Vocations and Learning (2011) 4:191–210
DOI 10.1007/s12186-011-9059-4

ORIGINAL PAPER

# The Nature of Study Programmes in Vocational Education: Evaluation of the Model for Comprehensive Competence-Based Vocational Education in the Netherlands

**Lidwien Sturing · Harm J. A. Biemans · Martin Mulder · Elly de Bruijn**

Received: 24 November 2010 / Accepted: 9 May 2011 /
Published online: 21 May 2011


**Abstract** In a previous series of studies, a model of comprehensive competence-based vocational education (CCBE model) was developed, consisting of eight principles of competence-based vocational education (CBE) that were elaborated for four implementation levels (Wesselink et al. *European journal of vocational training* 40:38–51 2007a). The model thus consisted of 32 cells, all defined by text. It was developed to provide study programme teams working in vocational education with an instrument to assess the actual and desired "competentiveness" of their study programmes. "Competentiveness" refers to the extent to which study programmes are based on the principles of CBE that we formulated. The model is an instrument for analysing the alignment of study programmes with the defining principles of CBE and clarifying programme teams' intentions, i.e. the extent to which they wish to achieve higher levels of implementation of the different principles. This article presents the results of two studies, the aim of which was to identify adjustments the teachers felt were necessary to make the CCBE model a valid instrument for assessing the actual and desired "competentiveness" of their study programmes. In study A, 57 teachers evaluated the model during focus group discussions, resulting in a revised CCBE model consisting of ten principles for five levels of implementation. In study B, 151 teachers completed a questionnaire to evaluate the comprehensibility of the revised model. The study showed that teachers understood and interpreted the revised model as intended, were able to position their study programmes by using the revised model and that the content validity of the revised model was good.

L. Sturing (✉) · H. J. A. Biemans · M. Mulder
Education and Competences Studies, Wageningen University, PO 8130, 6700 EW Wageningen, The Netherlands
e-mail: lidwien.sturing@wur.nl

E. de Bruijn
Faculty of Education, Utrecht University, Heidelberglaan 1, 3584 CS Utrecht, The Netherlands

**Keywords** Competentiveness · Vocational education · Competence-based vocational education · Self-evaluation · Curriculum policy making

## Introduction

The concept of competence occupies a central position in the curriculum reforms that are currently sweeping across the world (e.g., in France, Germany, Austria, Mexico, Australia, the UK and several Asian, South African and Middle Eastern countries) (Arguelles and Gonczi 2000; Brockmann et al. 2008; Clarke and Winch 2007; Descy and Tessaring 2001; Jonnaert et al. 2007; Mulder 2004, 2007; Onstenk et al. 2004; Smith 2010; Weigel et al. 2007). The development of competence is used increasingly as the starting point for designing curricula and instructional methods for vocational study programmes. Competence-based education is a response to the changing requirements of vocational practice and contemporary society. It is said that competence-based education better prepares students to become competent professionals, contributes to students' (professional) identity development, prepares students for participating in contemporary society and prepares students to adapt to changes in work practices within the same occupation (Billett 2003; cf., Velde 1999). Competence is the capacity necessary for effective performance in vocational practice or in a particular academic discipline (Billett 2003). Competence-based education adopts a comprehensive, situation-dependent approach that emphasizes the integration of knowledge, skills and attitudes (Eraut 1994).

In 2010, more than 485,000 students aged sixteen and older were enrolled in study programmes in senior secondary vocational education and training (MBO in Dutch) in the Netherlands. MBO institutions offer study programmes at four educational levels of increasing difficulty. The lowest level is assistant training (1) and the highest level is middle management and specialist training (4). MBO prepares students either to start work in a job or to study at the next MBO level. Level 4 also prepares students for higher professional education (HBO in Dutch). This fourth level is equivalent to the European Qualification Framework level 4/5. Students can choose between a school-based learning route in fulltime education (BOL in Dutch) and a work-based route (BBL in Dutch) in which work and study are combined. Study programmes are offered in four sectors: technology, commerce/administration, services/health care and agriculture. Following government policy, vocational study programmes in the Netherlands are expected to have adopted a competence-based qualification structure by August 2011.

The transition to competence-based education has not gone smoothly in the Netherlands. Implementing competence-based education calls for changes that affect many components of the education system, including the curriculum, enactment of the curriculum in the classroom and work placements (Jonnaert et al. 2007). Windschitl (2002) describes four types of dilemmas that teachers face during implementation of an educational reform (such as competence-based education): 1. conceptual dilemmas (understanding of the underpinnings of competence-based education), 2. pedagogical dilemmas (arising from the more complex approaches to designing curriculum and fashioning learning experiences that competence-based

education demands), 3. cultural dilemmas (roles and expectations of teachers and students) and 4. political dilemmas (resistance from various stakeholders). These dilemmas can also be observed in the Netherlands (De Bruijn and Leeman 2011). The underlying principles of competence-based education were not clear to the teachers in the first place. Furthermore, neither the Dutch government nor other organizations provided sufficient guidelines, instructions or examples to help reorient the curriculum to competence-based education (Onstenk et al. 2004; Van den Berg and De Bruijn 2009). The law merely requires that a competence-based qualification structure be put in place in which the competences that are necessary to function in a job or in society are described. So, the government mandate covers the 'what' of competence-based education, but guidelines for 'how' these competences can be fostered are lacking. Teacher teams can choose the extent to which they implement the 'how' aspects of competence-based education. As a consequence of these factors, the transition to competence-based education has resulted in putting new competence-related labels on old practices. In other words, there have been few changes in educational practice.

To support teachers in implementing competence-based education, Dutch researchers constructed a model of comprehensive competence-based vocational education (CCBE model). This described eight essential design principles of competence-based education (defined below) and four implementation levels for each (referred to as '*not*', '*starting to be*', '*partially*' and '*completely*' competence-based) (see Wesselink et al. 2007 p. 46–47). All eight principles are necessary and relevant if competence-based education is to be fully realized in the future, hence the name 'comprehensive'. The CCBE model was developed to provide study programme teams in vocational education with an analysis and improvement tool to assess the actual and desired "competentiveness" of their study programmes. Thus the CCBE model is an instrument for analysing the degree of alignment of study programmes with the defining principles of competence-based education and clarifying the intentions of programme teams with respect to the extent to which they wish to achieve higher levels of implementation of the different principles. "Competentiveness" refers to the extent to which study programmes are competence-based (Wesselink et al. 2007b).

A pilot study to test the CCBE model showed that teachers found it comprehensive and useful, but also that some parts of the instrument were subject to interpretation (Wesselink et al. 2007b; Wesselink et al. 2010). Ransom et al. (1990) argue that, if items do not mean the same thing to respondents as the researcher intended, a model may not be valid. It was therefore necessary to adjust the model to minimize the possibility of inconsistent interpretation. However, it is unclear whether the results of Wesselink et al. (2010), whose pilot study was only carried out in the agricultural sector of vocational education and training (VET) among a small group of teachers, apply to VET in general (i.e., all the sectors, learning routes and educational levels mentioned above). Further investigation was therefore deemed necessary to improve the model.

Rowan et al. (2004) showed that a crucial factor in the success of an educational reform, such as the implementation of competence-based education, is that the teachers and education designers involved have a thorough understanding of the underpinnings of the educational model upon which the reform is based. Once

necessary improvements have been made, the CCBE model could be used as an instrument to discuss concepts of competence-based education and achieve consensus.

The current study had two objectives. The first objective was to determine what adjustments teachers deemed necessary so that the CCBE model could be used as a valid instrument to assess the actual and desired "competentiveness" of their study programmes. The second objective was to examine the reliability and content validity of the revised model.

## Theoretical Framework

### Approaches to Competence-Based Education

Interest in the concept of competence arose in the 1960s and 1970s in the US, and was initially characterized by detailed lists of fragmented and assessable behavioural elements related to job performance (Biemans et al. 2004, 2009). This task-based approach to competence-based education based on behaviourist theories had little success. It was criticized for being reductionist in nature, for equating task and competence, for ignoring the influence of contextual and group factors, and for considering that the aggregation of various atomized tasks was sufficient for their integration—that is, that the whole was not greater than the sum of its parts (Gonczi 1994). In the 1990s, a new approach emerged which viewed competences as general, stable and context-independent attributes underlying effective performance (Eraut 1994). This approach was criticized for assuming that generic situation-independent competences exist, and the argument was put forward that expertise is highly domain specific (Bereiter and Scardamalia 1993; Gonczi 1994). In response to the criticisms of the first two approaches, a more comprehensive approach based on social-constructivist learning theories is now being used (Biemans et al. 2004; Eraut 1994). A key feature of this approach is the switch from thinking in terms of qualifications (task-based approach) to thinking in terms of competences. Here the emphasis is on the integration of knowledge, skills and attitudes, which enables a professional to perform fully. Another key feature is the switch from generic situation-independent competences (second approach) to situation-dependent competences (Hager et al. 1994). Two examples of the comprehensive approach are the National Vocational Qualification Framework (NVQ) and the Dutch competence-based qualification structure, which are both based on learning outcomes defined in terms of integrated competences. However, since its introduction, the NVQ Framework has run into several criticisms and problems (see Weigel et al. 2007). Brockmann et al. (2008) question whether it is possible to develop a universal European qualification structure (like NVQ), since this would require a common understanding of the concepts underpinning VET, and such systems currently differ considerably in the various European countries. The comprehensive approach to competence-based education differs in many aspects to the task-based approach and the context-dependent approach. In the next section we describe how comprehensive competence-based education can be defined in terms of underlying principles and is manifested in educational practice.

## The Model of Comprehensive Competence-Based Vocational Education

Studies that look at all relevant aspects of competence-based education are scarce. The majority of available studies cover one particular aspect only of how competence development can be fostered; they also focus on the content of competence-based curricula. To establish the model, various theoretical perspectives were consulted, resulting in a first set of principles important for competence-based education (Mulder 2004). These principles were examined during a focus group meeting and a Delphi study among 15 experts in the field of competence-based education, and then eight principles were identified that make up the model of competence-based education (see Wesselink et al. 2007, p. 46–47):

1. The **competences** that are the basis for the study programme are defined.

The notion of competence is the organizing principle of a curriculum (Jonnaert et al. 2007). Therefore the competences that are critical for students' future jobs should be verified.

2. **Vocational core problems** are the organizing unit for (re)designing the study programme (learning and assessment).

The introduction of competences into the curriculum leads to demand for curriculum integration and fewer pure disciplinary approaches. Theory and practice should be aligned and professional situations, or so-called vocational core problems, should be the point of departure in study programmes (Jonnaert et al. 2007). Engaging students in these vocational core problems is seen as providing a context that can make learning more meaningful (Boersma et al. 2010).

3. Students' competence development is **assessed** before, during and after the learning process.

Assessment tasks are meant to be interesting and authentic to students to engage them in a meaningful learning process. Both the product and the process are assessed, and students reflect on and document their development. Assessment is used in a summative way and/or to guide the learner by providing feedback on the product and the process. A single assessment method is often not sufficient to assess competences, therefore a mix of methods is used (Baartman 2008).

4. Learning activities take place in different **authentic situations.**

Jonnaert et al. (2007) state that if the curriculum prescribes the notion of competence as its organizing principle, the study programmes must use situations as their point of departure. People cannot develop their competence outside of a situation and then expect to apply it in some situation or other in the future. Learning in competence-based study programmes therefore has to be situated in recognizable (work-related assignments) and meaningful contexts (vocational practice).

5. Knowledge, skills and attitudes are **integrated** in learning and assessment processes.

Taconis et al. (2004) stress that competence-based curricula should address knowledge, skills and attitudes in an integrated way, since each of these separately is

not sufficient for the desired competent professional behaviour. Assessments should focus on the integration of knowledge, skills and attitudes, or as Smith (2010) puts it, 'holistic evaluation of students' workplace capability and knowledge'.

6. Students are stimulated to take **responsibility** for and reflect on their own learning.

The student is an active participant, who shares responsibility for the learning process, practices self-evaluation and reflection, and collaborates with the teacher and other students. Learning should not focus solely on mastering vocational skills, but should also include critical reflection on the student's own actions and their results (Jonnaert et al. 2007), and competence development (Schön 1993). Therefore it should be possible for students to be both increasingly responsible for their own learning processes and to steer their own learning process.

7. Teachers both in school and practice fulfil their role as both **coaches and experts**.

In competence-based education students are part of a community of learners for vocational orientation in which students and teachers work co-operatively as if they were colleagues working in an institution or company and helping their clients (Boersma et al. 2010). Teachers are both coaches and experts, taking part in the knowledge construction with students through respectful dialogues. According to Smith (2010), the role of the teacher has changed from that of a mouthpiece to that of a planner. The teacher is seen as a negotiator instead of a gatekeeper.

8. A basis for a **lifelong learning** attitude in students is realized.

A competence-based study programme is characterized by not only paying attention to competences needed for job performance, but also paying attention to competences necessary to survive in today's society e.g. competences in communication or learning (Onstenk 1997) and competences to enhance identity development (Wardekker 2004).

The CCBE model integrates principles concerning 1) the curriculum and specification of the study programme; 2) the way instruction takes place and the role of the teacher, referred to as the teaching practice; 3) the assessment procedure and 4) the career competences of the student. These aspects reflect the components curriculum, pedagogy, assessment and career competences, which together form an infrastructure for powerful learning environments (De Bruijn et al. 2005). Implementation levels were elaborated for each principle of the CCBE model, indicating the extent to which a study programme can be characterized as competence based. The first level, called '*not*' competence based, can be defined as traditional education. The transfer of knowledge between the teacher and the students (passive learning) is a central issue. In the second level, '*starting to be*' competence based, knowledge transfer is accompanied by examples or cases from professional practice. In the third level, '*partially*' competence based, relevant tasks and examples from practice play a dominant role. In the fourth and final level, '*completely*' competence based, learning processes are completely designed around competences and vocational core problems (Wesselink et al. 2010).

Teacher teams can choose to what extent they implement the '*how*' aspects of competence-based education (the 'instruction' principles 3, 4, 6 and 7) and the '*what*' aspects (the 'curriculum' principles 1, 2, 5, and 8). The CCBE model allows teachers to be pro-active and decide for themselves what their ambition level is regarding the implementation of competence-based education.

A follow-up pilot study was carried out to determine the extent to which teachers in MBO institutions perceived the CCBE model as comprehensible and useful (Wesselink et al. 2007, 2010). The researchers concluded that the model was indeed comprehensible and useful. Using the model, teacher teams were able to determine their current position with respect to implementing competence-based education in their study programmes as well as future goals with respect to the design of competence-based education. Although the teachers indicated that they found the model understandable at a general level, the results showed that at a more detailed level certain parts of the instrument needed adjustment. The teachers reported that the differences between the levels were not always clear, several principles, words or concepts were ambiguous, and the steps between specific levels were too large (Wesselink et al. 2007, 2010).

## Methodology

### Participants

In this study a mixed-method design was used. Two studies were carried out using two different methods: a focus group discussion, preceded by an individual questionnaire for participants (study A) and a digital questionnaire (study B). Enrolled in both studies were teachers who worked in MBO institutions. A convenience sample was used to select the teachers. MBO institutions were asked whether they were interested in participating in a research project whose aim would be to determine what adjustments to the CCBE model were necessary in order to apply the model to assess the "competentiveness" of their study programmes. Several MBO institutions reacted positively and they expected to gain added value from working with the revised CCBE model. Five MBO institutions participated in study A, and about ten to twelve teachers from each institution took part, resulting in a total of 57 participants. Five other institutions participated in study B and distributed the digital questionnaire by e-mail to their teachers. The digital questionnaire was also distributed to teachers by three national organizations involved in competence-based education via e-mail or their websites in order to increase the number of participants. 25% of the participants in study B received the questionnaire via these websites. In total 151 of 241 teachers completed the questionnaire (response rate 62.7%).

A disadvantage of convenience sampling is that participants might not be an accurate representation of the entire population. Therefore we calculated the distribution of participants according to sub-groups: sector, level and learning route. As shown in Table 1, the distribution of participants and their characteristics are to a large extent representative of the total population. The agricultural sector was underrepresented in study A, but overrepresented in study B (see Table 1 for the

**Table 1** Characteristics of the participants in studies A and B

| | Study A[a] | Study B[a] |
|---|---|---|
| General characteristics | | |
| Years of general teaching experience | 21 years | 15 years |
| Years of teaching experience in CBE | 2 years and 2 months | 3 years |
| Qualification level | | |
| 1 and 2 (proportion in MBO institutions: 30%) | 38% | 29% |
| 3 and 4 (proportion in MBO institutions: 70%) | 62% | 71% |
| Sectors | | |
| Technology (proportion in MBO institutions: 26%) | 15% | 19% |
| Commerce/administration (proportion in MBO institutions: 26%) | 53% | 21% |
| Services/health care (proportion in MBO institutions: 26%) | 25% | 24% |
| Agriculture (proportion in MBO institutions: 22%) | 7% | 36% |

[a] Study A was conducted in 2009 and study B in 2010

characteristics of the participants and their corresponding percentages of the total population).

## Procedure

### *Study A: Focus Group Discussions and Individual Questionnaire*

The objective of study A was to determine what adjustments teachers thought were necessary to make the CCBE model suitable for assessing educational practice. A focus group discussion was held at each institution, during which teachers in groups of three or four systematically discussed the model. The teachers received a large version of the CCBE model with two extra columns in which they could write down what adjustments to the model they thought were necessary and explanations for their suggested adjustments. Teachers could add extra columns or rows for additional levels or principles. The titles of the implementation levels were left out to encourage teachers to define their own level labels. By means of structured questions teachers discussed what adjustments to the CCBE model were needed. Prior to the focus group discussions teachers individually filled out a questionnaire. First they were asked to describe competence-based education in their own key words. Then the principles of the CCBE model were introduced and the teachers were asked to compare their key words to the principles. They were also asked if they agreed with the labels of the implementation levels, and for each principle whether they agreed or disagreed with the following statements: a) the meaning of the principle is clear, b) the levels in the model and corresponding descriptions are clear and logical c) all the words and descriptions in the model are unambiguous. If teachers disagreed they had to explain why. Their answers on the individual questionnaire were used as input for the focus group discussions. Based on the focus group discussions and the individual questionnaires, the CCBE model was revised.

*Study B: Digital Questionnaire*

The objective of study B was to examine the reliability and content validity of the model by means of a digital questionnaire. The questionnaire was based on the revised CCBE model resulting from study A. For each principle the teachers were asked to indicate the extent to which that principle was realized in their own study programme (by selecting a level) and to support their answer by giving an example. The supportive arguments provided by the teachers were used to investigate whether the teachers understood the content of the model. The teachers were also requested to rate the importance of the various principles for implementation of competence-based education on a five-point scale (1 = *very essential,* 2 = *essential,* 3 = *useful but not essential,* 4 = *not essential* and 5 = *not at all essential*). At the end of the questionnaire the teachers had to rank the principles from least important to most important for implementation of competence-based education. An open question at the end of the questionnaire invited the teachers to give further comments on competence-based education and their experiences with its implementation.

The questionnaire was pilot-tested by a test panel of six teachers working at an MBO institution. They filled out the questionnaire and commented on the readability of the questions. Based upon this pilot test, unclear questions were revised. In general, the questionnaire was considered by the panel to be understandable and relevant for teachers.

Data Analysis

A combination of qualitative and quantitative analysis techniques was used. First, a content analysis was performed on the data from the focus group discussions and the accompanying questionnaire in study A. Second, descriptive statistics were applied to the results of the online individual questionnaire in study B. Suggestions for adjustments to the model were accepted where 20% or more of the teachers concurred (in the digital questionnaire or during the focus group discussions). Based on these results, the CCBE model was revised. Third, the content validity was estimated by using a content validation approach based on the importance scores in the digital questionnaire. This strategy was suggested by Lawshe (1975) to estimate the content validity of selection tests. The formula for the content validity ratio (CVR) is as follows: CVR = (ne—(n/2))/(n/2) in which ne is the number of teachers indicating essential and n is the total number of teachers. This formula yields values ranging from +1 to −1; positive values indicate that at least half the participants rated the item as essential. The mean CVR across items may be used as an indicator of overall test content validity. To calculate the CVR, the five-point scale was recoded into a three-point scale: 1 = *essential* (code 1 and 2), 2 = *useful but not essential* (code 3) and 3 = *not essential* (code 4 and 5). Reliability was estimated by calculating internal consistency indices. Fourth, content analysis was used to analyse the argumentation of the teachers in the digital questionnaire. The answers were coded as follows: 1) sufficient argumentation as support (the answer was well supported and complied with the principle), 2) insufficient argumentation as support (the answer did not comply with the principle or the argumentation was not clear), and 3) no argumentation.

## Results

In this section we first present the adjustments to the CCBE model suggested by the teachers. We then examine the perceived importance of the principles and the supportive arguments put forward by the teachers in response to the questions whether the revised model is reliable and the extent of its content validity.

### Study A

The individual questionnaire showed that 87% (51 out of 57) of the teachers agreed with the principles of competence-based education as defined, because they compared favourably with their own key words for competence-based education. When asked whether the principles that made up the model gave a recognizable picture of competence-based education, 26% of the teachers considered principle 1 (concerning the job competence profile) to be superfluous. The defined criteria of this principle were putting together a job competence profile, using this profile and the interaction between education and vocational practice. These criteria assume that such profiles are put together by teachers, but in the Netherlands these profiles are prescribed by the government and not (only) developed by the schools themselves. Therefore the teachers considered this principle to be superfluous. However, since principle 1 is the basis for implementing competence-based education and is mandated by the government, this principle was retained in the model.

According to 10% (6 out of 57) of the teachers, the CCBE model was incomplete. These respondents felt that flexibility of study programmes and collaboration were aspects of competence-based education that were missing in the model. Although these adjustments were suggested by less than 20% of the teachers, the researchers added a principle about flexibility of study programmes because they believe this aspect is also a crucial characteristic of competence-based education. Collaboration was embedded in the remaining principles.

During the focus group discussions, teachers were asked whether they agreed with the implementation levels included in the model. The results showed that 40% of the teachers were not satisfied with the levels, because the gap between the last two levels was too large. Based on the selection criteria the levels were revised, resulting in five levels: '*not competence-based*', '*starting to be competence-based'*, '*partially competence-based*', '*largely competence-based*' and '*completely competence-based*'.

Table 2 shows the percentages of participants in agreement with the following statements: a) the meaning of the principle is clear, b) the levels in the model and corresponding descriptions are clear and logical, c) all the words and descriptions in the model are unambiguous.

For aspect a) the scores varied between 77% and 93%. The lowest score (77%) was found for principle 2 (vocational core problems). Teachers explained that they were confused about the meaning of the term 'vocational core problem'. The words 'organizing unit' were also considered vague. Most of the teams felt that the levels in the model and corresponding descriptions were clear and logical. The scores varied between 74% and 93%. A relatively high percentage of the teachers (26%) stated that the descriptions of principle 1 in the corresponding levels were not clear and logical. The teachers were least satisfied with the ambiguity of all the words and

**Table 2** Percentages in agreement with the questions related to aspects a), b) and c)

| Aspects Principles | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| a) The meaning of the principle is clear | 90% | 77% | 89% | 88% | 93% | 93% | 88% | 90% |
| b) The levels in the model and corresponding descriptions are clear and logical | 74% | 83% | 93% | 91% | 93% | 88% | 88% | 90% |
| c) All the words and descriptions in the model are unambiguous | 74% | 71% | 74% | 77% | 88% | 93% | 88% | 90% |

descriptions in the model. The scores varied between 71% and 93%. Especially the first four principles (competences, vocational core problems, assessment and authentic situations) scored relatively low. Some definitions, sentences or single words were not always clear to the teachers and some parts of the model could be interpreted in different ways. During the focus group discussions, teachers gave concrete suggestions to improve the readability. Another remark teachers made concerned principle 6 (self-responsibility and self-reflection of students). They did not agree that these two aspects should be combined in one principle. Their argument was that self-reflection is very important for students who attend a study programme at for instance level 1 in VET, but self-responsibility is less important for them. The teachers would therefore find it impossible to align their programme with a specific level of that principle. They suggested splitting the principle in two.

Based on the results of study A, the CCBE model was revised: various detailed semantic adjustments were made, and one new principle (flexibility of study programmes) and a fifth level of implementation were added. Principle 6 was also divided into two separate principles (self-responsibility and self-reflection).

## Study B

Teachers were asked to rate the importance for implementation of competence-based education (*not essential; useful, but not essential; essential*) of each principle of the revised model. The content validity ratio (CVR) was calculated by means of the percentage "essential" for each principle. The results are shown in Table 3. All principles showed significant CVRs. A positive score (+1) indicates that more than half of the teachers considered the principle to be essential. Principles 1 to 6 scored higher than principles 7 to 10. The highest CVR was .81. The lowest score was .32 (for principle 8), but still almost 70% of the teachers considered this principle to be essential. The model as a whole also had a good content validity (.61).

**Table 3** Average rating of the importance of the principles and CVR scores

| Principle | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CVR | .76* | .72* | .81* | .72* | .68* | .71* | .44* | .32* | .55* | .36* |
| Average ranking | 6.3 | 6.2 | 6.9 | 7.1 | 6.0 | 6.1 | 5.9 | 4.2 | 5.8 | 3.8 |
| Order | 3 | 4 | 2 | 1 | 6 | 5 | 7 | 9 | 8 | 10 |

*$p<0.05$

Teachers were also asked to rank the principles from 1 to 10, whereby 1 meant least important and 10 most important. The average ranking was calculated for each of the ten principles that made up the revised CCBE model. The teachers commented that they found it difficult to rank the principles, because they considered all principles in the model important. A higher ranking implies that this principle is more important than a principle with a lower ranking, but even at the lowest rank, 70% of the teachers indicated that the principle was essential for implementation of competence-based education.

We analysed the internal consistency of the CCBE model. Item analysis (see Table 4) shows that principle 8 differs in that it is not consistent with the rest of the scale. The correlation with the sum scale is .375, while all other principles correlate at .450 or higher. We can see that the reliability of the model would be about .827 if this principle were deleted. Since the reliability of the model would only increase slightly and this principle is an important principle of competence-based education according to teachers and authors, we decided to retain the principle in the CCBE model.

The supportive argumentations provided by the teachers for each principle were coded as level 1, 2 or 3. Most of the arguments (85%) were coded at the highest level 1. Teachers described personal experiences in support of their arguments or gave an example of a situation that illustrated the selected level in the model. Level 1 supportive argumentations of the teachers showed that they understood the principles and the differences between the levels. Argumentation level 2 was only assigned to 9% of the supportive argumentations for principle 1, 7% for principle 2, 2% for principle 4 and 0% to the remaining principles. Level 2 was mainly characterized by the fact that the answer given was irrelevant to the principle. For example, one irrelevant explanation related to principle 1 described internships in vocational practice instead of focusing on the job

**Table 4** Item analysis

| Statistics for Scale | Mean | Min | N<br>10<br>Max | Mean<br>35.15<br>Range | Variance<br>33.672<br>Max/min | SD<br>5,803<br>Variance |
|---|---|---|---|---|---|---|
| Item Mean | 3.515 | 2.709 | 3.868 | 1.159 | 1.428 | .115 |
| Item Variance | .868 | .672 | 1.315 | .643 | 1.957 | 0.032 |
| Principle | Scale Mean If Item Deleted | | Scale Variance If Item Deleted | Corrected Item Total Correlation | Squared Multiple Correlation | Alpha If Item Deleted |
| 1 | 31.28 | | 27.949 | .522 | .313 | .808 |
| 2 | 31.38 | | 27.597 | .490 | .357 | .811 |
| 3 | 31.43 | | 28.007 | .576 | .427 | .803 |
| 4 | 31.50 | | 28.132 | .528 | .304 | .807 |
| 5 | 31.44 | | 27.862 | .526 | .354 | .807 |
| 6 | 31.56 | | 28.288 | .450 | .273 | .815 |
| 7 | 31.95 | | 27.917 | .542 | .409 | .806 |
| 8 | 32.44 | | 27.821 | .375 | .298 | .827 |
| 9 | 31.68 | | 26.474 | .656 | .482 | .793 |
| 10 | 31.66 | | 28.012 | .492 | .306 | .811 |

competence profile and how this profile is used in the respondent's study programme. Irrelevant explanations for principle 2 concerned subjects such as assessment, vocational practice or teachers' opinions about competence-based education. Level 3 (no argumentation) was assigned in only 13% of the cases.

## Conclusion and Discussion

In the introduction, two objectives were formulated for this study. The first objective was to determine what adjustments to the CCBE model teachers deemed necessary in order to apply the model as a valid instrument to assess the actual and desired "competentiveness" of their study programmes. On the basis of the results of the first part of the study (A), it was concluded that several adjustments were necessary. Besides making various detailed semantic adjustments, one new principle (flexibility of study programmes) and a fifth level of implementation were therefore added to the revised CCBE model. Principle 6 was divided into two separate principles (self-responsibility and self-reflection). The model now contains the following principles (see Appendix A, Table 5 for the revised model):

1. The study programme is based on core tasks, working processes and competences (the qualification profile).
2. Complex vocational core problems are central.
3. Learning activities take place in different concrete, meaningful vocational situations.
4. Knowledge, skills and attitudes are integrated.
5. Students are regularly assessed.
6. Students are challenged to reflect on their own learning.
7. The study programme is structured in such a way that the students increasingly self-steer their learning.
8. The study programme is flexible.
9. The guidance is adjusted to the learning needs of the students.
10. In the study programme attention is paid to learning, career and citizenship competences.

The second objective was to examine the reliability and content validity of the revised model. The revised model proved to be reliable with good content validity. The teachers were able to evaluate their study programmes based on the model and they understood and interpreted the model as intended. The CCBE model can be validly used by teachers in educational practice to assess the actual and desired "competentiveness" of their study programmes. As mentioned in the introduction, a large threat to validity is that items may not mean the same thing to the participants as the researcher intended (Ransom et al. 1990). The possibility of multiple interpretations has been reduced to a minimum in the revised model.

As pointed out in the introduction, Windschitl (2002) describes four comprehensive dilemmas which teachers face during the implementation of an educational reform. The CCBE model might help teachers in facing these dilemmas. First, the CCBE model describes the principles of competence-based education and therefore might help teachers grasp the underpinnings of competence-based education (conceptual dilemmas). According to Windschitl (2002), having knowledge of the underlying principles is necessary but insufficient in itself for successful implementation. Teachers

also have to undergo a major transformation with respect to teaching and learning. The CCBE model might help them undergo and discuss this transformation. Second, the CCBE model distinguishes between the '*what*' (curriculum) and '*how*' (instruction) of competence-based education and might offer teachers an instrument to grasp the pedagogical dilemmas of competence-based education. Teachers currently working in MBO institutions are not trained to provide competence-based education. They therefore need to undertake professional development activities to become proficient at delivering competence-based education (Wesselink 2010). However, teachers are still confronted with the dilemma of reconciling their current beliefs about pedagogy with the beliefs of competence-based education.

Another dilemma Windschitl (2002) describes is cultural. The revised CCBE model offers teachers in vocational education and training an instrument to assess their own practice and see which aspects they have to work on and whether they want to fully realize the main principles of competence-based education in actual teaching and learning processes. The CCBE model helps teachers answer questions such as how competence-based do we want our study programme to become?

The political dilemma remains as to whether students become better competent professionals after competence-based study programmes. This is however a discussion which goes beyond the scope of this article. With the help of the CCBE model it will be possible to examine the nature of competence-based education and differentiate between study programmes, and thus study the relations between the nature of the programme and the output (i.e., the competence of the students). We intend to study this topic in the future.

This study examined whether the current combination of principles in the revised CCBE model is accurate and easy to understand for teachers in MBO institutions. Individual teachers participated in this study instead of entire teacher teams, which are held responsible for the complete study programme. More research at national and international levels is needed for additional empirical validation. In a future study the focus will be on the methodological quality in terms of inter-rater reliability and concurrent validity. Also the internal consistency, internal validity and convergent validity will be examined.

In practice, the transition to competence-based education is of course more complex than the CCBE model on paper. The CCBE model is not a step-by-step manual of how to transform a study programme into competence-based education, but a reflection instrument to help teachers discuss difficulties and desired "competentiveness" of study programmes. In a pilot-study, teachers successfully self-evaluated their study programmes using the model and improved their study programme, which indicates a possible practical importance of the CCBE model. More research is needed to investigate whether the CCBE model empowers teacher teams to make clear choices and agreements concerning the future development of their study programme in relation to competence-based education.

This article indicates that, for the time being, teachers regard the CCBE model as a useful instrument in the implementation of competence-based education.

## Appendix A

**Table 5** Revised model of comprehensive competence-based vocational education

| | Principle | Not CBE | Starting to be competence-based | Partially competence-based | Largely competence-based | Completely competence-based |
|---|---|---|---|---|---|---|
| 1 | The study programme is based on core tasks, working processes and competences (the qualification profile). | During the development of the study programme the qualification profile is not used and the programme is not synchronized with professional practice. Teachers are not familiar with the qualification profile. | During the development of the study programme the qualification profile is seldom used and the programme is not synchronized with professional practice. Teachers are seldom familiar with the qualification profile. | During the development of the study programme the qualification profile is partially used and the programme is partially synchronized with professional practice. Teachers are moderately familiar with the qualification profile. | During the development of the study programme the qualification profile is often used and the programme is largely synchronized with professional practice. Teachers are familiar with the qualification profile. | During the development of the study programme the qualification profile is at all times used and the programme is synchronized with practices and developments in the profession. Teachers are familiar with the qualification profile. |
| 2 | Complex vocational core problems are central. | Complex vocational core problems are not central to the study programme. | Complex vocational core problems are occasionally central to the study programme. Occasionally students work on vocational core problems. | Complex vocational core problems are central to some parts of the study programme. | Complex vocational core problems are often central to the study programme and are assessed in different contexts. The complexity of the problems does not increase during the study programme. | Complex vocational core problems are at all times central to the study programme and are assessed in many different contexts. The complexity of the problems increases during the study programme. |
| 3 | Learning activities take place in different concrete, meaningful vocational situations. | Students learn in school. Learning in practice is of subordinate importance. | Students learn occasionally in practical settings but classroom work is predominant. A link is seldom made between classroom learning and | Learning activities (both in and outside school) take place partially in concrete, meaningful practice settings. A link is sometimes made between | Participants often work (both in and outside school) individually and in teams on learning activities that take place in several meaningful, | Participants always work (both in and outside school) individually and in teams on learning activities that take place in various |

**Table 5** (continued)

| | Principle | Not CBE | Starting to be competence-based | Partially competence-based | Largely competence-based | Completely competence-based |
|---|---|---|---|---|---|---|
| | | | learning through practical experience. | classroom learning and learning through practical experience. | concrete practice settings. A link is often made between classroom learning and learning through practical experience. | meaningful, concrete practice settings. A link is always made between classroom learning and learning through practical experience. |
| 4 | Knowledge, skills and attitudes are integrated. | Knowledge, skills and attitudes (K, S and A) are separately developed during the learning process. The three aspects are assessed separately. | K, S and A are seldom integrated in the learning process. K, S and A are assessed separately. | K, S and A are integrated in some parts of the study programme. K, S and A are assessed separately. | K, S and A are often integrated in the learning process. Assessment of K, S and A is integrated as much as possible. | K, S and A are always integrated in the learning process. K, S and A are assessed as an integrated whole. |
| 5 | Students are regularly assessed. | Assessment is the final stage of a learning task and is qualifying. Vocational practice is not involved during the assessment. | Assessment takes place at several times during the learning process and is qualifying. The students' competence development is seldom assessed. Vocational practice is seldom involved during the assessments. | Assessment takes place at several times and is qualifying. Sometimes the students' competence development is assessed. Vocational practice is sometimes involved during in the assessments. | Assessment takes place before, during and after the learning process and is both qualifying and focused on the competence development of students. The timing and format of the assessments are the same for all students. Vocational practice is often involved during the assessments. | Assessment takes place before, during and after the learning process and is both qualifying and focused on the competence development of students. Students determine the timing and format of assessment themselves. Vocational practice is at all times involved during in the assessments. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Students are challenged to reflect on their own learning. | Students are not challenged to reflect on their own learning. | Students are seldom challenged to reflect on their learning and the learning outcomes. | Students are sometimes challenged to reflect on their learning and the learning outcomes. | Students are often challenged to reflect on their learning and the learning outcomes. | Students are at all times challenged to reflect on their learning, the learning outcomes and the occupation. |
| 7 | The study programme is structured in such a way that the students increasingly self-steer their learning. | There are no possibilities during the study programme for self-steering. The teacher is responsible for the learning process of the student. | The study programme seldom offers possibilities for self-steering. The teacher is responsible for the learning process of the student. | The study programme partially offers possibilities for self-steering. Students have an influence on their own learning process. The teacher and the student are jointly responsible for the learning process of the student. | The study programme often offers possibilities for self-steering. Students have an influence on their own learning process. The teacher and the student are jointly responsible for the learning process of the student. | The study programme offers at all times possibilities for self-steering. Students design their own learning process. The students' self-steering of their learning process increases during the programme. Each student is ultimately self-responsible for his/her own learning process. |
| 8 | The study programme is flexible. | The study programme is the same for each student. There are no possibilities to alter the study programme for a specific student. | The study programme is the same for each student. There are possibilities for the students to follow the courses at their own pace. | The study programme is the same for each student, but there are possibilities to alter the programme based on the accomplished competences of the students and earned dispensations. | The study programme is the same for each student, but can be followed at a student's own pace. The student can choose between different learning activities. | The study programme is flexible and planned with the coach based on the characteristics of the student. |
| 9 | The guidance is adjusted to the learning needs of the students. | The teacher is an expert. Transfer of knowledge is crucial. | The teacher is an expert. The teacher offers guidance which is seldom adjusted to the learning needs of the students. | The teacher is a coach and an expert. The teacher offers guidance which is partially adjusted to the learning needs of the students. | The teacher is a coach, mentor and expert. The teacher offers varied guidance which is often adjusted to the learning needs of the students. | The teacher is a coach, mentor and expert. The teacher offers varied guidance which at all times is adjusted to the learning needs of the students. Students are stimulated to help each other. |

**Table 5** (continued)

| | Principle | Not CBE | Starting to be competence-based | Partially competence-based | Largely competence-based | Completely competence-based |
|---|---|---|---|---|---|---|
| 10 | In the study programme attention is paid to learning, career and citizenship competences. | No attention is paid to learning, career and citizenship competences during the study programme. | Attention is seldom paid to learning, career and citizenship competences during the study programme. These competences are not integrated during the study programme. | Some attention is paid to learning, career and citizenship competences during the study programme.<br><br>These competences are not integrated during the study programme. | Attention is often paid to learning, career and citizenship competences during the study programme. These competences are integrated with vocational core problems. | Attention is paid at all times to learning, career and citizenship competences during the study programme. These competences are integrated in the study programme. |

## References


Arguelles, A., & Gonczi, A. E. (2000). *Competency based education and training: A world perspective*. Mexico City: Grupo Noriega editors.

Baartman, L. K. J. (2008). *'Assessing the assessment'. Development and use of quality criteria for competence assessment programmes.* Doctoral Dissertation, Utrecht University, the Netherlands.

Bereiter, C., & Scardamalia, M. (1993). *Surpassing ourselves. An inquiry into the nature and implications of expertise*. Chicago: Open Court.

Biemans, H., Nieuwenhuis, L., Poell, R., Mulder, M., & Wesselink, R. (2004). Competence-based VET in the Netherlands: background and pitfalls. *Journal of Vocational Education and Training, 56*(4), 523–38.

Biemans, H., Wesselink, R., Gulikers, J., Schaafsma, S., Verstegen, J., & Mulder, M. (2009). Towards competence-based VET: dealing with the pitfalls. *Journal of Vocational Education and Training, 61* (3), 267–286.

Billett, S. (2003). Vocational Curriculum and Pedagogy: an activity theory perspective. *European Educational Research Journal, 2*(1), 6–21.

Boersma, A., Ten Dam, G., Volman, M., & Wardekker, W. (2010). This baby… it isn't alive. Towards a community of learners for vocational orientation. *British Educational Research Journal, 36*, 3–25.

Brockmann, M., Clarke, L., Méhaut, P., & Winch, C. (2008). Competence-based vocational education and training (VET): the cases of England and France in a European Perspective. *Vocations and Learning, 1*, 227–244.

Clarke, L., & Winch, C. (2007). *Vocational education. International approaches, developments and systems*. London: Routledge.

De Bruijn, E., & Leeman, Y. (2011). Authentic and self-directed learning in vocational education: challenges to vocational educators. *Teaching and Teacher Education, 27*, 694–702.

De Bruijn, E., Overmaat, M., Glaude, M., Heemskerk, I., Leeman, Y., Roeleveld, J., et al. (2005). Krachtige leeromgevingen in het middelbaar beroepsonderwijs: vormgeving en effecten [Powerful learning environments in secondary vocational education: design and effects]. *Pedagogische Studiën, 82*(1), 77–5.

Descy, P., & Tessaring, M. (2001). *Training and learning for competence*. Thessaloniki: Cedefop.

Eraut, M. (1994). *Developing professional knowledge and competence*. London: Routledge Flamer.

Gonczi, A. (1994). *Developing a competent workforce*. Adelaide: National Centre for Vocational Education Research.

Hager, P., Gonczi, A., & Athanasou, J. (1994). General issues about assessment of competence. *Assessment & Evaluation in Higher Education, 19*, 3–16.

Jonnaert, P., Masciotra, D., Barrette, J., Morel, D., & Mane, Y. (2007). From competence in the curriculum to competence in action. *Prospects: Quarterly Review of Comparative Education, 37*, 187–203.

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personnel Psychology, 28*, 563–575.

Mulder, M. (2004). *Education, competence and performance: On training and development in the agri-food complex*. Wageningen: Wageningen University.

Mulder, M. (2007). Competence: the essence and use of the concept in ICVT. *European Journal of Vocational Training, 40*, 5–21.

Onstenk, J. (1997). *Lerend leren werken: brede vakbekwaamheid en de integratie van leren, werken en innoveren [Learning to learn-to-work: Broad job competencies and the integration of learning, working and innovation]*. Delft: Eburon.

Onstenk, J., De Bruijn, E., & Van den Berg, J. (2004). *Een integraal concept van competentiegericht leren en opleiden*. Den Bosch: Cinop.

Ransom, D., Fisher, L., Philips, S., Kokes, R., & Weiss, R. (1990). The logic of measurement in family research. In T. Draper & A. Marcos (Eds.), *Family variables: Conceptualization, measurement and use* (pp. 48–66). Newbury Park: Sage.

Rowan, B., Camburn, E., & Barnes, C. (2004). Benefiting from comprehensive school reform: A review of research on CSR implementation. In C. Cross (Ed.), *Putting the pieces together: Lessons from comprehensive school reform research* (pp. 1–52). Washington: National Clearinghouse for Comprehensive School Reform.

Schön, D. A. (1993). *The reflective practitioner: How professionals think in action*. New York: Basic books.

Smith, E. (2010). A review of 20 years of competency-based training in the Australian vocational education and training system. *International Journal of Training and Development, 14*, 54–64.

Taconis, R., Van der Plas, P., & Van der Sanden, J. (2004). The development of professional competencies by educational assistants in school-based teacher education. *European Journal of Teacher Education, 27*, 215–240.

Van den Berg, N., & De Bruijn, E. (2009). *Het glas vult zich: Kennis over vormgeving en effecten van competentiegericht beroepsonderwijs: verslag van een review [The glass fills up. Knowledge about design and effects of competence-based education: report of a review].'s*. Hertogenbosch: Expertisecentrum Beroepsonderwijs.

Velde, C. (1999). An Alternative Conception of Competence: implications for vocational education. *Journal of Vocational Education and Training, 51*(3), 437–447.

Wardekker, W. (2004). Curriculum as vision. In J. Terwel & D. Walker (Eds.), *Curriculum as a shaping force*. New York: Nova.

Weigel, T., Mulder, M., & Collins, K. (2007). The concept of competence in the development of vocational education and training in selected EU member states. *Journal of Vocational Education and Training, 59*, 51–64.

Wesselink, R. (2010). *Comprehensive competence-based vocational education. The development and use of a curriculum analysis and improvement model.* Doctoral dissertation, Wageningen: University, the Netherlands.

Wesselink, R., Biemans, H. J. A., Mulder, M., & Van den Elsen, E. R. (2007). Competence-based VET as seen by Dutch researchers. *European journal of vocational training, 40*(1), 38–51.

Wesselink, R., Dekker-Groen, A., Biemans, H. J. A., & Mulder, M. (2010). Using an instrument to analyse competence-based vocational courses: experiences of teachers in Dutch vocational education and training. *Journal of Curriculum Studies, 42*(6), 813–829.

Wesselink, R., Mulder, M. & Biemans, H.J.A. (2007b). Evaluation of the utility of a model for competence-based VET. Paper presented at AERA, April 2007, Chicago

Windschitl, M. (2002). Framing constructivism in practice as the negotiation of dilemmas: an analysis of the conceptual, pedagogical, cultural and political challenges facing teachers. *Review of Educational Researcher, 72*, 131–175.

**Lidwien Sturing Msc** is a doctoral student at the Education and Competence Studies Chair Group, Wageningen University, PO 8130, 6700 EW, The Netherlands; e-mail: lidwien.sturing@wur.nl. Her interests include the competentiveness of study programmes in vocational education.

**Dr. Harm J.A. Biemans** is an associate professor at the Education and Competence Studies Chair Group, Wageningen University, The Netherlands. He has carried out and supervised many projects in different domains, such as learning and instruction, educational development and evaluation, teacher training, school organization, and ICT.

**Prof. Dr. Martin Mulder** is full-time professor of Education and head of the chair group Education and Competence Studies at Wageningen University, The Netherlands; internet: www.mmulder.nl. His interests include education, competence, and work.

**Prof. Dr. E. de Bruijn** is a professor at Utrecht University and lector at an institution for higher professional education. Her interests include powerful learning environments, competence-based education, teacher skills and vocational education.