students, either in apprenticeship courses or in fulltime education, should have a curriculum of which 20–60% was spent in the workplace. The WEB was also significant because it marked the shift towards a qualification system that was based more on outcomes and placed a bigger emphasis on the demands of the labour market (Mulder et al., 2007). Despite these efforts, national institutes like the Social and Economic Council of the Netherlands and the Advisory Committee Education and Labour Market published reports (in 1997 and 1998 respectively) which reignited discussion about the desired connection between education and the labour market (De Vries, 2009). In sum, the overabundance of qualifications (over 700), and the inability of vocational institutes in responding rapidly to labour market changes (Eurydice, 2006) were driving factors for the development of a renewed competence-based qualifications framework.

As a result of said complaints, the number of qualification structures in the Netherlands was significantly reduced. However, the process of developing outcome-based qualifications was far from smooth, the resulting qualifications were criticised as being too specified and narrow for example. There was also criticism that the qualifications were not paying enough attention to more generic competencies and focused too much on technical-instrumental competencies (De Vries, 2009), resulting in a drop in the number of graduations to higher education (Nijhof & Van Esch, 2004). Many of the issues stemmed from start-up problems often inherent to such a large, system-wide reform. Nijhof and Van Esch argue, based on earlier experiences with large systemic change, that it takes time for participants and stakeholders to become familiar with new roles and new relationships and develop the knowledge and skills to handle them.

As to reducing the number of qualifications, in 2012–2013 there were 612 specific qualifications, which were clustered into 237 broader qualification structures (Van der Meijden, Van den Berg, & Róman, 2013). These qualification structures define and map 25 competencies with learning outcomes based on work tasks and processes (Cedefop, 2012). The first experiments with this competence-based qualifications framework took place between 2004 and 2009. The original plan was to introduce this framework through legislation in 2009 but its implementation was postponed, first to 2010, then to 2011 and finally to 2012, because not all VET institutes were equipped to handle its introduction up to that point (De Vries, 2009). In fact, in 2004/2005 only 2% of VET-institutes experimented with the competence-based qualification structure, expanding to 73% in the following four years (Van der Meijden, 2011). As of 2012, every VET programme in the Netherlands is required to use the competence-based qualification structure as the starting point for curriculum design. In late 2011, it was announced that the competence-based qualification framework was to be renamed vocation-based qualification structures, reflecting a shift in emphasis towards vocationally specific knowledge and skills (Cedefop, 2012). In the period 2004–2010 VET institutes were offered the opportunity to start implementing the newly developed competence-based qualification structures.

Efforts for a further reduction in the number of qualification structures are taken (Bussemaker, 2014a, 2014b). In the beginning of 2015 the Minister of Education approved a new set of qualification structures, containing only 168 qualifications. Besides this reduction, another major change was proposed. The qualification structures are enriched with optional modules. A student can choose between several modules and these are additional to the core qualification structure. This change has the aim to enrich the educational programme of students.

It should be noted that the content of the qualifications framework (the 'what') is determined at the national level, but as to *how* VET-institutes design their curricula to actually enable students to develop competencies is up to the VET-institutes. Competence-based qualification structures do not represent a teaching method, they only determine the outcomes of the curricula. VET-institutes themselves are responsible for redesigning their curricula so as to realize said outcomes and CBE therefore lacks a national standard. The absence of a clear standard for, or a shared definition of, CBE makes it difficult to assess whether VET-institutes actually enable students to develop competencies as opposed to just acquiring knowledge and skills. However, VET-institutes might already apply teaching practices and methods that are compatible with CBE without referring to it as such (Biemans et al., 2004). This is why some VET-institutes were forced to redesign their whole curriculum to conform to competencies, while others have had to adjust their programmes only to a small extent. These differences make it difficult or even impossible to say anything about the 'general level of CBE' in the Netherlands (Van der Meijden et al., 2013).

Although the VET-institutes are responsible for the 'how' of CBE, they did not perceive ownership in all cases. Moreover, policy-based research from Schuit, Kennis, and Hövels (2009) made explicit that within the current qualification structure, VET-institutes did not perceive much leeway with regards to the development of their own curricula. Because of the level of detail the structure provided, the institutes felt they had little room to manoeuvre when (re)designing their curricula.

Furthermore, the way in which the government chose to introduce the new procedures proved problematic. The government decreed that every educational programme was obliged to work with competencies from 2009 on (which was ultimately postponed to 2012). The government, however, did not wait to see whether the experiments with CBE – which took place at different VET-institutes – actually yielded the desired results (De Vries, 2009). So VET-institutes had to start developing CBE, and accommodate competencies in their curricula, without clear evidence for the added value of either competencies as learning outcomes or CBE.

As a consequence of the confusion about CBE among researchers (at a conceptual level) and practitioners (e.g. What is it? Does it work?) (Stoof, Martens, Van Merriënboer, & Bastiaens, 2002), considerable differences exist in the design of competence-based curricula (Van den Berg & De Bruijn, 2009). Several scholars (Sturing, Biemans, Mulder, & De Bruijn, 2011; Wesselink, Biemans, Mulder, & Van den Elsen, 2007) developed theoretical frameworks, with Dutch VET as starting point, to clarify what CBE could or should entail; one example being a model called Comprehensive CBE (CCBE, Sturing et al., 2011; Wesselink et al., 2007). This model integrates principles concerning (1) the curriculum and specifications of the

study programme; (2) the way instruction takes place and the teacher's role; (3) the assessment procedure; and, (4) the student's career competencies. A framework for CBE was also defined on the policy level: (1) integration of knowledge, skills, and attitude; (2) orientation on acting (in the domain of the profession); (3) focus on the individual; and, (4) focus on the development of the individuals' career (Inspectorate, 2009). These models concern the intended curricula and, in relation to their implementation, Sturing et al. (2011) evaluated the extent to which VET-teachers perceived how these elements differed in importance when realizing CBE. The teachers found it difficult to make a distinction as to their importance, because they shared a belief that all elements of CBE were of equal importance. In the remainder of this chapter we will take a closer look at CBE in Dutch VET and pay specific attention to the curriculum perspective.

9.3 Review CBE in Dutch VET Curricula

In 2007, three out of ten educational programmes considered their curriculum as being competence-based. These curricula shared the following characteristics (Inspectorate, 2009):

- Diversity in the teaching methods, resulting in 'hybrid' learning environments. Classic frontal instruction was alternated more often with: integral assignments, project work, self-study, and practice-based learning, inside as well as outside the school.
- Stronger ties between the programme and the (regional) labour market. These connections were realized mainly through the incorporation of practical, authentic assignments (from relevant regional business organisations) and through closer cooperation with the apprenticeship companies.
- Adjustability and flexibility of the programme.

As stated before; in the period between 2006 and 2009, VET-institutes in the Netherlands started experimenting with the new competence-based qualification structure. These experiments were monitored by Van der Meijden and colleagues; they published several reports, but only two related to the curriculum level. The other reports (e.g. Baarda, 2006; Van der Meijden, 2007, 2011) concentrated mainly on the student (students leaving VET-institutes, motivation of students, etc.). The results of those studies are mainly beyond the scope of this chapter; however, the results presented in 2009 and 2010 are relevant to this chapter. These reports yielded the following set of features which, according to the participants, contributed to positive effects of CBE:

- Suitable integrative assignments
- Contextual learning: learning professional knowledge and skills in context
- Differentiation; tailor-made instruction
- Appropriate collaborative learning and self-study

- A clearly structured curriculum
- Transparent organisation of the apprenticeship training period
- Training and development for supervisors/assessors at the workplace
- Structured career guidance with attention to personal development
- Sufficient preparation for lifelong learning.

The following three points of critique were formulated by the Inspectorate (2009) in relation to curricula that could be considered competence based. In the first place, the thoroughness of content and knowledge should remain one of the focal points. Especially according to workplace training supervisors, student knowledge was not thorough enough, and students did not sufficiently develop professional skills. In the second place, relationships with workplace organisations should be improved; communication especially was seen as one of the bottle necks. This was also signalled by Wesselink, De Jong, and Biemans (2010). They studied the three-way communication between students, VET-institute teachers, and workplace training supervisors in the context of CBE. Their case studies lead to the conclusion that it is mainly the case that mutual expectations about who has to do what that have to be articulated more clearly. Nevertheless, in general, students are satisfied with the content of the curriculum in relation to their needs in vocational practice (Inspectorate, 2009); they were able to apply what they learned in the educational setting in practice. Lastly, more attention should be paid to the overall structure of educational programmes. Although the programmes are flexible only to a limited extent, students especially do not perceive the structure of educational programmes as being clear enough. The content of the programmes is determined in large part by the qualifications profiles and only 32% of the programmes (according to the Dutch Inspectorate study) explicitly espouse to take demands of local parties (regional organisations) into account. To add to that, only 29% of the programmes took students' wishes and desires into account. As to the adjustability of the programmes, students reported that they were able to request additional theoretical lessons or workshops in only 10% of cases. And in just 16% of cases it was reported that the more general subjects (like Dutch or foreign languages) were aligned with the (authentic) assignments, as they were supposed to.

The results of De Bruijn and Leeman in 2011 show a similar picture. They published a study on Dutch VET programmes which took 'powerful learning environments' as the starting point for data collection; it analysed the state of affairs, dilemmas and practical tensions surrounding their implementation. Just like learning environments in CBE, powerful learning environments are based on (social) constructivist learning theories (Wesselink, 2010). The educational programmes in the De Bruijn and Leemans study could be characterised as slightly powerful; on a scale from 1 to 4 the mean score was a fraction above 2. Only three out of eleven study programmes scored over 2.5. The aspects 'adaptive instruction' and 'vocational identity' scored relatively high in comparison, leading De Bruijn and Leeman (2011) to offer the explanation that said aspects are more easily incorporated into a more traditional curriculum. Aspects like 'coaching' and 'learning by reflection' scored relatively low, only a few of the educational programmes actually

incorporated 'reflection on results and on the learning process' and in only a few cases could the teaching style be typified as 'coaching'. A combination of authentic learning and self-directed learning was only encountered in a handful of cases (De Bruijn & Leeman, 2011). In sum, VET-institutes are making progress with the implementation of CBE or other developments based on (social) constructivist learning theories. However, one would have expected to have seen more progress in the years past.

We have shown you characteristics of CBE, positive points, and pointers for the improvement of CBE. But, as mentioned before, we have not been able to share many results on attained curricula. Because of the extensive and ongoing efforts in implementing a certain level of CBE, VET-institutes are not willing or ready to participate in CBE research yet. Consequently, researchers were not able to evaluate CBE outcomes (e.g. more competent and motivated students). The difficulties in CBE implementation are dealt with in the next section.

9.4 CBE and Its Difficulties

VET-institutes started working with CBE enthusiastically; however, the transition towards CBE has not been a case of smooth sailing. Implementing CBE calls for changes that affect many components of educational systems. To name just a few: curriculum design, and enacting said curriculum within schools and work placements (Jonnaert, Masciotra, Barrette, Morel, & Mane, 2007). Biemans et al. (2004) summarised the most important pitfalls in CBE implementation on the basis of several applied studies in Dutch VET-institutes. In 2009, roughly the same authors (Biemans et al., 2009) continued this work. This section discusses these pitfalls (Biemans et al., 2004, 2009) which cover pedagogical, conceptual and cultural problems. These can be seen as the central problems complicating Dutch VET and are probably partly to blame for the delay in implementing CBE to its full extent.

1. *The concept of competence*. As early as 2002, Stoof et al. (2002) carried out a study for the Educational Council of the Netherlands in order to clarify the concepts of 'competence' and 'competency'. There is still little consensus among researchers on what these concepts mean. The same goes for the educational practice field; students, teachers, instructors, and workplace training supervisors perceive and experience CBE in different ways (Biemans et al., 2009). This ambiguity offers teachers and educational designers room for replacing existing labels (e.g. knowledge, skills) with more contemporary labels – such as competence – while bringing about very little actual change in educational practice (Wesselink, Dekker-Groen, Biemans, & Mulder, 2010). This gives rise to questions as to whether CBE is actually being realized and to what extent daily practice in VET-institutes is really changing. An increasing sense of urgency with regard to reaching more conceptual consensus is therefore felt in educational practice; that is why discussions were set up, both at national and local institutional levels, to achieve this goal.

2. *Standardisation*. Using overly standardised competencies misses the point of CBE (Biemans et al., 2004), since every abstraction that diverts from actual practice makes competencies less applicable and recognisable for students. Although the whole point of the nationally approved qualifications framework is labour market exchange value, it is important for VET-institutes to remain in tune with specific (regional) workplace contexts. Teacher teams play an important role in striking a balance between national standards and the local labour market. Biemans et al. (2009) reported that both teachers and workplace training supervisors (representing professional practice) agree that current educational programmes are more aligned with present and future professional practice than before, although there is still room for improvement.
3. *School and workplace learning*. It cannot be underestimated how hard it is to integrate in-school learning with learning in the workplace (Wesselink et al., 2010; Zitter & Hoeve, 2012). However, the distinction between the two settings should be reconsidered. Based on studying the three main stakeholders of VET internships (i.e. students, teachers and workplace training supervisors), Wesselink et al. (2010) conclude that said stakeholders recognise the growing attention being paid to workplace learning and are convinced of its added value. Problems and questions put forward all related to 'how' workplace learning could support the learning process and not 'whether' workplace learning should be part of the curriculum. It should be noted, however, that all three stakeholder groups have different conceptions of learning and that there is a lack of agreement on the division of responsibilities for workplace learning. These aspects need to be improved in order to be able to take more advantage of learning in the workplace (Wesselink et al., 2010).
4. *Determining learning activities*. Translating competence-based learning goals into actual learning activities is crucial to implementing CBE. If implementation gets stuck in the preparation phase, and/or does not advance to the execution phase, true innovation will fail (Biemans et al., 2004). Students should be made aware of their competencies and ways of learning, but this requires different approaches in both workplace and school settings. Actual learning activities should, as much as possible, be interdisciplinary and take place in authentic situations. Biemans et al. (2009) showed that Life Sciences VET-institutes have made considerable strides in designing, developing, and implementing new competence-based learning activities and assessments based on critical job situations, in order to support and connect learning and assessment in school and workplace alike. Where, in the beginning, these assignments were derived directly from traditional learning materials, VET-institutes nowadays are increasingly using authentic assignments provided by one or more regional parties (e.g. local government, farmers, or research institutes) as building blocks for their educational programme (Oonk, Beers, & Wesselink, 2013).
5. *Assessment of competencies*. Assessments are hard to standardise; the dichotomy between national standards and local flexibility forms a pressing dilemma (cf. Nieuwenhuis, Van Berkel, Jellema, & Mulder, 2001). Without going into too much detail with regard to assessment, as another chapter in this book deals with competence-based assessment, it can be said that important steps have been

taken. Many promising new competence-based assessments have been developed and implemented, consisting of various assessment methods like observation and criterion-based interview (see for example Gulikers, Baartman, & Biemans, 2010).

6. *Changing teacher roles and identity*. In CBE, the role of the educator also incorporates the role of coach: guiding students' learning processes, as opposed to merely enacting the role of expert and imparting knowledge to students. Students must gradually take responsibility for their own learning process, whereas the educator has to provide the necessary support and scaffolding accordingly. This process requires a different attitude from both parties involved and could perhaps even be considered a paradigm shift. In this regard, Biemans et al. (2009) showed that the students' need for autonomy and self-regulation appears to increase as they become more adept at independent learning.
7. *Conditions at institutional level*. In developing CBE, it is essential that structural attention is paid to the competence development of teachers and school managers. Biemans et al. (2009) showed teachers experiencing CBE implementation which was insufficiently facilitated by school management. Research by CBE consultant McDaniel (2012), initiated by collaborating VET-institutes, showed that a large proportion of teachers does not feel fully competent to work in CBE. In teachers' perception, designing, developing, and implementing CBE puts a lot of strain on their time schedule and it is up to school management to facilitate the process properly.

Although all the difficulties mentioned above are a hindrance to smooth CBE implementation, the pitfall of connecting learning in schools with workplace learning can be considered as the one that strikes at the heart of implementing CBE in VET curricula; true innovation will not take place if nothing changes at this level, according to Biemans et al. (2004). Therefore, the remainder of this chapter will focus on the relationship between in-school learning and learning through practice.

9.5 The School-Work Boundary

Learning through practice is one of the distinguishing characteristics (and difficulties) of CBE and manifests itself in multiple ways, such as: problem-based learning, authentic assignments, hands-on simulations, workplace simulations, projects, and other forms to foster learning in authentic contexts. These forms cross the traditional boundary between school and the workplace; to show the complexity of crossing them, we adopt the theory of 'boundary crossing' (Akkerman & Bakker, 2011) which includes four learning mechanisms. These mechanism are: identification, coordination, reflection, and transformation. The definitions of these four mechanisms are found below and include examples of how these mechanisms manifest themselves. These definitions and examples help shed more light on the complexity of crossing the school-work boundary and provide footholds for designing curricula, which have to cross these boundaries.

Identification is seen as learning the particularities of both sites in relation to one another (Akkerman & Bakker, 2011, 2012). School-based learning and work-based learning are useful for different purposes. In CBE curricula, work-based learning is considered part of preparatory rationality, which uses learning as preparation for work (Nieuwenhuis & Van Woerkom, 2007). School-based learning provides a safe environment that is more suited to knowledge acquisition and reflective processes. For example, Poortman, Illeris, and Nieuwenhuis (2011) show that work-based elements in curricula provide opportunities for applying theory to practice, allowing students to develop more practical skills. C*oordination* is seen as establishing cooperative and routinized exchanges between practices. For example, developing a protocol for the interaction between education and the workplace to help educational institutes and workplaces (business, governments or community organisations) collaborate more effectively in guiding students during workplace learning, (Blokhuis, 2006; Onstenk & Blokhuis, 2007). *Reflection* is seen as learning new things about a practice by viewing it from the perspective of the other practice. In a study on Dutch senior secondary vocational laboratory education (Akkerman & Bakker, 2012) this mechanism was deliberately triggered through bringing the workplace into the school by organising systematic visits from representatives from industry to the educational institute. The fourth and final mechanism is *transformation* and it is seen as changing practices in response to one another or creating a new in-between practice. Generally, bringing about cross links by designing learning environments that straddle traditional boundaries involves co-development by schools and professional workplaces. Below, insights into different practices of co-development are shared. These practices focus specifically on transformation, which is considered the most difficult mechanism when crossing boundaries.

9.6 Transformation: Review of Co-development Practices Between Educational Institutes and Workplaces

The co-development of new practices by VET-institutes and workplaces has taken flight in Dutch VET, with the aim of improving cross links between learning in VET-institutes and in workplaces. In 2002, the Dutch government introduced a national innovation programme for VET-institutes which will come to an end in 2015. Through this programme, projects could apply for government grants to fund experiments with innovative educational practices. One of the main goals of this programme was to stimulate collaboration between schools and professional practice/workplaces. The innovation projects were monitored by external researchers and during the latter years, representatives of the projects were required to carry out their own research (see for example De Bruijn, Hermanussen, & Van de Venne, 2008).

Smulders, Hoeve and Van der Meer (2012) carried out case study research on over 100 projects involved in this national innovation programme, ten of which were selected for an in-depth study. In these projects both VET-institutes and busi-

nesses were involved in the design and/or implementation of educational practices and this co-operation was structurally embedded within the organisations of these VET-institutes and companies. On the basis of this study, particular forms of co-development in Dutch VET were identified and the projects were classified as taking one of the following five forms.

1. School at work. This form of co-development is characterized by a long-term and intensive collaboration between a limited number of partners. This form provides an in-company work/learning environment for a group of students and is, for example, situated within a hospital or a nursing home. Supervision is provided mainly by senior workers in the workplace. In addition, teachers are frequently present at the workplace to guide students' critical reflection or provide just-in-time knowledge interludes.
2. New entities. This form is characterized by the collaboration between one or two VET-institutes and a small number of business partners. Both the VET-institutes and the business partners invest in the development of a new, stand-alone entity. The new entities provide a work/learning environment for individual students and/or groups of students. This learning environment also provides training opportunities for (groups of) employees of the business partners involved, or for other regional companies.
3. Work at school. This form is characterized by the collaboration between a VET-institute and a small number of business partners. It provides an attractive work environment situated on school grounds, explicitly interweaving more formal learning processes with workplace learning.
4. Temporary projects. This form is characterized by VET-institutes and business partners collaborating on temporary projects. The business partners are clients of the projects. These projects are carried out by individual students or student project teams. These projects can involve single or multiple disciplines or professions. This form creates regional networks of schools and (small) firms that can serve as a vehicle for regional knowledge development in support of economic growth.
5. Sector Councils for VET.[2] This form is characterized by the central role of national Sector Councils for VET. They coordinate the collaboration between VET-institutes and business partners, both on regional and national levels. The Sector Councils invest in the development of work/learning environments situated at VET-institutes in the different regions or at a central location. By operating on a national level, the Sector Councils can create economies of scale through joint investment in technology, sharing of work space and providing access to large business networks.

The five forms above showcase the diversity of the co-development types emerging in the Netherlands over the last decade.

[2] It should be noted that as a result of severe budget cuts (Coalition Rutte II, 2012) the Sector Councils are being reorganised. From August 2015 on, the 17 Sector Councils will form one collaborative organisation.

9.7 Transformation: Review of Learning Environments at the Intersection of School and Work

As reviewed above, new practices combining school-based learning and learning in practice have emerged during the last decade. We will now introduce a design model which will aid us in reviewing practices at the intersection of school and work in more detail. Where the above theory of boundary crossing and the five forms of co-development were used to illustrate the complexity and current co-development practices at the institutional level, the level of business–education partnerships, this new model helps us take a look *inside* learning environments that are the result of such co-development efforts. This model was developed in the context of higher vocational education (Zitter, 2010; Zitter, De Bruijn, Simons, & Ten Cate, 2011, 2012; Zitter, Kinkhorst, Simons, & Ten Cate, 2009) and further development took place in senior secondary vocational education (Zitter & Hoeve, 2012).

This model consists of two dimensions (see Fig. 9.1): (1) Acquisition-Participation and (2) Constructed-Realistic. The first dimension has on one side the knowledge acquisition metaphor, in which knowledge is considered a commodity that can be acquired, transferred and shared with others. On the other side is the participation metaphor, characterising the learning process of individual learners as one of becoming a member of a professional community (Sfard, 1998). This dimension addresses the type of learning process and its intended learning outcomes. The second dimension constructed-realistic is there to characterise the conditions under which learning takes place. Constructed conditions are characterised as low-fidelity, here rich reality is absent or at best simulated. Conditions become more high-fidelity when moving towards the realistic-side of this dimension; for example by involving simulation technology, internal employees, or outside actors to enact roles like client or patient. Moving to the right-hand side of the dimension, conditions closely mirror the real professional context. Under such conditions learners are immersed in actual working life. The combined result of these two dimensions falls in one of four quadrants, each with specific types of learning/working settings.

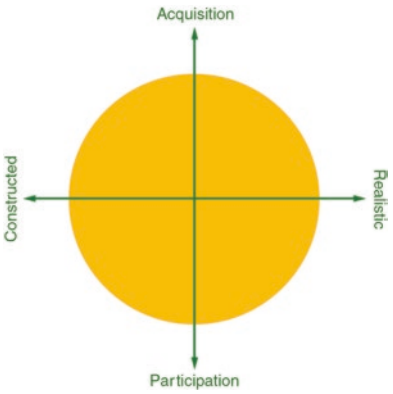

Fig. 9.1 Two dimensions of competence-based learning environments

Learning activities from all four quadrants can be distinguished within Dutch VET. The Inspectorate (2009) report shows a number of forms in which the connectivity between VET-institute and practice manifests itself. The following were distinguished (the brackets give the percentage of participants that said they utilised this form in 2009): guest lecturers from practice (79%), positioned in the realistic-acquisition quadrant. It is immediately apparent that guest lecturers are utilised quite often, although it must be said that settings with guest lecturers do not really allow students to practice and develop competencies in authentic situations. Other forms are simulations (66%), students working on authentic assignments within educational institutes (41%), students working on authentic assignments in companies (56%), students working for 'in-school companies' (36%) and students working in so-called mini-enterprises (20%). The latter forms can be positioned in the participation quadrants, along the constructed-realistic dimension.

9.8 'Acquisition' in Dutch VET

Settings in the upper quadrants (constructed-acquisition and realistic-acquisition) focus on acquiring knowledge, vocational as well as generic (e.g. languages and mathematics). In the chapter by De Bruijn and Bakker, a pendulum swing was observed between an emphasis on knowledge in the form of school subjects and an approach which stresses skills and attitudes. As stated before, the sector is now searching for an equilibrium between the upper, acquisition quadrants and the lower, participation quadrants. This search for balance is exemplified by a review study (Elbers, 2012) on the integration of vocational and language education, which combines language learning with vocational competencies in some form or another. From a curriculum perspective, it is interesting to note that in the review different forms of integrating generic and vocational elements were showcased; such as the use of vocational texts for language development, and using experiences from workplaces as input during language lessons. It should be noted that the search for balance cited above takes place in a policy climate that hinders the finding of said balance, owing to the fact that the ministerial action plan 'Focus on vocations 2011–2015' (Bijsterveldt-Vliegenthart, 2011) puts increasing emphasis on languages and mathematics.

For example, 'development portfolios' can be positioned in the upper right-hand corner (realistic-acquisition). A development portfolio refers to an instrument students use to describe and document multiple aspects of their own professional development over time. Research at a 3-year hairdressing program in a VET institution showed that combining a 'whole task approach' (comparable to 'vocational core problem') in which the learning tasks vary in complexity, authenticity, and amount of given support (Van Merriënboer & Kirschner, 2007) with a development portfolio (aiding students in taking responsibility for their own learning process) yielded a promising approach for the improvement of their self-directedness.

This approach helps students formulate directions for future learning which enhances the quality of their deliberate practice (Kicken, Brand-Gruwel, Van Merriënboer, & Slot, 2009).

9.9 'Participation' in Dutch VET

Innovation and research tend to focus on the lower (participation) quadrants, in line with the identified core difficulty of connecting learning in schools to workplace learning. Longitudinal monitoring shows that Dutch VET is characterized by students working on integral assignments, or projects focussed on learning how to carry out core vocational tasks and work processes (Van der Meijden, 2007). In addition, hands-on simulations are used in vocational oriented curricula for creating meaningful, occupation-related learning experiences (Khaled, Gulikers, Biemans, & Mulder, 2014). A similar concept is 'workplace simulations': authentic practice-oriented learning environments which integrate traditional vocational skills, generic skills, and domain knowledge (Jossberger, Brand-Gruwel, Boshuizen, & Van de Wiel, 2010).

'Pure' workplace learning can be positioned at the far end of the lower, right-hand quadrant (realistic-participation). The education of individual students in actual, real-life, workplaces is discussed in another chapter. Practice learning of a more constructed nature which is also interwoven with learning characterized as acquisition, will be discussed in the remainder of this chapter.

9.10 Hybrid Learning Environments in VET

Up to this point, the model above was applied as framework for reviewing all kinds of initiatives in Dutch VET curricula. The remainder of this chapter will substantiate the hybrid learning concept by means of one of the educational innovation case studies combined with research carried out on Dutch VET (Zitter & Hoeve, 2012). Part of a curriculum can be considered a 'hybrid learning environment' when *"different formal and informal elements are woven together into coherent programmes of learning and into single learning environments, rather than a programme that combines different components with the aim of offering a more enticing menu of learning for the students"* (Zitter & Hoeve, 2012 as cited in OECD, 2013, pp. 138).

In the Netherlands, research was carried out to identify emerging practices and make an in-depth study of hybrid learning environments (Huisman, De Bruijn, Baartman, Zitter, & Aalsma 2010; Zitter & Hoeve, 2012). On that basis we would like to present the Water Factory case study. The Water Factory is situated within the grounds of a VET-institute providing senior secondary vocational education (14,000 students). This learning environment offers five study programs in (senior) secondary vocational education, three in process technology and two in marketing and sales.

Fig. 9.2 Four quadrants/ hybrid nature of the Water Factory

The modality of co-development at the Water Factory can be characterized as 'work at school'. The environment is situated on school grounds.

The Water Factory is set up as an operational factory with a production line for the purification and bottling of water for external clients. In order to market and sell the water in bottles with custom designed labels, there is a marketing and sales department. The description will focus on the production line, which mirrors the production line of the national brewer involved. The hybrid nature is demonstrated, for example, by the fact that production takes more time than is strictly necessary. This stems from the fact that more supervision is provided when needed and step-by-step instructions are given when work is done on the production line. For an even more constructed situation, there are rooms on the left (see Fig. 9.2) with simulation software for practicing with intricate parts of the production line. Moving to the acquisition-quadrants, an educator can halt the production line when a problem occurs. These breaks are used to engage a small group of students in a process of systematic, collaborative problem-solving (realistic-acquisition). The educator can also stop the production line and step out through the low gates and move to one of the tables equipped with computer screens fixed to the wall on the right. Stopping the production for a just-in-time knowledge intermezzo is an example of constructed-acquisition. The implemented curriculum is perceived as positive. First, the students

are enthusiastic about the way in which learning and working are connected. Second, teachers are able to observe students connecting theory and practice. Third, workplace training supervisors of the external workplaces where students carry out their apprenticeship trainings (afterwards, outside of the Water Factory) are satisfied with the competence level students develop through learning in the Water Factory (Aalsma, 2011). So, the Water Factory can be considered a promising 'work at school' co-development project. The dimensions of acquisition-participation and realistic-constructed offer possibilities to analyse (the effects of) the interventions that are taken to stimulate the students' learning.

9.11 Conclusion and Discussion

VET-institutes and associated stakeholders in the Netherlands are, in general, certain of the added value of CBE. VET-institutes are putting a lot of effort in closing the gap between learning and working as this is one of the most challenging aspects of CBE. With the implementation of the WEB, a big step was taken on the national level to stimulate connections between in-school learning and workplace learning. As this chapter has shown, there are countless initiatives for closing gaps between the world of work and the world of learning.

Although research results are still scarce and as yet insufficient to convince people who are more critical of CBE, VET-institutes are making progress. The research efforts that have been made tend to lean towards conceptualizing (intended curriculum) and hardly offer any empirical foundation. Empirical studies of how curricula are perceived, how they work in action (implemented curriculum), and studies of learning outcomes (attained curriculum) of CBE are hard to find. Most research projects on a larger scale are still ongoing and understandably so, since VET involves so many different education levels and covers all industry sectors, from Life Sciences to the Technology Sector and Healthcare, to name just a few. Furthermore, implementing CBE takes a lot more time than anticipated. Due to a number of pitfalls in the implementation of CBE, its effectiveness can only really be assessed after the whole curriculum has been redesigned towards VET (De Bruijn & Leeman, 2011) and students have passed through the entire CBE programme. We expect to share large scale empirical results about the added value of CBE by 2018.

This chapter highlighted an important stumbling block and challenge for CBE implementation, namely how to interconnect learning in school with workplace learning in order to enhance the students' learning process. Instead of considering schools and workplaces as opposites in need of reconciliation (or 'integration'), taking the perspective of boundary-crossing shows us that *multiple* processes take place at the boundaries between education and workplace. This more nuanced perspective helps us to view the ongoing developments in VET taking place on either side of these boundaries, and particularly within the interspace of specific learning environments. Without a doubt, both school and workplace play their own unique role in VET and specifically in CBE. After reading this chapter, the lesson to be

drawn from this – both by researchers and practitioners – is that research and practice show us that interesting developments are taking place at the *intersections* of these worlds and that the design of the curriculum, design of learning environments, and the design of learning activities can foster the learning potential that these junctions provide.

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