LEARNING TO TEACH IN HIGHER EDUCATION:
THE IMPORTANCE OF MODELLING AND USING FIELD EXPERIENCES
Paper presented to the EAPRILConference, 24-26 November, Lisbon, Portugal.

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Abstract: processes of conceptual change involving 12 Dutch novice university teachers were studied during a five-month induction programme. The teachers were interviewed before and after the programme, and were asked to fill in logbooks during the programme. A dynamic, cyclic process of change was identified, in which field experiences played a central role. In particular, modelling by the teacher educator, the observation of video cases, reflection on these with peers and experiencing success in teaching practice seemed to be important incentives that encouraged teachers to adopt and eventually implement new pedagogical approaches. Implications for pedagogical design, the role of the teacher educator and the implementation of induction programmes in higher education are discussed.

1. INTRODUCTION

In Dutch research universities and universities of applied sciences (UASs), there is growing interest in the pedagogical development of novice teachers. Novice teachers are increasingly required to complete teacher induction programmes before being awarded tenure. A large variety of programmes are currently offered, and there is growing consensus on programme content and focus. Tigelaar et al. (2004) identify a shift in preferences among experts (policymakers, teacher educators and researchers) from programmes that focus on fostering novice teachers' conceptions of the transmission of knowledge to more student-centred conceptions. This shift mirrors international trends. Prebble et al. (2004) describe several recent programme effect studies that are based on conceptual change models. A review study by Prebble et al. (2004) cites programmes undertaken by Ho (2000), Gibbs & Coffey (2004) and more recently in Europe by Postareff et al. (2007) and Stes (2008a) as examples of this shift in focus. The main objective of these programmes is to move novice teachers' conceptions of teaching and learning in more student-centred directions.

It appears that most of the above-mentioned programmes were successful in changing teachers' conceptions (Prebble et al., 2004; Stes et al., 2010). In a review study, however, Stes et al. (2010) criticize the weak design of most effect studies. It is thus unclear whether the conceptual changes that have been identified in teacher induction programmes have indeed led to sustainable changes in teaching practice. Moreover, with the exception of Ho's programme (2000), none of the existing studies make explicit the underlying theories of teaching and learning, teachers' professional development and the pedagogical approaches on which course designs are based. In fact, in contrast with secondary education, reflection on the pedagogical design of teacher education programmes in higher education seems to be something of a 'black box'.

In research into teacher education in secondary and primary education, the complex relationship between teachers' conceptions and teaching practice has been a theme of major interest over the past two decades (see, for example, Korthagen & Kessels, 1999). In particular, linking teaching

conceptions to concrete field experiences is considered to be crucial for encouraging new and sustainable teaching behaviour. We think that results from this field of research could help us to develop a better understanding of the process of change, and a better underpinning of the pedagogical design of teacher education programmes in higher education.

In this article, we will focus on the results of a teacher induction programme in Dutch higher education for which we are teacher educators. We will attempt to connect the findings of this study with known pedagogical approaches in teacher education programmes in primary and secondary education. First, we will draw on general theories to discuss the process of conceptual change and the pedagogical approaches that can support this process. Second, we will describe our own study, which involved 12 participants in a teacher education programme at a Dutch UAS. We explain the form that the process of conceptual change took in this specific situation, and the pedagogical approaches that the novice teachers identified as being most effective. Finally, we discuss these findings in relation to the theories identified in the second section, and draw a number of conclusions regarding effective programme design for higher education.

2. RELATED LITERATURE

2.1. The process of conceptual change

We can see teacher's conceptions as the lens through which what happens in daily teaching practice is perceived and interpreted (Pratt, 1992). Two main perspectives emerge from the extensive literature on teachers' conceptions in higher education (see, for example, Samuelowicz & Bain, 1992 and 2001; Kember & Kwan, 2000; Trigwell et al. 1999). First, a teacher-centred, knowledge transmission perspective, in which teaching is seen as the imparting of information and the transmission of structured knowledge. From this perspective, a student learns by receiving information, and the acquisition of subject matter precedes practice. The teacher's role is to initiate and guide the learning process. The second perspective is a student-centred, learning facilitation perspective, in which the main concern is to facilitate students' learning activities and to promote understanding and intellectual development. From this perspective, the teacher creates an educational environment in which students are encouraged to process information themselves and make connections with their own experiences. Trigwell et al. (1999) argue that teaching from a student facilitation perspective promotes 'deep learning' rather than 'surface learning'.

In several studies (Tigelaar et al., 2004; Ho, 2000; Martin et al., 2000; Gibbs & Coffey, 2004), the shift from a teacher-centred to a student-centred conception is portrayed as a causal, linear process. It is generally assumed that to achieve change in teaching behaviour, teachers' conceptions must first be changed. Ho (2000), for example, used Strike & Posners' theory of conceptual change (Strike & Posner, 1992) to design a course for novice teachers at Hong Kong University. Strike and Posner researched 'conceptual change' among students of science education, and postulated a model that describes four conditions for change. The first condition for conceptual change is becoming aware of and dissatisfied with one's current conceptions. These are seen as 'misconceptions' that are contrasted with new, 'better' conceptions. The alternative conceptions have to be 'intelligible', 'plausible' and 'fruitful', which are the second, third and fourth conditions for conceptual change. In her teacher education programme, Ho used a method of creating cognitive dissonance to make novice teachers aware of the limited utility of teacher-centred conceptions. She subsequently tried to convince the novice teachers that the new student-centred conceptions were better and more useful in practice.

2.2. Questioning the causality of the conceptual change process

Like Ho (2000), Halliday & Soden (1998) used a cognitive restructuring model to construct a teacher education programme. They doubt the sustainability of the changes in beliefs and practices that seemed to result from their programme, however, due to the many influences in everyday practice that encourage novice teachers to follow traditional patterns. In a study of teachers in higher education, Murray & MacDonald (1997) discovered firm attachment to traditional practices. They suggest that it is difficult to develop new, adequate teaching strategies in the absence of support for novice teachers.

Changing teachers' conceptions at a cognitive level therefore appears to be insufficient for achieving significant, permanent change in teaching practice. In research into teacher education in secondary and primary education, this phenomenon is known as 'praxis shock'. Zeichner & Tabachnik (1981) show how in the long term, the novel and progressive conceptions promoted in teacher induction programmes can be 'washed out' in the reality of teaching practice. One reason for this lack of transfer between teaching conceptions and teaching practice might lie in the discrepancy between the new student-centred conceptions that are being promoted and a more underlying, deeply-rooted image of what 'good' teaching consists of, which is built up over the teacher's learning history (Hollingsworth, 1989; Wubbels, 1992), and is often reinforced by institutional culture (Brouwer & Korthagen, 2005), peer pressure (Halliday & Soden,1998) and the outside world (parents, media, pub-talk). According to this image, 'good' teaching is associated with the teacher being an active transmitter and the student being a passive listener. Also students are not immediately enthusiastic when asked to 'do it themselves' (Woods, 1994).

The discrepancy between the student-centred conceptions that are promoted in modern teacher education and the often implicit, unconscious images of 'good' teaching may cause feelings of anxiety and stress (Wideen, Mayer-Smith & Moon, 1998). According to Oosterheert & Vermunt (2003), novice teachers can perceive the achievement of real change in teaching practice as an 'emotional risk'. For this reason, Pintrich et al., (1993) speak of 'hot' and 'cold' conceptual change, and stress that conceptual change is not an exclusively rational process. They emphasize how feelings of self-efficacy can play an important role as intermediating variables in the process of conceptual change, which requires an emotional, supportive learning environment that allows a novice teacher to experience success. Indeed, recent studies of teaching in higher education confirm the important role played by emotions and self-confidence (Postareff & Lindblom-Ylanne, 2009).

2.3 Questioning the linearity of the conceptual change process
Not only the causality of the conceptual change process, but also its linearity, has been questioned in the literature. Guskey (2002) claims that new experiences can often trigger new thinking, which means that experimenting with teaching practices can be a starting point for teachers to reconceptualise their own thinking about teaching and learning. Clarke & Hollingsworth (2002) and Korthagen & Kessels (1999) describe this learning process as an ongoing interaction between conceptions and daily practice through reflection. McAlpine & Weston (2000) describe a process of reflection-in-action, in which each novice teacher gradually builds up their own unique conceptions in a teaching context, with an emphasis on the personal relevance of learning. Put simply, for novice teachers, the utility of 'new' conceptions of teaching and learning must be 'proven to work' in educational practice and adjusted to fit their own personal contexts. Wubbels (1992) therefore points out that the 'fruitful' condition may well be the most crucial condition in Strike and Posner's conceptual change model. Novice teachers only integrate new conceptions into their personal frameworks when they have an actual, positive impact on daily practice and help them to achieve better results.

In their 'interconnected model of professional growth', Clarke & Hollingsworth (2002) draw together the above-mentioned elements – the linking of theory and practice, the role of reflection, experimentation in practice and experiencing success – in a more comprehensive model, in which teacher development is seen as a 'continuous interplay between beliefs and practice' (2002, p. 951). They identify four domains in which change can occur: the personal domain (knowledge, beliefs and attitudes); the external domain (for example, peer coaching or role modelling by the teacher educator); the domain of practice (professional experimentation); and the domain of consequence (salient outcomes). Change in the domain of practice can thus lead to change in the personal domain of knowledge, beliefs and attitudes. Reflection, meanwhile, functions as a mediating process. Zwart, Wubbels, Bergen and Bolhuis (2007) illustrate how teacher learning can start in each domain: changing conceptions, external stimuli such as peer coaching, experimentation in daily practice and experiencing success.

2.4. Research questions

Changing teaching practices requires courage on the part of teachers. Continuing with old habits may well feel safer than running the risk of 'class disorder' (Wubbels, 1992). Teachers in higher education may find it as difficult as those teaching at the primary and secondary levels to really change their teaching practices, even when they have been exposed to student-centred teaching conceptions. Novice teachers thus have to be encouraged to genuinely experiment with and reflect on new approaches in their own practice, and be supported in their efforts, with the hope that experiencing success will encourage them to continue with these new approaches later on.

Having been teacher educators in higher education for some years, we have tried to improve the pedagogical design of our own five-month programme, so as to maximize the chance that the conceptual changes and short-term changes in practice that we encourage in our participants will be sustained in the longer term. The choices that we made regarding the pedagogical design of the programme partly grew out of our own successful experience as teacher educators. In addition, we were inspired by the above-mentioned literature on teacher education in primary and secondary education. In our programme, novice teachers are actively encouraged to experiment with all sorts of teaching techniques in their personal teaching practice, videotape the results, bring the tapes to the course meetings and discuss them with their peers. We try to create a constructive, safe learning environment, and we pay a lot of attention to role modelling by the teacher educator.

In this study, we undertook a detailed examination of how the process of change occurred among our novice teachers, and how the participants evaluated the various pedagogical approaches. The theories outlined above helped us to interpret the results, fine-tune the pedagogical design of our own programme and to formulate more general guiding principles for building teacher education programmes in higher education.

Our research questions were:
1. Which forms did the process of conceptual change in our programme take, and which programme characteristics did novice teachers consider most helpful, in terms of improving their practice?
2. Which programme characteristics did the participants consider to have most facilitated this change?
3. Which programme characteristics should be taken into account more generally in the pedagogical design of teacher induction programmes in higher education?

3. THE STUDY

3.1. Context
We studied the process of conceptual change in two of our course groups between September 2008 and January 2009. The 12 participants were all teachers in their first, second or third years in various Dutch UASs. In a UAS, the primary task for members of staff is to teach students in a variety of contexts: lectures, seminars, individual and group tutoring, workshops, and so forth. The teachers participating in our programme already had some teaching experience, and had experimented with teaching techniques and applying pedagogical principles in their own practice. UAS teachers exercise a certain degree of autonomy when designing and teaching their courses. Our respondents saw being an effective teacher as a matter of high importance. Most of them were motivated to attend the programme, which aimed to develop their student-centred conceptions and make their teaching practice more stimulating. The programme lasted around five months (12 ECs).

In the 12-EC programme, the novice teachers worked on three competence tests. The first related to the application of effective and stimulating pedagogical strategies. The second test related to tutoring individual students and group work. The third and most demanding test focused on course design and assessment. Over the five-month period, we held 28 three-hour course meetings, during which a wide variety of learning activities took place. In addition to discussing theory relating to course design, assessment and learning processes, a great deal of time was spent on carrying out and videotaping teaching activities and discussing the results in the course group. Furthermore, in all course meetings,

the teacher educators' activities and the pedagogical principles applied were made explicit and discussed extensively.

3.2. Respondents
The first course group consisted of 11 teachers of different disciplines from the same UAS. The second group consisted of 14 novice teachers from different UASs. Prior to the first course meeting, we sent an e-mail to all 25 teachers that invited them to take part in our research. As we wanted to carry out a mainly qualitative study, our research group was limited to six or seven participants from each course group. The 13 teachers who responded first – six teachers from the first course group and seven from the second – were invited to take part in the study. These 13 teachers represented different disciplines, and differed in the amount of teaching experience they had and the kinds of training they had undertaken. The characteristics of our respondents are displayed in Table 1.

-        Table 1 -

One of the respondents (respondent no. 1) had to be removed from the research group, due to having an excessive workload and not being able to participate fully in the research.

3.3. Data collection
We carried out a pre-test one week prior to the start of the programme, three interviews by e-mail during the programme period, and a post-test one week after the programme had finished. We used three instruments: a standardized 'Approaches to Teaching Inventory' (ATI) questionnaire (Trigwell & Prosser, 2004); a semi structured 'dilemma instrument'; and digital logbooks in which the teachers wrote their reports.

The ATI is an instrument that is widely used in higher education to describe approaches to teaching. It is a validated questionnaire with 22 items that represent two separate dimensions: information transmission and teacher-centred (ITTF) and conceptual change and student-focused (CCSF). We used the Flemish version, which had been translated and validated by Stes (2008b). Given its widespread use at the international level, we intended to use the ATI as a reference for our study. As producing ATI scores for just 12 participants would not be very meaningful, however, as a backup, the ATI was also completed by 127 of the participants' colleagues from nine of our course groups, between September 2008 and July 2010.

For the dilemma instrument, we drew on the extensive literature on teacher conceptions (see, for example, Samuelowicz & Bain, 2001; Kember & Kwan, 2000; Trigwell et al., 1999). We selected the nine most frequently-mentioned themes: motivation, teacher control, educational aims, the starting point of learning, linking theory and practice, the importance of interaction, assessment, taking student characteristics into account and programme design (See Figure 1).

-        Figure 1 –

The dilemma instrument was used to determine whether, and in which ways, teachers changed their minds about the selected themes. Before and after attending the course, each teacher was asked to take a position on the nine dilemmas, which were presented as seven-point Likert scales. An example of a scale is presented in Figure 2.

-        Figure 2 –

In this instrument, the polarity of the nine scales was randomly alternated. Each teacher was asked to take a position on the seven-point scale by 'thinking aloud'. In this way, we were able to gather quantitative data using the ATI, while we used the dilemma instrument to gather quantitative and qualitative about teachers' conceptions both before and after participating in the programme.

At three moments during the course, the participants were asked to answer the following questions by e-mail (digital logbook):

       1. Has there been any change in your thinking about teaching and learning?
       2. Have you actually already changed things in your own practice?
       3. Has there been any change in your self-confidence as a teacher?
       4. For 1 to 3: which programme characteristics were supportive and which were unhelpful?

3.4. Data analysis

The results of the ATI were analysed statistically using SPSS. For 139 teachers, we studied the scores for the ITTF and SCCF dimensions and the difference between the pre-test and post-test scores. We compared these scores with the measurements made by Stes (2008a) in a study of novice teachers participating in a teacher education programme at Antwerp University (a research university) that is comparable to ours in terms of length and focus.

The dilemma instrument provided quantitative as well as qualitative information about the changes experienced by the teachers. We calculated means and mean differences between pre-test and post-test scores. The 'think aloud sessions' relating to the nine dilemmas were recorded and transcribed. Due to the fact that the position on the seven-point scale for the pre-test and the post-test could be coloured by a response shift bias (Howard, 1980), afterwards, the teachers were explicitly asked to identify the dilemmas that they had really changed their opinions on. Both researchers independently analysed the transcripts on these changed conceptions. Only those reported changes on which both researchers agreed were taken into account.

The digital logbooks were based on open-ended questions, and provided additional unstructured information about the changes that the teachers reported, and about which programme characteristics they considered to be supportive or unhelpful. A phenomenographic research method (Marton, 1986) was used to categorize the data from the digital logbooks. The following procedure was used to analyse these data:

1. The text fragments were selected and sorted. Only those text fragments that were relevant to the main questions were selected: A. which new insights have you gained? B. What have you really already changed in practice? C. How did gaining these new insights help you? E. What helped you to increase your self-confidence? F. Which course elements did you consider to be obstructive? and G. other doubts or remarks. Question D (did you experience any change in your self-confidence as a teacher?) was answered positively by all 12 teachers and needed no further analysis.

In the first instance, in a study session, both researchers read the transcribed text for each question and determined together which categories could be identified in the material. Following this, both researchers independently assigned text fragments from the raw material to the categories. Only a 70% match was reached, which we considered to be insufficient. Apparently, while sorting the text fragments, the two researchers had interpreted the categories differently. Furthermore, the raw text included statements that contained more than one concept. In a new study session, the text fragments were reduced to single statements. For example, the statement, *'I identify better with the student's role and I have a better understanding of the differences between the students'* was split into separate statements*: 'identify better with the student's role'* and *'better understanding of differences between students'*. In the end, we identified 398 single statements (A. 85, B. 89, C. 97, E. 72, F. 44 and G. 11).

2. The creation of categories. The statements were written down on small cards. For each main question, both researchers independently studied and sorted the statements, created suitable categories and assigned the statements to the categories. When it came to grouping the statements, on the whole, there was a match of approximately 95% between the researchers.

3. Discussion and reaching consensus. In a study session, both sets of categories were clarified and discussed by the two researchers. A shared set of categories was created on the basis of consensus.

4. THE RESULTS

4.1.Teachers' initial conceptions when embarking on the programme

Table 2 shows the results of the student-centred (SCCF) and the information transmission (ITTF) dimensions of the ATI: the mean and standard deviation of the pre-test and the post-test, the mean difference between the pre-test and post-test scores for our research group (N=12), the backup group from which they originate (N=139) and a comparable research group from the study by Stes (2008b) (N=20).

The scores for both the SCCF and ITTF dimensions for the 12 teachers and the reference group all lie between 3.2 and 3.5. Compared to Stes' results, however, in our research group and the reference group, the student-centred orientation is relatively high: our group's pre-test level is as high as the post-test level for Stes' group. One should note that Stes' research group consisted of teachers from a research university, whereas our teachers originate from a UAS. It is not possible to compare Stes' results with ours for the ITTF dimension, due to the fact that the alpha for the ITTF scale in Stes' study was too low. The Cronbach's alphas for the SCCF dimension pre-test, SCCF post-test, ITTF pre-test and ITTF post-test in our reference group are 0.82, 0.77, 0.74 and 0.75 respectively.

The mean scores for the nine dilemmas are shown in Table 3. From these data, it is also clear that our participants adopted a fairly student-centred stance with respect to Dilemmas 1, 2, 3, 6 and 9:

Dilemma 1), the teacher as motivator:
'I really think that motivating is the teacher's task. The teacher must be able to teach so engagingly that students like coming to the lectures' (Teacher 2, before the programme).
Dilemma 2), student activity:
'I took over Insurance Law from a colleague. He used to just cover content; for three hours, just covering content rapidly, sheet by sheet! It makes the lecture very boring' (T4, before).
Dilemma 6), interaction is essential:
'In my experience, it is necessary to have interaction between teacher and student. Apparently our UAS students aren't able to understand the content independently. In such circumstances, interaction is necessary' (T8, before).
Dilemma 9), customized programmes:
'A standard programme? No, that would be suitable for standard students, but we haven't got many of them!' (T9, before).

The relatively high score on vocational competences (Dilemma 3) can be explained by the vocational orientation of the students and teachers at a UAS.

The scores for Dilemma 4 (using students' experiences) relate to a key dilemma for teachers: they really want to connect with students' experiences, but basic concepts have to be presented first. *'So I try as much as possible to build on the basic knowledge they already possess, or should possess. And when that appears to be problematic I really want to repeat it once more … it's both, really. Students' experiences are important, but the basic concepts are important too. I take a middle position' (T5, before).*

The scores for Dilemmas 5, 7 and 8 reflect a somewhat more teacher-centred and subject-centred stance: the teacher transmitting theory and offering examples, assessment procedures that are essentially meant to define and safeguard the grade level, and addressing the subject knowledge prescribed in the curriculum.

Dilemma 5), student can link theory and practice:
'Even after 14 years of practical experience, it is still difficult for me to give practical examples in an exciting way when I am teaching. It's already difficult, so I don't expect students to be able to do it already' (T4, before).
Dilemma 7), assessment:

'Sometimes you're assessing and at that same moment, you're providing feedback, even when the answer is correct. In that way, there is always feedback in assessment. But in the end, the aim is to achieve the grade level. Assessment is not intended to stimulate learning. That's a side effect' (T9, before).

Dilemma 8), focused on students' questions:

'Yes, but never all the way through. In the end, it's your responsibility as a teacher to make sure that everything is covered. But you have to build in some room for stimulation, encouraging the students to offer some input themselves' (T7, before).

'You choose to work in education because you want to learn something about it. I really think you should take students' interests and concerns into account, but having some prescribed subject matter is part of that as well. It is still a bit of both' (T2, before).

In summary, when it came to our research group's starting position, our novice teachers were quite student-centred with respect to some aspects: motivating students, teaching for vocational competences, promoting student activity, teacher-student interaction and taking students' characteristics into account. On the other hand, the teacher's role in transmitting knowledge, safeguarding a certain grade level, and the importance of covering the subject knowledge prescribed by the curriculum revealed a more teacher- and subject-centred stance.

4.2. Which changes occurred?

Tables 2, 3 and 4 show the differences between the pre-test and post-test scores. In the ATI (Table 2), the backup group (which included our 12 participants) shows a significant change for the SCCF dimension, which means that even more so than previously, the teachers were able to underline the importance of promoting learning for understanding, student-teacher discussion and discussion among students. The ITTF dimension shows a relatively small (insignificant) decrease. Table 3 shows the quantitative differences between the pre-test and post-test scores for the nine dilemmas. Table 4 shows the difference between the pre-test and post-test scores, as explicitly described by the participants in the interviews. The dilemmas for which most change was reported (five or more of the participants) were those relating to assessment (Dilemma 7), interaction (Dilemma 6) and student activity (Dilemma 2).

Most of the teachers – seven in total – changed their opinions on the role of assessment. Assessment should play a greater role in the teaching process (Dilemma 7):*'I learned a lot about assessment. I now say that assessment is meant to support the learning process' (T2, after the programme).* Furthermore, after the course, five teachers were more convinced about the importance and effectiveness of stimulating student activity (Dilemma 2): *'I really think that you can expect more of students than I previously assumed. You can expect them to start studying the content and you can ask this from them. Before, I thought they just wouldn't do it' (T5, after); 'That's right, when I actually look at my old way of teaching, it was just 'slamming in' the content. Now I would choose to let the students be active, so they become familiar with the content. Not covering content just for the sake of covering it, so to speak, but so that you can see for yourself that the student is active. This does indeed require different teaching techniques' (T3, after).*

Five teachers reported that they now thought that interaction was more important (Dilemma 7): *'I learned how very productive interaction can be' (T6, after); 'Interaction means that you discuss, discussing means that you think, that you are busy and that the grey matter up there starts moving and … that's satisfying in any case. Yes, my view on learning really changed a lot on this' (T4, after).*

Tables 5 and 6 show the changes reported in the digital logbooks. The new insights that were reported by the teachers (Table 5) are consistent with the pre-test and post-test results: the importance of assessment as an instrument for controlling the learning processes, and the need to promote student activity and to take students' characteristics into account. Moreover, the logbooks show that in particular, having a better understanding of learning processes in general (A.2.1.) helps teachers to become more aware of their own roles and to better focus their actions. In particular, eight teachers regarded the concept of student activity (A.2.2) as an eye-opener: *'the student has to cover the course material, not the teacher' (T12).*

As a consequence, the teachers reported that in practice, they were reflecting more on teaching processes and teaching in a more focused way (Table 6). All 12 teachers reported that they had already tried out new teaching techniques and expanded their repertoires. This item was mentioned 32 times across the three logbooks.

What did not change? Namely, neither the scores for our 12 teachers nor those for their 127 colleagues in the backup group changed with respect to the ITTF dimension, and the teachers did not change their minds with regard to Dilemmas 4 and 8. This highlights one of the core issues faced by teachers: while factors such as connecting with students, stimulating them, using interactive methods and taking their questions and concerns into account are important, imparting basic knowledge, safeguarding a certain grade level and covering the content are at least equally important. Teacher 4 expressed this feeling very well: *'I do think students' questions and concerns aren't that important. I think that they are important for the way you pass the content on, but not for the content that has to be taught'* (T4).

In summary: prior to the programme, most teachers had already revealed student-centred conceptions. After the programme, these conceptions had deepened. The teachers were more aware of why and how they should use teaching techniques that would promote active learning and more interaction, of the need to resist the urge to cover all of the content, the importance of using more formative assessment forms, and the need to better prepare and organize their lectures and tutorials. What did not change was their conception of the importance of imparting basic knowledge and safeguarding a certain grade level.

4.3. Which course activities were most helpful when it came to changing conceptions and practices?
See Table 7. The teachers clearly thought that the examples that were demonstrated and discussed during the course meetings were very instructive. One reason for this was that modelling by the teacher educator and the course's 'mirror' function helped the teachers to experience what it was like to be students (*'learning as a student: acting and experiencing',* T11), and to better understand the consequences of teachers' actions. Partly for the same reason, observing and discussing their own video cases or those of colleagues was considered to be instructive, because it demonstrated how teaching behaviour works in practice. Discussion in the course group was an important aspect of observing the video cases, and seven teachers explicitly mentioned that sharing general experiences had been instructive. Likewise, experiencing success in practice also helped the teachers to answer the 'what really works?' question, and motivated the teachers to carry on: it *'gives you more confidence'* (T11).

In summary, observing and experiencing (good) practice, experimenting with teaching techniques in practice, experiencing success and discussing experiences with teacher educators and colleagues helped the teachers to personalize and better understand the process of teaching and learning. Seeing and feeling 'what really works' appeared to be important.

4.4. What was considered to be helpful when it came to gaining self-confidence?
See Table 8. All of the teachers reported a change relating to their self-confidence. Due to the fact that self-confidence is seen as an important condition for willingness to change in the conceptual change literature, we explicitly asked teachers what they thought had helped them to gain self-confidence. In accordance with Table 7, experiencing good practice and sharing experiences were considered to be important. In particular, receiving positive feedback from peers or the teacher educator in the context of the course meetings and experiencing success in practice were thought to be very helpful. In addition, feeling competent was mentioned as important; *'a successful lesson doesn't just 'happen' to me anymore. I am more satisfied about what I try out and what works out, because I have more insight and a better grip on what I'm doing'* (T11).

In short: feeling that one is competent, that it 'can be done', and having a positive, supportive programme environment were particularly important factors in helping teachers to gain confidence.

4.5. Which programme characteristics were considered to be obstructive, and were there other doubts or remarks?

See Table 9. Institutional obstacles and some personal aspects were reported to be the most important obstructive elements. Curricular constraints became more manifest, which was mainly due to the teachers' changing conceptions of the function and place of assessment in their courses. Furthermore, some teachers felt discouraged by the contrast between the newly-developed conceptions and the difficultly of implementing them.

5. CONCLUSIONS AND DISCUSSION

In this section, we first discuss the process of conceptual change experienced by our respondents and relate this to the literature. Second, we discuss the consequences for practice.

Prior to participating in the programme, most of our teachers had already shown that they had student-centred perspectives on key issues: the importance of the teacher's role in motivating their students, teaching for vocational competences, promoting student activity, the importance of teacher-student interaction and taking student characteristics into account. After the programme, some of these conceptions were further deepened: in particular, the possibility of using assessment to guide and support the learning process was reported to be an eye-opener. Furthermore, the teachers reported being more strongly inclined to promote student activity. Above all, according to the teachers, the programme helped them to better understand the process of teaching and learning. They were more aware of why and how they should use more active teaching techniques and promote more interaction, the need to resist the urge to cover all of the content, and the importance of using more formative assessment forms. In addition, the programme provided some tools to help them to better prepare and organize their lectures and tutorials. Some teachers had already changed their teaching practice in these ways during the programme: they started to use more active teaching techniques, and to organize and prepare their lessons in a more purposeful and decisive manner.

This appears to suggest that the first condition formulated in Strike and Posner's (1992) theory of conceptual change – dissatisfaction with the status quo – is easily met. Most teachers really want to change a situation in which the teacher is 'doing all the work' and the students are passive. The same is true for the second and third conditions; the alternative has to be intelligible and plausible before a teacher will adopt it (*'in the lessons, students have to get active themselves; it is not my job to entertain them' (T11))*. Almost all teachers reported attempting to get their students more involved.

At the same time, the teachers' conceptions regarding the role of the teacher in transmitting knowledge, safeguarding a certain grade level and the importance of covering the subject matter did not seem to change a great deal. It appears that for our teachers, the way in which a subject could be transmitted, but not the subject matter itself, was up for discussion. In their study of teachers in a Dutch UAS, Van Driel et al. (1997) had a similar finding: the participants' conceptions relating to the importance of transmitting a fixed amount of subject matter did not change, but the conceptions about the way in which this had to be done and, in particular, the relations with the students, changed significantly.

It is clear that having participated in the programme, most teachers showed a better understanding of how they should engage their students. Equipped with some basic tools, they started to experiment in practice and find out how 'it really could be done'. This 'how to' question was considered to be very important during the programme. The novice teachers thought that the following incentives were particularly helpful when trying to answer the 'how to' question:

a) Experiencing good practice, particularly the teaching methods demonstrated by the teacher educator. By attending the course meetings and encountering many different pedagogical techniques and approaches, the participants found out what it was like to be a student and a teacher simultaneously. Modelling by the teacher educator and the subsequent reflection on what was

demonstrated appear to have been very effective. It has recently been recognized that modelling plays an important role in teacher education (Lunenberg et al. 2007). How to use the 'dual' role of novice teachers as an important principle for constructing teacher education programmes is also an issue that is raised by Korthagen et al. (2006).

b) Observing and discussing examples of peers (video cases). The process of watching the video cases and discussing peers' practices was mentioned as having been very instructive. Although not all of these videos feature good practice, identification, personal relevance and being able to draw parallels with one's own personal situation were all factors that made this a powerful pedagogical method, and perhaps one that is more credible than good written examples; *'observing video cases of peers. The others aren't perfect either, thank goodness!'(T8).* Clarke and Hollingsworth (2002) also recommend using video cases on the grounds that they can contextualize and personalize teaching and teacher development.

c) Experimenting in practice and experiencing success. Most of the teachers experimented with many different pedagogical techniques: group work, more interaction, quizzes, using assignments to provoke more self-study, and so forth. This proved to be very stimulating and encouraging when the techniques resulted in more engaged students, better learning results or more teaching pleasure. Even observing positive results in the peer video sessions seemed to have a motivational effect. Experiencing good practice in the course meetings, observing and discussing the video cases and experiencing success all underline the importance of making new conceptions of teaching personally relevant. Experimentation helps a teacher to 'fit' the conceptions promoted into a personal framework. Only when things work well in practice will a teacher genuinely adopt a theory. Korthagen et al. (2006) point out that systematically reflecting on these experiences in one-to-one supervision sessions makes the process even more effective.

Apart from these three principles, the learning environment also seems to play an important role. We explicitly asked the teachers what had helped them to gain more confidence as teachers. A feeling of competence, the sense that it 'can be done' and having a positive, supportive programme environment were all mentioned as important factors. This underlines that just experimenting and trying things out in practice is not enough to become a better teacher. Positive and relevant feedback is needed to obtain a sense of competence and the motivation to keep experimenting after the course has finished.

In the context of the programme, the learning principles – experiencing, observing, trying out and discussing – were used at different moments and in different sequences, and all of these elements seemed to be important. There seems to be a continuing process of aligning concrete teaching experiences ('how it can be done') with teaching conceptions ('how it should be done'). In this respect, the 'interconnected model of personal growth' (Clarke & Hollingsworth, 2002) offers a useful framework for interpreting our research results. It shows a dynamic process of experimentation, discussion and reflection, in which theory and practice come together and in which teaching conceptions gradually depart from a somewhat abstract level and become integrated in teaching behaviour.

Implications for practice
In our experience as teacher educators in higher education, teachers tend to be highly motivated to better engage their students and achieve improved learning outcomes and higher levels of understanding. It is therefore not surprising that teachers can be convinced of the benefits of adopting a more student-centred orientation, which aims to make students more active and achieve higher learning outcomes. As demonstrated in our programme, we succeeded in convincing most of our teachers about how it 'should be done'. That might be not enough, however. As we saw in our review of the literature in section two, underlying beliefs can be obstructive, institutional contexts can be unhelpful, and initially at least, students tend to be unenthusiastic when asked to 'do it themselves' (see, for example, Woods, 1994). It is thus tempting for novice teachers to fall back on traditional practices after a while. Really changing students' attitudes to study means having teaching techniques that can not only be learned, but also tried out, practiced and internalized.

In the first place, it is important to have a course programme that shows teachers how it can be done. Experiencing what it is like to be a student in the context of the course meetings seemed to be helpful. Furthermore, teachers have to be stimulated to experiment with new teaching techniques, receive feedback on these and to experience success in order to have the strength and motivation to continue with this behaviour after the programme. Finally, having a positive, constructive learning environment seems to be important. Teachers have to feel secure enough to try out new teaching techniques in practice and to show recordings of their experiences to their colleagues in the context of the course group.

Although not mentioned explicitly, indirectly, the above-mentioned programme characteristics – observing others, experiencing teaching methods, role modelling, discussing and reflecting together, supporting and mentoring each other – are contingent on having an intensive programme context in which ongoing exchange can occur with peers in a safe environment. It is necessary to have a shielded, classroom-like context in which teachers who are 'in the same boat' can share their concerns and experiences. Long-term, portfolio-type teacher education programmes that are structured around the individual would appear to be less suitable for this approach.

The use of field experiences is not easy to realize in a higher education context. In particular, in research universities, teaching is normally only one of a member of staff's duties. Despite this, we consider it important to find ways of realizing this linkage between theory and practice. Finally, much is asked of the teacher educator. Acting as a model for adequate teaching behaviour, shaping a safe learning environment, promoting, organizing and coaching reflection; the professionalization of teacher educators themselves seems to be a key issue, and should form a distinct theme in teacher education courses.

6. LIMITATIONS AND FURTHER RESEARCH

Our study focused on UAS teachers. As mentioned previously, these teachers believe that it is extremely important to be an effective teacher, and most are motivated to attend teacher education programmes. By contrast, teachers at research universities have considerable research duties and usually have to be 'won over' to attend teacher induction programmes. It would be interesting to find out how the above-mentioned principles might be effectively applied in a research university context.

Second, our study was based exclusively on self-reporting by teachers. Using theoretical notions from the context of secondary education, we attempted to show that strong pedagogical principles could lead to sustainable change in teaching behaviour. Of course, we cannot be sure about the profundity and sustainability of the change in teaching conceptions without using stronger research methods, such as class observations, however difficult these may be to realize in practice.

Lastly, we conducted an in-depth study of the experiences of just 12 Dutch teachers, teaching in Dutch institutions, in the context of just one induction programme. Care thus has to be taken when generalizing the results. Despite this, we have attempted to raise our idiosyncratic experiences to a more general level by showing that our results do indeed tally with data from other areas of teacher education research.

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Table 1: Characteristics of the 13 teachers

	Gender	Teaching Subject	Training*	No. months experience
1	M	Real Estate	TU – Geography, Academy of Arts (partly)	12
2	M	Communication	UAS – Hospitality Management	24
3	M	Health promotion	RU – Agriculture	19
4	M	Law	RU – Law	7
5	M	Chemical technology	RU – Chemical technology PhD	10
6	M	Tourism	UAS – Tourism	24
7	M	Human Resource Management	UAS – HRM	12
8	F	Communication	RU – Literature	>24
9	F	Communication	RU – Educational Psychology	17
10	M	Ergotherapy	RU – Kinaesthetic Science	12
11	F	Training & coaching	RU – Pedagogic sciences	24
12	M	Chemistry	RU – Chemistry PhD	7
13	F	Management	UAS – Marketing	30

* TU= Teaching University, RU= Research University, UAS= University of Applied Sciences

1. Motivation driven by student	< >	Motivation driven by teacher
2. Teacher covering all content	< >	Students active with key concepts
3. Subject knowledge	< >	Vocational competences
4. Knowledge as starting point	< >	Student experiences as starting point
5. Teacher links theory and practice	< >	Student links theory and practice
6. Interaction essential for learning	< >	Interaction supplementary to learning
7. Summative assessment is key	< >	Formative assessment is key
8. Teacher focused on subject content	< >	Teacher focused on student questions
9. Same programme for all students	< >	Customized programmes

Figure 1: The nine teaching dilemmas

A. When time is limited, main concern is that the teacher covers all content	Before start of programme: O O O O O O O After finishing programme: O O O O O O O	B. When time is limited, main concern is that students are active with key concepts

Figure 2: Example of Dilemma 2 as presented to the teachers

Table 2: Results of ATI. Scores on SCCF and ITTF dimensions for backup group (N=139), our research group (N=12) and Stes' research group (2008, N=20)

5-point Likert scales	SCCF			ITTF		
	Mean Pre-test + (SD)	Mean Post-test + (SD)	Mean Difference (Post-test – pre-test)	Mean Pre-test + (SD)	Mean Post-test + (SD)	Mean Difference (Post-test – pre-test) = (SD)
Our research group (N=12)	3.26 (0.50)	3.35 (0.57)	0.09 (0.45)	3.29 (0.75)	3.03 (0.69)	-0.27 (0.51)
Our back up group (N=139)	3.23 (0.68)	3.54 (0.53)	0.31*** (0.64)	3.46 (0.57)	3.36 (0.51)	-0.10 (0.58)
Stes' (2008a) research group (N=20)	2.56 (0.87)	3.25 (0.85)	0.69**	–	–	–

Table 3: Mean scores for the nine dilemmas on seven-point Likert scales; pre-test, post-test and difference between both tests (sorted by mean post-test).

N=12 7-point Likert scale *Dilemmas*	Mean pre-test	SD	Mean post-test	SD	Difference (Post-test minus pre-test)	SD
2. Student activity	5,50	1,24	6,08	0,67	0,58	1,00
3. Vocational competences	5,50	1,45	5,67	1,30	0,17	1,90
6. Interaction essential for learning	5,00	1,21	5,50	1,09	0,50	1,24
9. Customized programmes	5,08	1,44	5,25	1,77	0,17	2,25
7. Formative assessment is key	3,67	1,56	4,83	1,70	1,17	1,99
1. Motivation driven by teacher	5,25	1,36	4,58	1,62	-0,67	1,23
4. Student experiences starting point	4,08	1,56	4,25	1,82	0,17	1,59
5. Student links theory and practice	3,50	1,98	4,17	1,53	0,67	2,43
8. Focused on student questions	3,67	1,78	4,08	1,24	0,42	1,31

Table 4: Reported positive change on the nine dilemmas in the interviews. (Sorted by T = number of persons that reported change on this dilemma)

Dilemmas	2	3	4	5	6	7	8	9	10	11	12	13	T
6. Interaction essential for learning	x		x		x	x	x	x	x				7
2. Student activity		x	x		x		x		x				5
7. Formative assessment	x				x	x			x				x	5
5. Student links theory and practice	x	x	x										x	4
4. Student experiences starting point	x							x					x	3
3. Vocational competences		x	x											2
1. Motivation by teacher													x	1
8. Focused on student questions							x						1
9. Customized programmes													x	1

Table 5: Logbook Question A. What new insights did you gain? (NS = number of statements, T= number of participants that reported change in this category)

Category	*Examples*	*NS/T*
A1 Role of Assessment	'Thinking about assessment forces one to reflect on the whole' (Teacher 5). 'How teachers differ in grading a test, even when there is an response model' (T6).	*13/8*
A2.1. Understanding learning processes in general	'More convinced about connecting with students' (T2). 'A better understanding of the learning processes and how to connect with them' (T5).	*13/6*
A2.2. Understanding learning processes: student activity	'In the lessons students have to get active themselves, it is not my responsibility to entertain them' (T11). 'The student has to cover the course material, not the teacher' (T12).	*11/8*
A3 Awareness of teacher influence	'More aware. Thinking about my own role' (T6). 'Gradually more grip on how I teach' (T11). 'Makes you think about how you learn yourself' (T9).	*13/8*
A4 More focused designing	'Course design: using learning objectives' (T4). 'More aware that good preparation really works' (T8). 'Taking the course objectives as a starting point instead of the course content' (T13).	*15/8*
A5 Awareness of complexity	'To reach all students optimally is difficult' (T4). 'Formulating objectives is difficult' (T10). 'Simple image of teaching has to be adjusted, there is a lot to learn' (T11).	*7/6*
A6 Awareness of strengths	'Confirmation of ideas' (T3).	*4 /3*
Not interpretable		*9/6*

Table 6: Logbook Question B. What did you change in your actual practice? (NS = number of statements, T = number of participants that reported change in this category)

Category	*Examples*	*NS/T*
B1 Experimenting with teaching techniques	'Started to work in a more varied way. More teaching techniques' (Teacher 2). 'Students more engaged as a result of interaction' (T3).	*32/12*

B2 More focused teaching	'In lessons looking forward and looking back have become more natural' (T6). 'Yes, shaping my teaching better. Good and thorough preparation for my classes' (T10).	*14/10*
B3 More reflection	'More critical thinking about design' (T5). 'Think more about how to give the students more grip on the subject' (T9).	*13/9*
B4 Pedagogical approach	' More outspoken in my teaching' (T9). ' Involving quiet students' (T11).	*10/7*
B5 Assessment serving the learning process	'Started to use formative assessment and to apply the things I learned about assessment' (T5). 'Improvement of assessment: quality control beforehand, use of test matrix, better questions, response model, better cutting score' (T12).	*10/4*
B6 Discussion with colleagues	'More discussion with colleagues' (T10). 'More listening to experiences of colleagues' (T13).	*3/3*
Not interpretable		*7/7*

Table 7: Logbook Question C. How did these changing insights help you? (NS = number of statements, T = number of participants that reported change in this category)

Category	*Examples*	*NS/T*
C1 Experiencing good practices during the programme, congruence	'The programme in itself acts as a mirror for the department'(Teacher 9). 'Experiencing learning as a student' (T11). 'Commitment and effort of teacher educators as an example' (T6).	*30/12*
C2 Video observation	'Observing your own behaviour and that of colleagues and understanding what it means to them' (T4). 'Creating and observing your own video case plus positive/constructive treatment in the programme' (T10). 'Observing own video case and those of colleagues – how boring it is when you're too long-winded' (T11).	*13/9*
C3 Experiencing success	'Students find it more challenging and get more feeling for the course content' (T2). 'The fact that students become more active and that I can stand back and take some distance gives more confidence' (T11).	*8/7*
C4 Sharing experiences	'Sharing of experiences; recognition' (T10). 'Feedback from the peer group' (T11).	*9/7*
C5 Working on assignments	'Working on the third test of competence (course design) helped with thinking more conceptually' (T6).	*10/7*
C6 Theory handed over during the programme	'Theory about lesson preparation' (T5). 'Instruction about lectures: how much is forgotten!' (T10).	*20/7*
C7 Personal meeting with teacher educator	'Interview with teacher educator: naming strengths was stimulating' (T11).	*7/5*
Not interpretable		*-/-*

Table 8: Logbook Question E: What was considered to have helped them gain self-confidence? (NS = number of statements, T= number of participants that reported change in this category)

Category	*Examples*	*NS/T*
E1 Receiving (positive) feedback	'Positive-critical way of teaching by teacher educator and stimulating feedback' (Teacher 6). 'The combination of action and getting feedback' (T11). 'Especially feedback in peer group and of peers in video cases, because of positive reactions' (T13).	*17/8*
E2 Experiencing success in teaching practice	'Experiencing what it feels like when lessons and solutions turn out well' (T5). 'A successful lesson doesn't just "happen" to me any more. More satisfaction about what I tried out and what works out, because of more insight and having more grip on the issue' (T11). 'It helps to be better prepared' (T6).	*11/8*
E3 Experiencing competence	'The course programme provides guidance for development as a teacher and gives confidence by changing a boring lesson into an interesting one' (T6). 'Being trained reassures. It has allowed me to make mistakes. I'm learning' (T6).	*11/8*
E4 Experiencing good practices during the programme, congruence	'The teacher educators' role modelling: the endeavour can be as enriching as a way to improve your lessons' (T6). 'By seeing that there are more ways to realize your goals' (T7).	*12/7*
E5 Sharing experiences with colleagues in peer group	'Fun with colleagues' (T3). 'Consulting peers about your personal development plan (others have similar problems)' 'Especially working together in the peer group. A safe atmosphere enables you to show vulnerability' (T11).	*9/6*
E6 More focused teaching	'More focused teaching. More focus on strengths instead of weaknesses and consequently more confidence' (T11).	*4/3*
E7 Comparing with others	'Observing video cases of peers. The others aren't perfect either, thank goodness!' (T8).	*2/2*
Not interpretable		*6/5*

Table 9: Logbook Question F and G. Which course elements were considered to be obstructive and other doubts or remarks? (NS = number of statements, T = number of participants that reported change in this category)

Category	Examples	NS/T
FG1 Institutional obstacles	'Course design isn't managed very carefully at the institutional level' (Teacher 5). 'Ambiguity about goals and objectives at the institutional level' (T12). 'Gap between the book and practice' (T3).	11/7
FG2 Confronting	'Information about how it really has to be done can be discouraging as well' (T4). 'Attending the course makes you insecure. Especially when you are with peers who have more experience' (T10).	10/6
FG3 Difficulty	'More and more realization that teaching is difficult' (T4). 'Doing a counselling interview was tricky. There were many pitfalls' (T8).	7/5
FG4 Programme critique	'The fuzzy explanation of second assignment, which wasn't clear about how we should assess each other' (T7). 'Could have been more opportunity for tips from peers' (T7).	14/5
FG5 Lack of time	'No opportunity to put things into practice in the next term' (T5).	4/3
Not interpretable		9/6