

Teachers' individual action theories about competence-based education: the value of the cognitive apprenticeship model

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Dutch prevocational secondary schools are reforming their educational programmes to make them more competence-based. This reform has substantial implications for the roles played by teachers. Yet, little empirical research has been conducted on teachers' processes of competence development in vocational settings. This study explores teachers' individual action theories regarding the introduction of competence-based prevocational secondary education. The cognitive apprenticeship model provides a conceptual framework for addressing this issue. The research questions addressed here are: How do teachers value elements of the cognitive apprenticeship model in designing and delivering competence-based prevocational secondary education?, and, What individual action theories do teachers have regarding competence-based prevocational secondary education? The study was designed in two phases. In the qualitative phase, interviews and concept map techniques were used, while the quantitative phase employed a questionnaire. Teachers valued elements of the cognitive apprenticeship model differently, and suggested two additional features: a custom-made educational approach and the professionalisation of teachers.

Keywords: vocational education; teachers; individual action theories; workplace learning; cognitive apprenticeship

Introduction

The Dutch secondary education system is highly multi-faceted, ranging from short, very practical prevocational and vocational education (comparable to the American vocational high schools) to a 6-year academic stream that permits entrance to a university study. Having finished primary school, ~ 60% of Dutch pupils attend PreVocational Secondary Education (PVSE), which precedes Senior Secondary Vocational Education (SSVE). Learners usually enter higher levels of vocational education (ages 15–18) through PVSE (ages 12–15). PVSE combines general education and vocational preparation, divided into four sectors: care and welfare, engineering and technology, business and economics, and agriculture. In PVSE, learners can choose between a more practically based or a more theoretically oriented track. This form of education, however, does not conclude with a vocational certification, which means that learners have to continue to SSVE in order to become certified. Having

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finished SSVE, learners can choose to either enter higher professional education – comparable to vocational colleges or polytechnics – or receive a vocational certification. In this article, we focus on PVSE.

In the Netherlands, PVSE and SSVE are increasingly making their educational programmes more competence-based. Instead of concentrating on knowledge acquisition, they attempt to help learners acquire a combination of knowledge, skills, and attitudes that they will need in their chosen vocation (i.e. competences). This process has substantial implications for the school as a learning environment, as well as for the roles of teachers employed by schools. Teachers are expected to support their pupils by helping them integrate knowledge, skills, and attitudes into personal competences (Onstenk 1997). Most teachers currently employed within PVSE and SSVE were not trained to fulfil the new roles that competence-based learning environments require of them. Furthermore, teachers are now required to work together with colleagues from different disciplines in designing competence-based education, an approach that is new to them. These changes require teachers to fulfil different roles than they fulfilled previously. Since there is little time available for them to acquire these teaching competences in more traditional in-service learning settings (e.g. courses), they therefore must acquire them on the job. These competences require a change in both teachers' views and the individual action theories that underlie their behaviour in instructional contexts (Argyris and Schön 1978; Van der Krogt and Warmerdam 1997; Van der Sanden and Teurlings 2003).

In research on teacher learning, there is increasing interest in the often implicit and experience-based knowledge, subjective working concepts, and professional concepts regarded as the foundations of teachers' teaching strategies (Beijaard, Verloop and Vermunt 2000; Oosterheert 2001; Van Velzen 2002). This study, therefore, explores the individual action theories that teachers have regarding teaching. More specifically, we study the ways that teachers give meaning to their new roles, the problems they experience, and the learning processes that are involved in developing more competence-based learning environments. This study takes a social-constructivist perspective on learning and teaching, where learning is viewed as giving meaning to experiences in a process of continuous progressive re-contextualization (Guile and Young, 2003; Van der Sanden and Teurlings 2003). The basis for this research lies in the *cognitive apprenticeship model*, which holds that learners should be guided in their process of development from novices to masters in a complex domain (Collins, Brown and Newman 1989).

The cognitive apprenticeship model specifies four dimensions for designing powerful environments, namely: content, method, sequence, and sociology. The first dimension, *content*, holds that it is important to differentiate between different types of knowledge, such as conceptual, factual, procedural, and strategic knowledge. To become a master within a certain domain it is important to pay attention to problem-solving strategies and heuristics, especially regarding how to acquire these types of knowledge. The second dimension, *method*, provides guidelines for teaching methods (i.e. modelling, coaching, scaffolding and fading, articulation, reflection, and exploration) to help learners acquire and integrate cognitive and meta-cognitive strategies for constructing, using, and managing knowledge. These methods provide learners with the opportunity to observe, engage in, and invent or discover expert strategies in their context. This enables them to see how these strategies fit together with their factual and conceptual knowledge and how to make use of the variety of resources in social and physical contexts. *Sequence*, the third dimension, prescribes how to identify

changing learning needs and how to adjust the sequence and structure of learning materials accordingly. There are three principles central to sequencing, namely: increasing complexity, increasing diversity, and acquiring global skills before local skills. These principles are important for learners to help them integrate and generalise knowledge and complex skills. The final dimension, *sociology*, refers to the sociology of the learning environment, a critical dimension that has received increasing attention lately (e.g. Loyens, Rikers and Schmidt 2006; Sluijsmans, Straetmans and Merriënboer 2008). Important elements of this dimension are situated learning, culture of expert practice, promoting intrinsic motivation, exploiting cooperation, and exploiting competition. Here it is important that learners encounter different levels of expertise in a situated and authentic environment; they need to engage immediately in the authentic context and become part of the community of practitioners.

There has been little empirical research conducted on processes of competence development in practical settings, especially concerning teachers in vocational education. The current study explores the individual action theories of teachers regarding competence-based secondary education. As such, it is a critical first step in identifying teachers' individual action theories to gain insight into how they view their roles and the boundary conditions within competence-based PVSE. Insight in these competence-development processes can provide a theoretical foundation for further research. In addition, these insights can be used to support student teachers as well as in-service teachers involved in professional-development trajectories. The study described in this article focuses on the following questions:

- (1) How do teachers value elements of the cognitive apprenticeship model in designing and delivering competence-based prevocational secondary education?
- (2) What individual action theories do teachers have regarding competence-based prevocational secondary education?

Methodology

Context

This study was carried out in two phases. First, we report on a relatively small-scale qualitative phase, conducted at one PVSE school in the Netherlands. This school was in the process of preparing a more vocationally-oriented programme aimed at better preparing and supporting learners choosing the sector in which they will eventually work (i.e. care and welfare; engineering and technology; business and economics; agriculture). The teachers who participated in the qualitative phase designed 'project weeks' where the traditional school subjects were integrated into a project focusing on one of the sectors. The 'project weeks' were aimed at designing new forms of education integrating general and vocational subjects and embedding new pedagogic measures within a more authentic context. These weeks were a first attempt at establishing a more competence-based curriculum.

Secondly, we report on a somewhat larger-scale quantitative phase, in which teachers who were also in the process of developing new competence-based programmes participated. These schools participated in a consortium subsidised by the Dutch government, in which they were given the opportunity to experiment with new curricula, pedagogies, and assessment programmes.

Participants

In the qualitative phase, 12 teachers (three women, nine men) from one PVSE school in the Netherlands participated. Their teaching subjects included business and economics, mathematics, physics, chemistry, biology, information technology, history, geography, English, German, French, and Dutch.

In the quantitative phase, 42 teachers (three women and 39 men) from 34 schools filled in the questionnaire. These teachers taught a wide range of both vocational and general subjects, varying from physical education to Dutch.

Materials and procedure

The qualitative phase made use of concept mapping, cued interviews, and semi-structured interviews. *Concept mapping* is a technique for deriving the meaning that a person attributes to several concepts from a graphical reproduction of the coherence between propositions within a certain domain, which is generated by that particular person (Seezink and Van der Sanden 2005). Of the 12 teachers involved in this phase, nine generated concept maps which they submitted 2 weeks prior to the start of the 'project week'. The instructions given to them were:

Write down as many concepts as you can on the cards related to developing competence-based PVSE, and if necessary, you may use small sentences (please make sure it is clear what you mean). Place every new concept or small sentence on a different card. Divide and arrange these cards on the large sheet of paper, so that it is logical for you. Cards that are related to each other should be placed closer to each other than cards that are not related. Draw lines between the cards that you think are related. You can draw as many lines as you want. Write alongside each line the relationship between these cards. If possible, try to transform the lines into arrows so that the direction of the relation is apparent. If you come across concepts that you think are important, please add them to the cards. Underline the most important concepts.

Of the 12 teachers, five participated in *cued interviews* during a 'project week' on location – in this case a vacation park – where they functioned as coach. During this 'project week', video recordings were made of the counselling meetings, with special attention to the interaction between learners and coach. The duration of these recordings was ~ 30 minutes. These video recordings were used as a basis for a cued interview in which they were asked: Why did you use this intervention? Why did you decide to intervene at this particular moment? Why did you intervene like this? What did you think of the reactions of the learners? and What did you think about your own reaction? The interviews were recorded on an audiocassette and were later transcribed and analysed.

Not all teachers were present for the 'project week'. The teachers who were absent could not take part in the cued interview. These teachers did not function as coach during the 'project week', but did participate in designing the tasks for and the preparation of this week. For this reason, seven of the 12 teachers took part in a *semi-structured interview* in the same week that the cued interviews took place. The interview questions were based on literature about individual action theories of teachers (Henze, Van Driel and Verloop 2007; Van de Sande 2007) and were adapted to the vocational education context. The semi-structured interviews contained the following questions: How do you see the role of the teachers within this innovation? How or in what way do you interpret your own role in this innovation? How do you

(think you) support learners in their tasks? Which elements do you find important within the curriculum? What do you want to achieve during these ‘project weeks’? Which educational measures do you think are still desirable? What do you expect of learners when they finish their education at this school? and What do you think learners have learned during the ‘project weeks’? After analysing the results, a feedback session was organised with the teachers who participated in the qualitative phase to discuss the most significant results. This feedback session was recorded on an mp3 device and was transcribed and analysed.

In the quantitative phase, the authors developed a questionnaire, which was partially based on the results of the qualitative phase as well as on seven exploratory interviews with teachers who were randomly selected from the consortium. The questionnaire consisted of six conceptual scales, namely: *content*, *teaching methods*, *sequence*, *sociology of the learning environment*, *custom-made educational approach*, and *professionalisation of teachers*. The questionnaire consisted of a number of instructional measures that teachers can implement, which are potentially relevant for promoting the development of learners’ competences in PVSE. For each of these, the teachers were asked to answer three questions, namely: How important is this instructional measure for realising competence-based education?, To what extent do you think this instructional measure is applicable in your own situation?, and To what extent do you apply this instructional measure within your own classroom environment? The answers were given on a 5-point scale, with a score of 1 being ‘I do not deem this important/applicable/applied’, a score of 3 being neutral, and a score of 5 being ‘I deem this important/applicable/applied’.

Before analysing the questionnaire results, the reliabilities of the conceptual scales were determined. Table 1 shows the Cronbach’s Alpha scores of all scales, which were rated as moderately-to-highly reliable (range = .67–.87), as well as examples of the items.

Analyses

The data gathered in the qualitative phase (i.e. the cued and semi-structured interviews) were transcribed into text documents. Subsequently, the concept maps and transcriptions were explored with the goal of identifying concepts and principles that

Table 1. Reliability analysis for the different conceptual scales.

Scale	Cronbach’s alpha	Number of items	Illustration item
Content	.69	4	Aiding pupils in forming a well-organised knowledge base.
Teaching methods	.87	9	Providing lots of examples of problem-solving to pupils.
Sequence	.72	5	Gradual increasing complexity within learning tasks.
Sociology of the learning environment	.84	10	Building relations between educational arrangements and future job opportunities.
Custom-made educational approach	.87	7	Using input of pupils for organising education.
Professionalisation teachers	.67	5	Giving teachers the opportunity to develop themselves further.

referred to elements of the cognitive apprenticeship model. Figure 1 formed the foundation for these analyses. Furthermore, the data were explored for expressions used by the teachers that recurred more than three times, and that referred to elements in the learning environment that teachers wanted to change.

For the data gathered in the qualitative phase, one-sample *T*-tests and descriptive statistics were used to analyse the results. The perceived importance was analysed using one-sample *T*-tests. If the scores of the teachers were significantly higher than 3, it was assumed that the measures were viewed by them as being important. Finally, a paired-samples *T*-test was used to gain insight on whether teachers valued some scales significantly higher than other scales. To reduce the chances of a type I error,

Content	Domain knowledge	The conceptual and factual knowledge and procedures explicitly identified with particular subject matter.
	Heuristic Knowledge	Generally effective techniques and approaches for accomplishing tasks that might be regarded as 'tricks of the trade'
	Control strategies	The control of the process of carrying out a task, which includes regulation strategies for managing, guarding and control strategies for the execution of tasks.
	Learning strategies	Strategies for learning any of the other kinds of content which are described above.
Methods	Modelling	Showing an expert carrying out a task so that learners can observe and build a conceptual model of the processes that are required to accomplish the task.
	Coaching	Observing learners while they carry out a task and offering hints, scaffolding, feedback, modelling, reminders and new tasks aimed at bringing their performance closer to expert performance. Coaching focuses on the enactment and integration of skills.
	Scaffolding and fading	A kind of cooperative problem solving effort by teacher and learner in which the expressed intention is for the learner assume as much of the task on his own as possible, as soon as possible and also the gradual removal of supports until learners are on their own.
	Articulation	Any method of getting learners to articulate their knowledge, reasoning or problem-solving processes in a domain.
	Reflection	Enabling learners to compare their own problem solving processes with that of an expert, other learners and ultimately, an internal cognitive model of expertise.
	Exploration	Pushing learners into a mode of problem-solving of their own. This is essential for learners to learn how to frame questions or problems that are interesting and that they can solve.
Sequence	Increase Complexity	The construction of a sequence of tasks and task environments such that more and more of the skills and concepts are necessary for expert performance are required.
	Increase diversity	The construction of a sequence of tasks in which a wider and wider variety of strategies or skills are required.
	Global before local skills	Sequencing lessons such that learners have a chance to apply a set of skills in constructing an interesting problem solution before they are required to generate or remember those skills.
Sociology	Situated learning	Carrying out tasks and solving problems in an environment that reflects the multiple uses to which their knowledge will be put in the future.
	Culture of expert practice	Creating a learning environment in which the participants actively communicate about and engage in the skills involved in expertise.
	Intrinsic motivation	Creating environments or tasks in which learners perform because they are intrinsically related to an interesting goal, rather than an extrinsic reward.
	Exploiting cooperation	Having learners work together in a way that fosters cooperative problem solving. This is a powerful motivator and a powerful mechanism for extending learning resources.
	Exploiting competition	Comparing the output of the learners, not between products, but between the processes of learner problem solving.

Figure 1. Definitions used in the cognitive apprenticeship model by Collins, Brown, and Newman (1989).

Cronbach's Alpha was divided by the number of scales used in the pair wise comparison (Shaughnessy, Zeichmeister and Zeichmeister 2000).

Results

The results are described in two sections. First, the results of the qualitative phase are addressed and then the results of the quantitative phase.

Qualitative phase

The analyses of the concept maps and the interviews indicated that various dimensions of the cognitive apprenticeship model play a role in the individual action theories of the 12 teachers. We explored the data for illustrative expressions of each element.

Overall, references to *teaching methods* and the *sociology* of the learning environment are more prominent in teachers' individual action theories than *content* and *sequence*. Within the *teaching methods* dimension: 'coaching', 'scaffolding and fading', 'articulation', and 'exploration' are quite prominent. *Teaching methods* such as 'modelling' and 'reflection' come to the fore less frequently. An example regarding Coaching within the dimension Teaching Methods is:

They [the pupils] neglected to write things down where they agreed upon. [...] They want to go by bicycle or they want do it for so and so long, but they did not write it down. That is why I said to [name]: now write down what has been said. (Cued Interview, Subject nr 03, Teaching Method; Coaching)

Here the teacher reminds pupils that it is important for them not only to make decisions, but also to record those decisions. The teacher, thus, is observing the pupils and giving them hints, reminders, and so forth to bring their performance closer to expert performance. Another aspect prevalent in the analyses is that teachers require pupils to articulate what they are going to do and why. An example:

[...] But then I [the teacher] do not want to say: guys you need to do this step by step. However, I try to accomplish through a little discussion that they realise: what is important? What do we [the pupils] want to know when other groups are presenting? What do others want to know about us? (Cued Interview, Subject nr 13, Teaching Method, Articulation)

Less prominent within Teaching Methods were expressions regarding Modelling and Reflection. However, teachers do think this is important. An example of Modelling is:

Well, if you [the pupils] go to the CEO, how do you go about? What do you do? Well I [the teacher] would say, Dear mister [name], listen, we have interviewed some people ... No! Who did you interview? You have interviewed tourists and personnel. You should say exactly what you did. Not just, well we asked some people ... (Cued Interview, Subject nr 13, Teaching Methods, Modelling)

Regarding the *sociology* dimension, teachers value different elements. Many teachers emphasised the power of learning within an authentic and rich context. Some examples are:

I [the teacher] would take the pupils more out of the school, the classroom. Into the real world. [...] Yes, that is when a subject becomes real. (Interview, Subject nr 06, Sociology, Situated Learning)

They [the pupils] think that they can group the people in groups of 75, 75, and 50. Nevertheless, if people can sign themselves in, these numbers are going to change, because the reality is different from what they are thinking now. Therefore, I [the teacher] try to make that clear that it is not realistic. And then they end up having costs and calculations that do not fit. (Cued Interview, Subject nr 03, Sociology, Situated learning)

Not only the authentic context is valued by teachers, but also exploiting cooperation between pupils is an important aspect of the *sociology* component.

[I value] the way pupils work together. Everyone has to do his share within the group. (Interview, Subject nr 07, Sociology, Exploiting cooperation)

The focus was more on the process, less on the product, but more on the process. Working together to establish something, having meetings together, discussing subjects [...] (Interview, Subject nr 04, Sociology, Exploiting cooperation)

References to the *content* component are less frequent, although teachers are rather focused on their own subjects. Some examples are:

[... this year] we hardly had any time for didactic innovations regarding your own subject. That is what you have to do in your own time. [...] I hope we can develop more next year for our own subjects. (Interview, Subject nr 01, Content, Domain knowledge)

[...] Regarding our subject, they studied [subject material]. [...] Those are predominantly the [subject] matter that I [the teacher] wanted them to study, and they did study that. (Interview, subject 04, Content, Domain knowledge)

Regarding *sequence* only one reference was made within the interviews:

[...] and also regarding the integration of subjects, there are opportunities. [...] More as a domain [...]. (Interview, subject 01, Sequencing, Increase diversity)

After exploring the data for expressions regarding the cognitive apprenticeship model, we went through the data looking for expressions that recurred more than three times and referred to elements in the learning environment that teachers wanted to change. Within this specific innovation, the school focused on helping pupils choose among job opportunities and among further education programmes. Teachers expressed that they think a *custom-made educational approach* is more suitable at this level of education, so as to give learners more freedom in developing their capacities and interests, and that pupils also want to develop their own curriculum more. Some examples are:

Because these pupils say 'I have learned a lot over there', it might be that they are saying: 'I [the pupil] want to learn more than only knowledge. I [the pupil] want to learn other things. And that I [the pupil] am able to show that now. (Feedback session, subject nr 06, Custom-made educational approach)

I have experimented this year with the fact that pupils could choose when they wanted to make their examinations. [...] It is difficult to organise that properly. The focus of the

experiment was to see whether pupils worked harder if they could choose their own examination times. (Interview, Subject nr 01, Custom made educational approach)

Another element that became prevalent was the need felt and expressed by teachers to receive further training in order to be able to provide better support for learners. Some examples are:

[...] But also for us [teachers] it is difficult to provide coherence within the content of the projects. [...] Providing this coherence is also something we [the teachers] have to learn. (Feedback session, subject nr 08, Professional development)

[...] There are situations that I [the teacher] find myself in the situation that I have to say to the pupil: 'well, I don't know this either, but shall we look for solutions together?' (Feedback session, Subject nr 11, Professional development)

To determine whether these two aspects were also valued by other teachers involved in designing competence-based PVSE, they were developed into conceptual scales within the questionnaire designed for the quantitative phase.

Quantitative phase

The quantitative phase consisted of a questionnaire with six conceptual scales: *content*, *teaching methods*, *sequence*, *sociology of the learning environment*, *custom-made educational approach*, and *professionalisation of teachers*. The first four scales were based on the cognitive apprenticeship model, and the last two scales were added based on the results of the qualitative phase. The descriptive statistics – presented in Table 2 – give insight into how teachers valued the different scales with respect to their importance, their applicability in vocational education, and the extent to which they were actually applied in the teachers' own school environment. On the one-sample *T*-test all conceptual scales were found to have scores significantly higher than 3 (*M* ranging from 4.19–4.47; $p < .001$).

Table 2. Hierarchical representation of the descriptives ($n = 37$).

Importance	Applicable in general prevocational education	Applied within own school environment
Sequence ($M = 4.46$; $SD = .42$)	Sequence ($M = 3.93$; $SD = .71$)	Sequence ($M = 3.76$; $SD = .81$)
Teaching methods ($M = 4.38$; $SD = .54$)	Teaching methods ($M = 3.86$; $SD = .81$)	Teaching methods ($M = 3.71$; $SD = .81$)
Professionalisation of teachers ($M = 4.32$; $SD = .57$)	Professionalisation of teachers ($M = 3.74$; $SD = .89$)	Professionalisation of teachers ($M = 3.50$; $SD = .92$)
Content ($M = 4.27$; $SD = .60$)	Content ($M = 3.68$; $SD = .83$)	Sociology ($M = 3.30$; $SD = .74$)
Sociology ($M = 4.19$; $SD = .51$)	Sociology ($M = 3.60$; $SD = .74$)	Content ($M = 3.27$; $SD = .90$)
Custom-made educational approach ($M = 4.19$; $SD = .68$)	Custom-made educational approach ($M = 3.50$; $SD = .96$)	Custom-made educational approach ($M = 3.02$; $SD = .92$)

To investigate whether some scales were rated significantly higher than other scales, a paired-samples *T*-test was conducted. To reduce the chances of a type I error, Cronbach's Alpha was divided by the number of scales used in the pairwise comparison, restricting it to .008 ($\alpha/6$) (Shaughnessy, Zeichmeister and Zeichmeister 2000). Pairwise comparison of the 'importance'-scores regarding the paired-samples *t*-test revealed significant results for *teaching methods* and *sociology* ($t(36) = 3.98; p < .001$) and *sequence* and *sociology* ($t(36) = 3.92; p < .001$) and *sequence* and *custom-made educational approach* ($t(36) = 2.98; p = .005$). This means that *sequence* was rated as significantly more important than *sociology* and *custom-made educational approach*. In addition, *teaching methods* was rated as significantly more important than *custom-made educational approach*.

Pairwise comparison of the 'general PVSE applicability'-scores regarding the paired-samples *t*-test revealed significant results for *teaching methods* and *sociology* ($t(36) = 3.71; p = .001$), *teaching methods* and *custom-made educational approach* ($t(36) = 3.44; p = .001$), and *sequence* and *sociology* ($t(36) = 3.98; p < .001$) and *sequence* and *custom-made educational approach* ($t(36) = 4.19; p < .001$). This means that in the perception of teachers, *sequence* as well as *teaching methods* are valued to be significantly more applicable within competence-based PVSE than aspects such as *sociology* and *custom-made educational approach*.

Pair-wise comparison of the 'applied within own school environment' scores regarding the paired-samples *t*-test revealed significant results for *content* and *teaching methods* ($t(36) = -4.50; p < .001$), *content* and *sequence* ($t(36) = -5.01; p < .001$), *content* and *custom-made educational approach* ($t(36) = 2.99; p = .005$), *teaching methods* and *sociology* ($t(36) = 6.76; p < .001$), *teaching methods* and *custom-made Educational Approach* ($t(36) = 6.69; p < .001$), *sequence* and *sociology* ($t(36) = 5.77; p < .001$), and *sequence* and *custom-made educational approach* ($t(36) = 7.32; p < .001$), *sociology* and *custom-made educational approach* ($t(36) = 3.02; p = .005$), and, finally, *custom-made educational approach* and *professionalisation of teachers* ($t(36) = -4.82; p < .000$). This means that, in the teachers' perceptions, elements such as *sequence*, *teaching methods*, and *professionalisation of teachers* are applied more within their own school environment than measures of *sociology*, *content*, and *custom-made educational approach*. To clarify the results in a more hierarchical way, Table 2 provides an overview with the scores of each scale.

Conclusions and discussion

The aim of this study was to explore the individual action theories of teachers regarding competence-based secondary education. To gain insight into these individual action theories we used qualitative and quantitative techniques. The first research question focused on how teachers valued elements of the cognitive apprenticeship model in designing and delivering competence-based education. In the qualitative phase, we found that different aspects of the cognitive apprenticeship model were valued by teachers as being important. In the qualitative phase, the teachers focused on *teaching methods* and *sociology*. Expressions about *content* and *sequence* were less frequent and less diverse in the interviews and the concept maps. This can probably be explained by the fact that *teaching methods* and *sociology* were viewed as the focus of the innovative project, which was underpinned by a social-constructivist pedagogy. Because of this focus, it is plausible that matters concerning *content* and *sequence* were less prominent. Another aspect is that PVSE-teachers often use

and follow schoolbooks that describe the content and sequence of the subject matter in a detailed way, and are often not involved in curriculum development themselves. Therefore, they might – incorrectly – think that they cannot change this, and therefore *content* and *sequence* are not very prominent in their individual action theories. In the quantitative phase, however, *sequence* and *content* were valued as highly important features of competence-based PVSE, as were *teaching methods* and *sociology* (all mean scores > 4.19 on a 5-point scale). This means that when teachers are cued by a questionnaire, then they do value these elements. Looking at the applicability and actual application scores of the four scales, however, teachers give much lower scores for ‘applicable within general PVSE’, and even lower for ‘applied within own school environment’.

The second research question explored the individual action theories that teachers have regarding competence-based PVSE. The qualitative phase revealed that teachers valued all elements and principles of the cognitive apprenticeship model; however, they also felt a need to provide a more custom-made educational approach for their pupils. Also, they indicated that they wanted to pay more attention to their own professional development. Therefore, in the quantitative phase we included these two scales based on the outcomes of the qualitative phase. These added *custom-made educational approach* and *professionalisation of teachers* scales revealed that teachers value these aspects highly as well (with mean scores of, respectively, 4.32 and 4.19). With regard to the applicability of these measures, however, teachers are more negative.

Another outcome is that, in both phases, teachers expressed the desire to receive more professional development. Teachers need to be situated at the centre of the innovation, since they are the ones who must execute the innovative reform measures (Garet et al. 2001; Knapp 1997). Although teachers often support high standards for teaching, many teachers are not capable of implementing and sustaining these high standards (Lambert 2003).

Current in-service education and training programmes are often found to be insufficient for long-term results. In addition, these programmes are often designed and developed by others, therefore teachers are not involved in designing their own professional development trajectory in accordance with their own perceived learning needs. Schools, then, choose to implement short-term training courses that often do not fit the needs of the teachers (Atay 2008). As teachers have not been trained to provide competence-based education, they need to acquire these skills in the workplace (Lohman 2006). These short-term training courses seem to be perceived as ‘stop-gap’ measures, and therefore usually do not yield the needed results. However, literature has shown that on-the-job professional development programmes are most beneficial when they are long-term programmes, focused on individual learning wishes and needs, and are linked to the curricula being implemented (e.g. Garet et al. 2001).

In this study, qualitative and quantitative analyses were used to explore the individual action theories of PVSE teachers regarding competence-based secondary education. In taking this multi-method approach, we aimed to avoid the different pitfalls associated with each method. A limitation of this research, however, is the limited number of subjects, for the qualitative phase as well as the quantitative phase. A recommendation would be to replicate the quantitative phase with a larger sample. Another limitation is that the qualitative phase was originally set up as an authentic explorative study, meaning that it was assumed that if teachers chose to speak of certain elements, then they considered those elements to be important. However, we

may not conclude that if they did not discuss certain elements, those elements were necessarily unimportant for them. Even if an element is not mentioned, it can still be deemed important.

There is a growing interest in professional development designed for groups of teachers from the same school, department, or grade level (Seezink and Van der Sanden 2005). Professional development designed for groups of teachers has a number of potential advantages, for example, by engaging the teachers in joint professional development, they become able to integrate what they learn with other aspects of their instructional context. By focusing on a group of teachers who preferably collaborate with regional businesses, teacher training institutes, and further educational institutes, such professional development may help sustain the changes in practice over time and, therefore, be more effective. Where an emphasis on professional development may help contribute to a shared professional culture, collective participation in the same activity can provide a forum for debate and improved understanding, which increases teachers' capacity to grow. Finally, a change in classroom teaching involves both individual learning and organisational learning, therefore establishing a innovation-supportive culture can facilitate individual change efforts (Knapp 1997; Bottrup 2005).

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