

Competence-based education

An example from vocational practice

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Conference paper ECER 2003, VETNET, Hamburg, Germany

Abstract

In the first section of this article the existing confusion about competence-based education is described. It appears to be difficult to define the concept. Three approaches to competence-based education are described; the behavioristic, generic and holistic approach. The more holistic approach corresponds best with the latest developments on competence-based education. The following definition is formulated to describe the concept of competence-based education in the current project: Competence-based education is creating opportunities for students and workers, close to their world of experience in a meaningful learning environment (preferable the professional practice) wherein the learner can develop integrated performance-oriented capabilities to handle the problems in practice. The principles described in this article formulated by various authors, who support the more holistic approach. On the basis of their principles, eleven concrete principles were formulated that lay the ground for the project Competence-based Green Education. Central question in this paper is: 'What are the experiences of the different groups involved with competence-based education, and to what extent do those experiences influence the principles formulated? In other words are the formulated principles good and useful in practice. The most principles are useful, but more attention has to be paid on coaching.

1. Introduction

In the present society globalisation, technical innovations, information and communication technology are everyday developments. Knowledge of today is outdated tomorrow and so the concept lifelong learning is of increasing importance. From the economic point of view lifelong learning is the process of acquiring and updating knowledge to stay employable in the labour market. So leaving school does not mean that one never has to learn anymore. Young adults have to be prepared to meet the challenges of today's knowledge society. Lifelong learning should be the shared responsibility of the government, employers, unions, educational institutes, local authorities and individuals. However these partners are still looking how to perform their roles and duties in practice (Descy & Tessaring, 2000). The labour market is exhibiting contradictory demands. On the one hand employers are seeking for individuals who are highly adaptable to various situations (i.e. generalists) and on the other hand they are seeking for individuals who must be immediately operational (i.e. specialists) (Descy & Tessaring, 2000). Although lifelong learning is the responsibility of several parties, mostly education is seen as the responsible institute to meet those demands. According to Velde (1999) the concept of competence-based education can facilitate learning in a society of rapid change and complexity. Competence-based education is a concept that exists already for several decades. In the 1960's it originated in performance-based teacher education in America (Olesen, 1979). Competence-based education has been introduced and used throughout the United Kingdom, Europe, Asia, United States and New Zealand, although models differ between countries as well as the degree to which competence-based education is used (Velde, 1999). Competence-based education in vocational education and training system (VET) is a leading development for innovation on different levels of the school organisation. Biemans, Poell, Nieuwenhuis and Mulder (2003) made an overview of the aspects

contributing to the popularity of competence-based education nowadays. The first reason is the emphasis that the concept puts on the positive side of education and learning. The main goal is to make individuals more competent instead of emphasizing their knowledge deficits. But the second and also the main reason for the popularity of competence-based education is the expected reduction of the gap between the labour market and the school system. Van Merriënboer, van der Klink and Hendriks (2003) also postulate this argument as one of the main reasons for the popularity of the concept of competence-based education.

In this contribution an example of competence-based education in the Dutch vocational education system is described. According to Descy and Tessaring (2000) The Netherlands have chosen to increase flexibility through, what they call, external differentiation. That means that The Netherlands are creating new training programmes or institutional settings to increase the possibility for individuals and systems to react rapidly to unforeseeable developments, changes and requirements. Besides that, occupational practice plays an important role. Vocational education is developed in consultation and collaboration with practice.

In this contribution an attempt is made to evaluate principles for the development of competence-based education. In many articles and discussions about competence-based education several principles for the development of competence-based education are mentioned. The question in this contribution is: *What are the experiences of the different groups involved with competence-based education and to what extent have those experiences consequences for principles formulated?* On the basis of experiences in the project Competence-based Green Education (CGE) this question is answered. CGE is a project of the Education and Competence Studies Group of Wageningen University. In this project competence-based education is, supported by researchers of the group, developed and implemented in one school. The following subjects are described in this contribution. The first part describes the definition of competence and competence-based education in relation to different research approaches. The second part of this contribution is about the design principles of competence-based education in general. These principles lead to the principles used in this particular research. The following part is about the case study and the experiences in the case study. The last part describes whether the principles were applicable and gives answer to the central question of this paper.

2 Exploring competence and competence-based education

Considering the history of the concept of competence it is not easy to describe or even to define it. Many interpretations of the concept are already given. Some descriptions can be regarded as of behaviouristic interpretations, others have a more holistic character. Biemans et al. (2003) indicate that nowadays the interpretations of competence represent a more holistic interpretation. Competencies are seen as integrated capabilities. Mulder (2000) formulated the following working definition: a 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 also 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. Although the research of Mulder focussed on human resources management and development in organisations, the working definition also applies for education. In both situations development of competence is the central issue.

In view of exploring the concept of competence-based education, it is necessary to return to the different interpretations of the concept of competence. Those different interpretations cause that the exploration of the concept of competence-based education is varied. In attempts to define and design competence-based education, three main traditions can be mentioned (Eraut, 1994; Gonczi, 1994). The first tradition is the behaviouristic tradition. This tradition can be characterised by the discrete behaviours associated with the completion of atomised tasks (Gonczi, 1994). This

approach is not concerned with the connections between the tasks and the transformation from one task into another. Evidence for the assessment of competence is on the basis of direct observation of performance. The developments in the UK on NVQ's (National Vocational Qualifications) could be characterised as behaviouristic. The tradition of competence-based education in the UK comprises not more than being able to perform a series of tasks to encompass the full set of expectations of a competent worker. This behavioristic approach to competence is criticized heavily. Barnett (1994) says that competencies described in a behaviouristic way can not provide guidelines for an educational curriculum because of the detailed level of description. Working with competencies at this level reduces authenticity of human action. Hyland (1995) gives four reasons why behavioural objectives do not offer the best methods for measuring competencies.

- Behavioural indicators of competence can rarely be determined in advance.
- The emphasis on terminal outcomes undervalues the importance of the learning process.
- Not all the learning outcomes are specifiable in behavioural terms.
- Learning may occur which is not being measured.

Also Barnett (1994) indicates that only being concerned with action and behaviour as such, the ways in which - in professional life, at least – action is interwoven with thought, understanding and reflection are neglected. Eraut (1994) states that competence-based education in the UK atomises and fragments learning into assessable chunks. Competence-based education is concerned only with performance outcomes with no attention for experience or the learning process.

The second tradition is the generic approach. The main motive to do research into the generic approach has been to distinguish between average workers and excellent workers (Eraut, 1994). Most research on this approach concerned the management in an organisation and especially the selection and appraisal of that management. Many studies have been done in individual organisations. Central in these researches were the generic competencies or sometimes called the 'personal qualities' e.g. critical thinking capacity, problem solving. Gonczi (1994) describes three major critics on the generic approach:

- Lack of evidence whether such 'generic' competencies exist;
- Reasonable doubts about the transferability;
- Decontextualisation of competence and the abstraction of concrete situations.

This approach is not suitable for education. The first point of critic is the most fundamental point. When it is not sure whether 'generic' competencies exist, it is impossible to develop education to learn them. In education a student has to learn competencies in specific situations and develop the capability to apply it also in other situations. Besides, it is for students important to learn in a meaningful context like a workplace setting. So also the last two critics of Gonczi indicate that the generic approach does not suit education.

The third approach has features of both the first and second interpretation and is called the holistic approach. In this approach competence is seen as a whole of knowledge, capabilities, skills and attitudes displayed in a context with an appropriate level of generality or holism (Hodkinson & Issitt, 1995). They suggest that two dimensions of holism emerge. The first conceptualisation of holism concerns the integration of knowledge and understanding, values and skills of the individual who is the practitioner. The personal identity of a helpdesk employee for example, can be of great importance for a particular client. It is very difficult to define personal identity into measurable units. The second dimension of holism relates, according to Hodkinson and Issitt (1995) to the education and training process itself. The more behaviouristic approach focuses merely on the output. Hodkinson and Issitt (1995) foresee a major problem when professional training centres just focus on methods of assessing performance. It is not sufficient to judge professional workers only on their performance related to standards; it is important to include the education and training process in

the judgement. In comparison with the other two approaches this approach focuses on the development of capabilities of workers (or students) in relation with professional practice. Furthermore it is not enough to focus just on the results at the end of a learning process. During the learning process formative evaluation can support the worker or student to become competent. Dall'Alba and Sandberg (1996) main comment on this (and all the other approaches) approach is that the workers' meaningful experience of practice is ignored. They say educating for a profession consists of enabling the student to develop competencies through experiences of engaging in practice within a particular field.

Considering the interpretations mentioned above, it is necessary to discuss the points in the different traditions to explain how competence-based education is defined in this study. The behaviouristic approach concentrates mainly on the measurability of results, ergo the atomised tasks were main point of discussion. Competence-based education has to focus on meaningful parts. The second approach puts forward the more generic competencies that distinguish average workers from excellent workers. The absent relation with practice was main point of discussion, so this relation has to be part of the definition. In the third approach the practice is the central point of departure. But it is important to make the experience of students the main point of departure in the learning process.

Competence-based education is creating opportunities for students and workers, close to their world of experience in a meaningful learning environment (preferable the professional practice) wherein the learner can develop integrated, performance-oriented capabilities to handle the problems in practice.

These rather historical explanations of competence-based education are not only described to provide the concept competence-based education with a definition. These explanations are also mentioned to be aware of the historical pitfalls, so the same mistakes will not be made again. In the following section several design principles for competence-based education are discussed. This discussion focuses on the more holistic design principles. Velde (1999) describes that several research attempts on the more holistic approach have been made, but these are not applied to the actual practice. In this contribution an attempt is made to do so.

2.3 Principles for the development of competence-based education

Considering the different approaches to competencies and competence-based education, it seems to be rather difficult to develop competence-based education. In this section principles are described of several authors in the more holistic approach of competence-based education. At the end of the paragraph the principles used in the project CBGE are summarised.

The first principles originate from Blank (1982). Blank describes principles for the development of education and training programmes primarily for job-related training, but the primary goal is competence development. Blank's approach to competence-based education arises from increasing criticism on vocational education and industrial training programmes e.g. a small percentage of students really mastered the training tasks, students received little or no immediate feedback and programmes were in many cases unusable to respond to the unique learning requirements of the students. According to Blank, programmes developed according to his approach focus on learning, not teaching, are individualised and personalised and evaluate each trainee on his or her performance. Although Blank's principles are far-reaching and strongly focused on outcomes, especially the focus on the learner makes the principles of Blank interesting. Not all seven principles of Blank are described, only what he indicates as his most important principle: 'Any student in a training program can master any task at a high level of mastery (95 to 100%) if provided with high-quality

instruction and sufficient time.' He describes that students enrolled in training programmes can learn complicated task at a high level if the students are provided with high quality instructional materials and enough time to spend on learning the task. (Blank, 1982, p 12). It is important to mark a former statement. The principles of Blank are far-reaching. It is almost impossible to implement these principles in their current form in the practice. But these principles are mentioned here to make sure that a central point of departure for the development of competence-based education is the student and his or her capabilities and experiences.

The second set of principles described are the principles of Dall'Alba and Sandberg (1996). They describe an alternative approach to competence development. Instead of seeing competence development as acquiring the necessary attributes such as knowledge, skills and attitudes, they see competence development as enriching lived experiences through the experience of vocational learning and practice. Dall'Alba and Sandberg (1996) try to explore a learning situation in which they take into account the lived experiences of students and the way in which learning content is experienced by students. In other words they focus on the experiences of students.

These principles are typical for competence-based education because Dall'Alba and Sandberg work with large meaningful multidisciplinary units in practice. Everything students learn is in the framework of the whole or large units. These principles are originally developed for professional education, but according to Velde (1999) they can also be applied to vocational education. It concerns the following principles:

1. The point of departure for the structure and shape of the educational programme is the students' experience of vocational practice. This structuring principle increases the likelihood that the educational programme challenges and extends students' experiences of practice. This structuring principle is in strong contrast with ordering by subject that carries with it the risk of taking for granted those issues which are most tacit and fundamental and difficult to grasp for less experienced.
2. Students have to develop a representation of what vocational practice involves, from the beginning and throughout their studies. Problem hereby is that there is not a single, agreed way of conceiving practice within a specific professional field. Hence, critical reflection of students is essential to effective educational programmes.
3. Students need to learn about the vocational theory and practice as a whole, and about the place and significance of parts in the whole. Everything students learn needs to be seen in relation to the relevant practice, as a whole, also considering the different ways in which students learn.
4. Students must gain experience themselves by working in the vocational practice and not just observe an experienced practitioner.
5. During the learning process, developing an integrated knowing and doing must be emphasised, because being engaged in the vocational practice does not automatically signify that the students are able to do it by themselves. Besides engagement in practice, reflecting on it are both central aspects of competence development.
6. It is necessary to provide students with experience in a range of situations comparable with the experience in practice. Not one situation would be the same, so it is important to work with suitable methods to broaden and deepen the experience of the practice in a variety of situations.
7. Judgement of the competencies by means of assessment or other forms of feedback must focus on the essential aspects of practice and, thereby demonstrate the importance of those aspects.
8. Students have to be fully engaged in work practices. The students must be regarded as less experienced colleagues instead of outsiders in the margin of the practice.

According to Velde (1999) these principles are leading to a model which acknowledges the embedding of competence in both context and work relationships and has the capacity to enhance workplace learning and to enrich practice. The

conception of competence is of vital importance. A focus on discrete tasks (behaviouristic) can limit the learning and a more holistic view can extend learning.

Hodkinson and Issitt (1995) give several guidelines to support the development of competence-based education. These guidelines are formulated on the basis of literature and the experiences of several studies with the aim to use competencies effectively in education. In contrast to the principles mentioned before, these guidelines are not real principles, but that does not mean that they can not be used during the development of competence-based education.

1. Competence development must aid personal growth and the development of real expertise and it must not focus on outcomes. Besides, the notion of 'the state of the art' is very important. Students must have the opportunity to expose their performance in practice to the best practice known at the time of training. They have to compare their capabilities with the capabilities of an expert or an excellent worker.
2. Competence-based approach must have the point of departure that competencies are, as well for assessments as teaching and learning, part of the total picture. Students have to be intellectually aware of, and reflectively critical about their own practice and about the context (in the widest sense) in which they (are going to) work.
3. Mentoring, and especially the quality of mentoring are very important. Supporting learning and professional development is for the greater part a continuous dialogue between student and mentor. Mentoring is not new and exclusive for competence-based education, but a condition for competence-based education.
4. The tasks that have to be learned are most of the time multidisciplinary tasks. Teachers have to be involved to design suitable instruction for these tasks. This demands collaboration between teachers and other professions in the school (or outside the school) in order to create a good learning environment.
5. The competencies have to be grounded in existing practice. They have to be developed and continually modified in consonance the most recent information of practice.

Reviewing the literature it appears that the principles of Dall'Alba and Sandberg (1996) are the most practical principles. These principles are the starting point for the principles used in the project Competence-based Green Education, completed with principles derived from Blank and Hodkinson & Issitt. Principle 4 and principle 8, both about the role of the student in the practice are combined because these principles are strongly related to each other.

1. The point of departure for the structure and shape of the educational program are the **experiences** which the students already has had in situations in vocational practice. This structuring principle increases the chance that the educational programme corresponds with aims for competence development, that is, that it challenges and extends students' experiences of practice.
2. Students have to develop a **representation** of what vocational practice involves from the beginning and throughout the curriculum. Problem is that there is not a single, agreed way of conceiving practice within a specific professional field. Hence critical reflection of students is essential to effective educational programmes.
3. Students need to learn about vocational **theory and practice as a whole** and about the place and significance of parts in the whole. Everything students learn, also considering different ways in which they learn, need to be seen in relation to the relevant practice, as a whole.
4. Students must gain experience themselves by working in vocational practice and not just observe an experienced practitioner. Students have to be fully **engaged** in work practices. Students must be regarded as less experienced colleagues instead of outsiders in the margin of practice.

5. During the learning process the **integration of knowledge, skills and performance** must be emphasised. Being engaged in vocational practice does not automatically signify that the students are able to do it by themselves. Besides engagement in practice, reflection on it are both central aspects of competence development.
6. It is necessary to provide students with **experiences in a range of situations**, comparable with the experience in practice. Not one situation is the same, so it is important to work with suitable methods to broaden and deepen the experience in practice in a variety of situations.
7. Evaluation of the competence development by means of **assessment** or other forms of feedback must focus on essential aspects of practice and, thereby demonstrate the importance of those aspects.

Based on Blank's work the following principle can be added. Blank's most important principle is that any student can master a task at the level excellence if provided with high-quality instruction and sufficient time.

8. The learning environment has to be flexible and offer many different learning opportunities so the students can spend as much time as they want on a task and can learn in **their most favourable way**.

The principles of Hodkinson and Issitt (1995) partly cover principles of Dall'Alba and Sandberg. The first principle of Hodkinson and Issitt state something about the development of real expertise and the comparison of this expertise with the expertise of experts. The fourth principle of Dall'Alba and Sandberg is comparable. Those two principles are combined. The second principle of Hodkinson and Issitt says the same as the third principle of Dall'Alba and Sandberg. Those two principles are also combined. The other principles of Hodkinson and Issitt are used as such:

9. **A continuous dialogue** between student and mentor supports the learning and development process.
10. The tasks that have to be learned by the student are mostly multidisciplinary tasks. Several teachers have to be involved to develop suitable learning and teaching materials these tasks. This requires teachers and other professionals in the school (or outside the school) **to collaborate** to create a rich and useful learning environment.
11. The basis for education are competencies. These competencies have to **be grounded in existing practice**. They have to be developed and continually modified in consonance the most recent information of practice.

The principles (1-11) are the fundamentals for the development of competence-based education in the current project. In the following of this contribution the bold words in the principles indicate the keywords that represent the whole principle. In the following section the case study is described.

3. A project on competence-based education: the project Competence-based Green Education

3.1 Methodology

In the project Competence-based Green Education (abbreviation: CBGE) competence-based education is implemented in a university for professional education. The results of this process are described in a case study. The choice is made explicitly to work with a case study, because there are only a few good examples of competence-based education in practice. Furthermore the research can be characterised as a development study. In this kind of research the development of a theory and the application in practice are integrated. Knowledge construction in this project is based on a co-production between the researchers and the teachers and managers of the school.

This project went through a number of stages: exploration phase, prototype phase, implementation phase and evaluation phase. In all the phases managers and teachers and researchers worked closely together. The support of the researchers did not concern passing on educational formats for competence-based education. In fruitful collaboration a

model for competence-based education was developed. In the exploration phase, together with the teachers of the school a description of competence-based education was made for the specific situation of the school. This description was provided with meaningful examples from practice, wherein several aspects of competence-based education are explored. During the prototype phase the teachers started developing competence-based education for their own discipline. One of the main activities was the development of the occupational core problems for example. After half a year the first students started with the course. After the first year the evaluation phase started. In this evaluation phase teachers as well as students were asked for their opinion about competence-based education. Because of the small target group, the choice is made for a qualitative survey. Central in a qualitative survey are the experiences of the persons concerned (Nooij, 1996). For the teachers the instrument for evaluation was a questionnaire and the students were interviewed group-wise. Group-wise interviews also gives the opportunity to deepen the conversation. Teachers are busy and that is the reason why they had to complete a questionnaire so they could fit it in their agenda easily. Furthermore the experiences of the teachers were individuals experiences. On the contrary the students worked in groups, so they have comparable experiences.

3.2 Target groups

Two different target groups can be distinguished: students and teachers. The first year the course on agricultural entrepreneurship counted twenty students. For the development and the implementation of the course on agricultural entrepreneurship a group of fifteen teachers were involved. Each teacher had a different discipline. In the overall process of the development of competence-based education, three managers were involved.

3.3 The pilot CAH Dronten

The example project in this study was situated in the Dronten Professional Agricultural University (abbreviation: CAH Dronten). CAH Dronten offers several degree programmes for students in agricultural sciences and related subjects. Livestock production and chain management are examples of degree programmes. The students who want to study at the CAH Dronten must have completed secondary general education (HAVO) or secondary vocational agricultural education (MAS). The first two years the students with the same diploma are one group. The last two years, those two groups are differentiated accordance their specialisation.

Since 2002 CAH Dronten offers a special course that concentrates on entrepreneurship. In The Netherlands only 7 % of the graduates in higher education become an entrepreneur, however more than 30% of the graduates of CAH Dronten start their own enterprise. CAH Dronten sees learning for enterprise and entrepreneurship, as one of their core competencies. This is the reason why it started a special course to increase the percentage of graduates that becomes an entrepreneur. The special course is called agricultural entrepreneurship and is different from other courses because it focusses on competencies of an entrepreneur right from the beginning. It is a deliberate choice of CAH Dronten to use competencies in this course.

It is difficult to define the concept of entrepreneurship. In the international literature it is a subject of discussion. When it comes to entrepreneurs, the economist focuses on the entrepreneur as an innovator, whereas the sociologist tries to provide insights in the values, beliefs and attitudes fostering entrepreneurial development (Erkkila, 2000). It is considered impossible to formulate a list of the most important tasks for an entrepreneur, also because of the dynamic changes in the society. These tasks are out dated before the students leave the school. In comparison with tasks, competencies have a more generic character. This is one of the main reasons why CAH Dronten started working with competencies. Another important reason for using the concept of competence-based education for the development of

the course is the apparently strong relation between competence-based education and professional practice. One of the points of departure in the development of the course was the strong emphasis on professional practice.

The complete course takes four years for students who completed HAVO, for students who completed MAS the course takes three years. The base for the development of the course has been a competence profile of the entrepreneur. The managers of the course have developed this competence profile by means of several brainstorm sessions. The results of these sessions were submitted to several leading agricultural entrepreneurs and they commented on these results. Their considerations were processed in the competence profile. The final competence profile contains the following competencies. The entrepreneur is able to:

- communicate professionally;
- manage the production processes;
- manage the quality improvement processes;
- do applied research;
- draw up and to present business (development) plans;
- use business reports;
- become the successor of the business;
- manage and develop the business;
- think and act at an international level;
- take care of purchases and the sales;
- develop personal competencies;
- cooperate with others and to participate in networks;
- conduct businesses in a social responsible way.

To take part in the course it is obliged that the future student has a prospect to acquire his or her own enterprise. The future student can be the successor in the enterprise of his or her parents for example, or the student has thoroughly developed business plans to start his or her own enterprise. These and other topics are discussed during intake. The intake consists of two parts. The first part concerns a questionnaire and the other part a conversation between a teacher of CAH Dronten and the future student. Central topics in the intake are (technical) data of the enterprise, the motivation of the future student why (s)he wants to participate in the course and the competencies of the future student. The result of the intake is the decision whether the future student can join the course or that he has to choose one of the regular courses of the CAH Dronten.

In the year 2002 twenty students passed and they started the course. The first thing they had to do was to complete their own personal development plan. This plan is at the centre during the whole course. This plan is adapted every year and in the end of the course the student has a personal development plan as well as a business development plan.

The programme is implemented in a rather dual setting. Each year the course consists of four parts. The first and third part are called 'in-school training' and the second and fourth part are called 'in-practice training'. The content of the 'in-school training' and 'in-practice training' are closely linked. On the basis of occupational core problems the students search during the 'in-school training' for information and after that they try to solve the problem in the 'in-practice training'. The 'in-practice training' takes place at a real agricultural enterprise, chosen by the students themselves. Occupational core problems ought to contain comparable problems with the problems in occupational practice, e.g. the problems of agricultural entrepreneurs. The teachers work in multidisciplinary teams when defining the occupational core problems. Each occupational core problem involves two or three competencies from the competence profile.

During the 'in-school training' students are working in groups to find as much information as possible on the occupational core problem. So when they enter practice they are fully informed on how to solve the problem. In this

process the teachers support the students, but the students have to ask for the teachers when they need support. In contrast with the 'in-school training' it is not possible to cooperate with colleague students during the 'in-practice training'. Although several ways, email, internet or the organisation of days that students return to school, make it possible that students still have contact with each other and with their coach or other teachers.

The students have their own coach during the whole year. The student discusses the achievements in relation to his or her personal development plan with the coach. The coach tries to motivate the student to learn as much as possible. The evaluation of the educational achievements takes place by means of assessments. During the 'in-school training' as well as during the 'in-practice training' assessments are held to define whether the students have made progress with respect to certain competencies. The assessment in the 'in-school training' has a more traditional character. The main point is to assess whether the students have enough knowledge to work in practice on the problem. After each period the students have to write a report on their experiences while working on the occupational core problem. In this report they have to reflect on the competences, which were involved in that specific occupational core problem and in a conversation with a teachers these results are translated in the personal development plan. The assessments in the 'in practice training' are on the basis of the process of solving the occupational core problem and the outcome of it. Experts from outside the school on the specific core problems are involved in the assessments when possible.

4 Results

In this section the experiences with using the principles mentioned earlier are described. This section consists of two parts. The first part contains the description of the way the principles are elaborated. On the basis of the description in the previous section for each principle is described how this principle is elaborated in practice. The second part comprises the first experiences of the people who were involved in this case study e.g. the students and the teachers.

4.1 Elaboration of the principles

Experiences

This principle indicates that the experience the students already have before they enter the course is of great importance. This aspect is elaborated as follows The intake procedure is the most important instruments to determine the existing experiences of students and how they prefer to learn. The questionnaire in the intake comprises a self-assessment tool. When the student passes the intake this information is included in a personal development plan and on the basis of this plan the progress in competence development of student is determined.

Representation

Critical reflection is important to give the students, as there is no definite representation of what vocational practice involves. This principle is elaborated as follows. Students have to talk with each other to share experiences and learn to appreciate the different ways in which different students differ in their conception of practice. In this way they give each other feedback. The role of the coach is important because he has to take care that the students reflect critically on what they hear from each other. During the 'in-school training' this is not a problem, but it is more difficult during the 'in-practice training'. In this period the students and their coaches can communicate by email or internet. The school also organises two or three days during which all students return to school and talk about their experiences. After each occupational core problem students have to report their experiences. Critical reflection is one of the main parts of the report. The students discuss this report with their coach.

Theory and practice as a whole

The occupational core problems are multidisciplinary problems from professional practice and they are the basis for 'in-school training' as well as the 'in-practice training'. The problems are 'designed' by the teachers of the courses. During the 'in-practice training' students are expected to solve these problems in a real enterprise, so the entrepreneurs where students do their 'in-practice training' benefit from solving that problem. Solving the problem in professional practice sets the specific problem in the context of the whole enterprise.

Engagement in work practice

As mentioned earlier, students solve a occupational core problem in practice within an existing enterprise. They can use information of the enterprise and ask the entrepreneur for information, when needed, but they have to solve the problem by themselves. The students have to work independently so the entrepreneur can continue his own activities.

Integration of knowledge, skills and performance

The students work independently in practice within an enterprise. They are fully engaged because they want to solve the problem in such a way the entrepreneur is satisfied. During the 'in-practice training' the entrepreneurs have a role as a client and coach. The entrepreneur stimulates the student to look critically at his or her own activities and to reflect on it. As described earlier, the student also has the possibility to contact the coach in the school and his colleague students.

Experiences in a range of situations

At the end of the course the student has to have visited six to eight enterprises including his or her own. The students solve different occupational core problems at those different enterprises. The difficulty of the core problems is increasing, but the experiences within the enterprises are comparable. During the in-practice training most of the students work on the same problem so the students can exchange experiences on the basis of that problem. By this they can see how their problem is solved in other enterprises.

Assessment

The assessment procedure is distinguished into two components. The first assessment takes place after the in-school training. This assessment resembles a traditional knowledge test. The teachers want to know whether the students have gathered enough information to make the step towards the in-practice period. The second assessment takes places on the basis of the problem solving process and the outcome (or solution) of the occupational core problem. The essential aspects of practice are central in the occupational core problems, so they are also central in the assessment procedure.

Favourable way of learning

During the in-school training students can gather information in several ways and they can choose their own way of learning. During the in-practice training the students in discussion with the entrepreneur develop, their own way to solve the problem. The students have to search for their own entrepreneur to solve the problem. So they can select an entrepreneur who can support the favourable learning process of them. The periods in a year are fixed, so the students have a certain period of time to gather information and to solve the problem.

A continuous dialogue

Each student has his or her own mentor, or what they call their coach. At several moments this coach talks with the students about their progress and helps them to reflect on their own activities. They students can ask their coaches anything anytime they want.

Collaboration

In this case study the occupational core problems are the central subject. The teachers work in multidisciplinary groups to 'design' the problem and to design a suitable learning environment. One of the teachers carries the final responsibility for the final learning environment.

Grounding competencies in existing practice

The managers constructed the list of competencies or the so-called competence profile for an entrepreneur. They did this by means of brainstorming and checking the result of the brainstorm with several entrepreneurs in the practice. The course is now implemented only once, so there have not been any activities to update the competence profile.

4.2 Experiences of the students and teachers

During the pilot the teachers and students were asked what their experiences were while working in a competence-based educational environment. In this section the results of those interviews are described. In the interviews with the students they were asked to give their opinion about the intake, the competencies and the competence profile and the learning environments. Thirteen students were interviewed. The other seven were not available at that particular time. The teachers were invited to complete a questionnaire, and seven of fifteen teachers also did complete it. On the basis of these interviews and questionnaire each design principle is evaluated on its applicability or in other words are the formulated principles good and useful in practice? When the results of the group interviews concerns a specific principle the keyword of that principles is mentioned between brackets.

Students

In general the students experienced the intake as very useful. However, it was not an easy job to complete the questionnaire and the students had the feeling the conversation was almost an assessment. Especially answering the questions about the future was experienced as very difficult. The students from the HAVO found it difficult to fill in all the technical details in the questionnaire. Besides, all students did expect the result of the intake would be used during the program, but they did not experience it as such (experiences). The next item in the group interview was to what extent the competencies were meaningful concepts for the students. The students did not recognise themselves in the abstract descriptions of the competencies. The descriptions of competencies were not written in the vocabulary of the students and so they had less meaning for the students (grounding in practice). Students had to reflect on whether they had developed certain competencies during working on the occupational core problems, but they did not understand the competencies, so the validity of the answers about the competencies can be questionable (representation). The last subject in the group interview was about the learning environments during the course. The students were very enthusiastic about the learning environments (engagement in work practice), although they did miss each other during the periods in practice. They liked to be half of the year in school and half of the year in practice. Being in different practices makes the students experience different aspects of being an entrepreneur (experiences in a range of situations). But the students have the opinion that coaching in the school as well as in practice could be better (continuous dialogue). Not every student is used to self-responsibility that is necessary to function in a competence-based education program (experiences, favourable way of learning). Besides they think that not every teacher or entrepreneur

is able to coach and mentor the students (continuous dialogue). It is important to make a good selection of the enterprise and especially the entrepreneur to come close to the goals of the student and the school (engagement in practice). In the current programme design, the students are responsible for the communication between the entrepreneurs and the school. The students prefer that the coach or another teacher would fulfil this role. The students have the feeling they do not have the overview over the complete course to be able to answer all the questions of the entrepreneurs. The expectations of both the school and the entrepreneur have to be formulated more clearly.

Teachers

The role of the teachers is changing dramatically. The role of expert decreases and the teacher becomes more and more a facilitator and coach. In the evaluation of this case study it became clear that the practical elaboration of this role is unclear and rather vague for teachers (continuous dialogue). The teachers say that they are not well trained to fulfil the role of mentor or coach. The role of coach requires more time than the more traditional role, especially in the beginning of the process. Teachers have to coach all students in a way that suits the students (favourable way of learning). Teachers are afraid that this leads to fragmentation and that not every student is triggered enough to reach his or her maximum. The teachers experience problems with the formulation of the occupational core problems (theory and practice as a whole, collaboration). It is very difficult for them to think in actual problems or activities of an entrepreneur, since they are used to think within the limits of one discipline. But they were enthusiastic about working in multidisciplinary teams. They also perceived the assessment of occupational core problems (assessment) also as being difficult. Teachers are not used to work with other methods than the more traditional test methods. The teachers and especially the coaches have more contact with the students and they like that. By means of this more intensive contact the teachers have a better indication of the students' progress (representation). The students were motivated to solve the occupational core problems and they learned more efficiently. Although the teachers were a little disappointed about the dependent attitude of some students. This kind of education does not suit every student (favourable way of learning). The teachers experienced also difficulties with the competencies. It was difficult to define a clear relation between the competencies and the occupational core problems (grounding competencies in existing practice). The teachers recognise the added value of in-practice training, but they do not exactly know what the students are doing during in-practice training. The teachers say they want to know more about the context of in-practice training (engagement in work practice). They say themselves that the frequency of the coaching can be higher and more efficient. The teachers differ in their opinion about the length of in-practice training. Some of them say it is essential, provided that the students are motivated. Others think in-practice training is too long and they do not see what the students are doing (representation).

6. Conclusion

In the first section of this article the existing confusion about competence-based education is described. It appears to be difficult to define the concept. Three approaches to competence-based education are described; the behavioristic, generic and holistic approach. The more holistic approach corresponds best with the latest developments on competence-based education. The following definition is formulated to describe the concept of competence-based education in the current project: *Competence-based education is creating opportunities for students and workers, close to their world of experience in a meaningful learning environment (preferable the professional practice) wherein the learner can develop integrated performance-oriented capabilities to handle the problems in practice.* The principles described in this article formulated by various authors, who support the more holistic approach. On the basis of their principles, eleven concrete principles were formulated that lay the ground for the project Competence-based Green

Education. Central question in this paper is: 'What are the experiences of the different groups involved with competence-based education, and to what extent do those experiences influence the principles formulated? In other words are the formulated principles good and useful in practice. The following conclusions can be drawn by principle.

Experiences

The intake is a good instrument to determine the students' experiences. The intake results in a personal development plan and this plan is the basis for the programme of the student. However the students do not experience the personal development plans as the basis for their study programme. The instruments to put this principle into practice are good, but their relation to the programme of the students has to be made clear to the students. The principle has to be completed with this finding.

Representation

Critical reflection is seen as the key instrument to put this principle into practice. Both students and teachers experience critical reflection as very important. Completing a reflection report is not the right instrument; critical reflection has to be done in conversations between students themselves and between students and coaches. This principle can be completed by stating that critical reflection has to be practised in personal conversations.

Theory and practice as a whole

Working with occupational core problems is the instrument to put the different aspects of an enterprise in perspective of the whole and meaningful context. Working with these problems was evaluated very positive by the students as well as the teachers, although the teachers found it hard to define core problems. When they work more with professional practice this problem will be solved. This principle can be applied in its original form.

Engagement in work practice

This principle was implemented by working on an occupational core problem during in-practice training. The students appreciate this in-practice training, but they want more support from the teachers and the entrepreneurs. The teachers do not notice everything the students do. Adding to this principle that students should have the possibility to ask for support when they need, it improves the application of this principle.

Integration of knowledge, skills and performance

This principle was also implemented by the occupational core problems during in-practice training. The role of the entrepreneur (in this case) is not clear. Adding to the principle that entrepreneurs have to act as coaches to support students in practice might improve the application of this principle.

Experiences in a range of situations

The students visit different enterprises and get different experiences. The students appreciate this, but it is important to let the student learn of all these experiences. That is the job of the coach. The principle would be better if added that coaches have to take care of the overall picture of all the experiences of the students.

Assessment

The assessments take place using the outcomes of the occupational core problems and the learning process. The principle in its current form can be applied as it is, but adding formative evaluation during the learning process would be of value.

Favourable way of learning

The students can choose between several ways of gathering information. The students can choose their own enterprise. These are two flexible characteristics. But the organisation of the school is not ready to make a flexible time schedule. So the first part of the principle can be applied and the second part not.

Continuous dialogue

This principle is applied by means of a coach for every student. In practice the teachers say they are not well educated to be a coach and the students expect more from a coach at school as well as in practice. So this principle is applicable, but the addition that the entrepreneur also has to act as a coach, makes this principle more useful.

Collaboration

Working in multidisciplinary teams is the way in which this principle is implemented. The involved teachers like working in such teams. It will take a while before every teacher is used to work in those teams, but the principle does not need any change.

Grounding competencies in existing practice

Management of the school has formulated the competencies in the programme. Both students and teachers did not participate in competence formulation and were consequently not able to work with these competencies. They were too generic. This principle can be applied but with the addition that persons who will have to work with the competencies understand them.

In general the principles can be applied for designing and implementing competence-based education but with an addition. The most additions are necessary because the students cannot work as independently as the teachers thought. The additions mainly contained a more explicit role for the coach with respect to that specific principle. Some concluding remarks have to be made. The students were selected before they could join the course agricultural entrepreneurship and those selected students are extremely motivated. They know exactly what they want in the future and this course offers them what they need. Those students are maybe more positive about a new course than other students. But on the other hand the course was organised for the first time. Many little problems occurred and they were not always very good for the motivation of the students and the teachers. In general it could be said that the development of competence-based education is not easy and whether it can decrease the gap between education and the labour market is also unknown, but the experiences with competence-based education are rather positive. Students are motivated to learn in rich learning environments and they see that learning never stops in those environments.

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