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ABSTRACT

This paper puts forth techniques for the promotion of reflection which can be used in university seminars for preservice teachers. The techniques are based on the idea of reframing, i.e., looking at experiences from a new perspective. From a cognitive psychological point of view, this means that the person's cognitions about a situation or phenomenon are restructured. Analysis of the characteristics of the process of restructuring cognitions leads to the conclusion that restructuring is promoted by student teachers' reflections on the relationships in their cognitions about teaching. The researchers worked out techniques to promote reflection on the relationships between: (1) educational goals and values; (2) educational goals and actual teaching behavior; (3) teacher behavior and pupil characteristics as perceived by student teachers; and (4) goals, pupil characteristics, and teaching strategies. The techniques are described and results of their use in a group of student teachers and a group of teacher educators are discussed. (JD)

Techniques for stimulating reflection through seminars on campus

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Introduction

The promotion of reflection is generally accepted as an important goal in teacher education. Although publications on reflection regularly appear in professional journals and books in the field of both preservice and inservice teacher education, there is a need for descriptions of techniques or activities which can be used in university seminars in order to promote reflection. Most program descriptions (e.g. Feiman, 1979; Korthagen, 1985; Zeichner & Liston, 1987) are quite general, and provide no detailed information about activities which encourage prospective teachers to subject their teaching practice to a critical analysis. Noteworthy exceptions are recent publications on the use of metaphors to describe experiences in teaching (see for example Russell et al., 1988).

In this paper we put forward a number of techniques for the promotion of reflection which have been developed for use in groups. These are based on Schön's (1983, 1987) notion of reframing, i.e. looking at experiences from a new perspective. From a cognitive psychological point of view, this means that the person's cognitions about a situation or phenomenon are restructured. In the next section we analyse the characteristics of the process of restructuring cognitions. This analysis leads to the conclusion that restructuring is promoted by the reflection of student teachers on the relationships in their cognitions about teaching. We then present our techniques for inducing this kind of reflection, and the results of the use of these techniques in a group of student teachers and a group of teacher educators.

Theoretical framework

Our starting point is the assumption that teacher behavior is directed by cognitions. People create mental structures as models of reality, which help them to interact with their environment and to anticipate future actions (Groeben, 1981). These mental structures are known by several different names, but for the present purposes we will use the terms "cognitive schema", defined by Fiske & Taylor (1984, p. 140) as "a cognitive structure that represents organized knowledge about a given concept or type of stimulus", and "subjective theory", a term which emphasizes the subjective nature of these structures.

There is a substantial body of literature pointing to the importance of prior knowledge in learning (Bransford, 1979). When we consider the learning process there are three ways in which schemata can be modified (Rumelhart & Norman, 1981; Vosniadou & Brewer, 1987). The first way is accretion, i.e. the gradual accumulation of information within existing schemata. The second is tuning, which refers to evolutionary changes in the way information is interpreted, such as generalizing or constraining the extent of a schema's applicability. And finally, there is restructuring, which involves the

creation of new schemata.

If prospective teachers enter a preparation program with schemata about teaching that can be changed by accretion or tuning, problems will be minimal. However, the situation is more difficult when subjective theories have to be restructured in order to be able to adopt new educational theories. Unfortunately, this is often the case, as student teachers' subjective theories are generally not based on careful empirical testing and may contain elements which conflict with the theory taught in the program. And as people's cognitive structures generally resist change (Turk & Speers, 1983), even when confronted with incompatible information (Fiske & Taylor, 1984, p.171), existing schemata tend to impede internalisation by students of the educational theory offered within a preparation program.

This analysis leads us to conclude that one of the major tasks facing teacher education is to find effective ways of detecting inadequate subjective theories, and of restructuring th cognitions of student teachers. The restructuring of students' frames of reference with regard to teaching has been called reframing by Schön (1987); he states that reflection can promote the process of restructuring one's frames of reference. De Jong & Korthagen (1989) even equate reflection with the attempt to restructure one's mental representation of experience.

In order to develop effective reflection techniques for student teachers, aiming at this process of restructuring existing schemata, we must first have a clear notion of what schema restructuring actually is. Van Hiele's (1986) theory on levels in thinking may be helpful here. This theory maintains that qualitative changes in a person's thinking about phenomena are characterized by changes in the nature and the number of the relationships between the objects in his cognitive schemata. At the zero level of thinking (called the ground level) a person does not yet think about a phenomenon or a situation in an abstract way. His thinking is bound to the concrete and unique experience, which is perceived as one "Gestalt". He is not able to answer questions about causes and consequences, or answers these questions with simple statements like "that's just the way things are", or "these things just happen". At the first Van Hiele level of thinking, the person sees relationships within the Gestalt of the ground level; in other words, he has formed an internal structure which represents the external phenomenon. Now he can answer questions about the way elements in that situation are connected with each other. Va Hiele calls the schema "richer" if it contains more relationships. (We must bear in mind, however, that these schemata are personal and thus subjective representations of reality.) On the second level of thinking, the relationships of the first level become the elements of a new schema, which means that the person now sees a structure

in the relationships. In this way each succeeding Van Hiele level is characterized by the fact that relationships are constructed between the relationships of the lower level. Van Hiele says that a shift to a higher level of thinking about a phenomenon takes place when the person analyses the relationships in his schema and the relationships between the relationships. If the person makes these relationships concrete, for example by writing them down or drawing a picture or scheme, a reduction of the level of thinking takes place. What was the first level becomes the ground level through the concretization of relationships. This is a stimulus for a subsequent shift to the next level of thinking.

Thus, if we conceive of reflection as the process of analyzing and, where necessary, restructuring one's own schemata, the effectiveness of that process will be determined by the degree to which the relationships in these schemata are considered by the person reflecting. The quality of the product of this process is determined by the number and the nature of the resulting relationships in the person's schemata: a quantitative change takes place when the person sees more relationships, a qualitative change when the person constructs new relationships between the relationships he already was aware of or if the nature of existing relationships changes. This analysis of the nature of schema restructuring and reflection is in line with the few attempts which have thus far been made to operationalize and measure reflection in teacher education; our theoretical framework can be seen as a synthesis of the theories behind those attempts, as we will explain below.

Zeichner and Liston (1985) base their reflective-teaching index on the degree to which different types of discourse occur during supervisory conferences. The lowest level is the 'factual' level: what occurred in a particular teaching situation or what will occur? The highest is the 'critical' level: the assessment of the adequacy of justifications for certain pedagogical activities, and the examination of values and assumptions embedded in the curriculum and instructional activities. Although the different levels that Zeichner and Liston distinguish do not bear a one-to-one correspondence to those of Van Hiele, the highest - critical - level of reflection implies awareness of relationships between ethical, political and moral values and pedagogical relationships.

A group of researchers in Michigan (Simmons et al., 1989) have developed a taxonomy of reflection consisting of seven levels. In this classification the most important criterion is the number of cause-effect pedagogical principles, which are in fact relationships, used in the description of an instructional event.

Both these classifications of reflection are in line with our own theoretical analysis of the essence of schema restructuring. This leads us to conclude that an important goal of

teacher education should be to help teachers to reflect on the relationships in their schemata about teaching, to add relationships to these schemata and, where necessary, to alter the nature of existing relationships. We believe that without such reflections, educational theories taught in teacher education programs have little chance of becoming part of the student teachers' cognitions.

Problem formulation

This conclusion left us with the question of which techniques or activities can be used to encourage student teachers to reflect on the relationships in their cognitive schemata about teaching. Moreover, our goal was not only to stimulate to reflect and, where necessary, to restructure schemata, but also to ensure that this restructuring is based on the educational theories presented in the teacher education program. For this reason, what we needed were techniques and activities that could be used in university seminars.

Although there are various other types of relationships, we will confine ourselves here to four types of relationships on which we want to promote reflection.

(1) the relationships between educational goals and values
(2) the relationships between educational goals and actual teaching behavior
(3) the relationships between teacher behavior and pupil characteristics as perceived by student teachers
(4) the relationships between goals, pupil characteristics and teaching strategies.

For each of these relationships we give a concrete technique that we developed and have used successfully in our teacher education program in the Netherlands.

Techniques

We will now describe the four techniques which correspond to these four types of relationships.

The wall

This technique aims at promoting reflection on the relationships between educational goals and values (type 1).

Each student teacher in the group receives a number of paper 'bricks' with statements about educational goals or values. Some of the bricks are blank and have to be filled in by the prospective teacher. The assignment is to build your own 'teaching wall'; placing the bricks with the most important principles at the bottom, and the others on top. The wall is glued onto a piece of paper. The student teacher can also draw a 'waste-paper basket' in which useless bricks are deposited.

This is the first step in a process of reflection on one's goals and guiding principles in teaching. A comparison of the various walls constructed by the members of the group stimulates the student teachers to give voice to their own views, but also to reflect critically on those views.

As some of the bricks are filled in beforehand, the teacher educator is able to direct the discussion towards topics which he or she thinks are important and which reflect educational theory. For example, as in our program considerable significance is attached to process goals in education, we provide bricks with such statements as "I would rather ask questions than give answers", "pupils should learn to reflect on their work", "it is important for pupils to become self-confident", but also "I want to prepare pupils for their examinations" and "pupils should listen to me". Other examples of bricks we use are:

- it must be quiet in the classroom;
- the pupils should see relationships between subject matter and everyday life;
- the pupils should develop a critical attitude towards societal issues;
- pupils should be given a sense of the "beauty" of the subject matter.

We also use one or two subject-specific bricks, which contain a goal that is conditional on other subject-specific goals. In the field of mathematics, for instance, this could be "learning to solve quadratic equations".

Columns

This technique is designed to promote reflection on the relationships between educational goals and actual teaching behavior (type 2).

Each student teacher chooses one class in which he or she often teaches. Where possible, it is best if the classes of the student teachers are on the same grade level, or if the classes are similar as regards the subject matter being taught. Four columns are drawn on a large sheet of paper. In the first column the student teacher enters a general goal he or she thinks is important in education. This goal can be selected from the 'wall'. In the second column the student teacher writes a specific goal for the next series of lessons in that class, which should be derived from the general goal in the first column. In the third column the student teacher puts down a further specification of the goal to be reached in the next lesson. The fourth and last column is filled in after the lesson, when a particular piece of interaction is entered - say, from an audio recording of the lesson - which shows how the student teacher went about achieving the goal. Back on campus, the student teachers show their columns to each other, discuss them and prepare the columns for the next lesson, which are written under the previous ones. This often results in changes the third, second or even the first column: the realization that there may be a conflict between one's goals and one's actual teaching can lead student teachers to alter their view on education or their own role in the teaching-learning process. The teacher educator or fellow students in the group can be helpful in finding ways to

overcome obstacles which prevent the student teacher from reaching the formulated goal.
This often requires a careful formulation of long-term and short-term strategies.

The whole process towards which this activity is directed is illustrated by the successive rows referring to the various lessons. We ask the student teachers to write down their rows and columns on a large sheet of paper, which makes it easier to present their "story" to their fellow students.

The repertory grid

This technique involves type (3) relationships, i.e. relationships between teacher behavior and pupil characteristics, as perceived by the student teacher. The activity is based on Kelly's (1955) technique for inquiry into the constructs people use when dealing with their environment.

Several times each student teacher receives three cards, each containing the name of one pupil. These pupils are all in the same class, which the student teacher knows well. Without thinking about it too long, the teacher must choose one of the three pupils whom he or she thinks is different from the other two. After that, the teacher must formulate the characteristic, or construct, which describes the difference. In this way, a list of personal constructs is generated. The repertory grid technique helps teachers to discover the ways in which their behavior is shaped by subjective perceptions of pupils.

For this activity, is advisable to divide the group of student teachers into pairs. One of them shuffles the cards and offers three of them to the other student. The first student teacher also writes down the construct his fellow student mentions. Then the cards are shuffled again, etc. When a list of about 10 constructs has been made, the two student teachers change roles.

It may promote the reflection process to realize that all the characteristics are one pole of a dichotomy, which is why we also have the student teachers give the opposite of each characteristic on their list. It is important that the student teachers use their own words when formulating the characteristics and their opposites, because the strength of the method lies in the fact that these self-chosen terms have a particular significance for the individual. Kelly made use of this fact in developing the repertory grid technique as a research method designed to describe people's subjective perceptions of their environment. He showed that people have no trouble scoring others on the basis of the constructs they have formulated themselves, as opposed to those offered to them by others, for example the researcher. Using this same principle, the student teachers can score all pupils from the class under consideration on a five-point scale for each of the constructs from their personal list. The resulting matrix illustrates the role of the personal constructs in the student teachers' perception of the pupils.

In order to reflect on the relationships between the student teachers' lists of constructs and their teaching behavior, they are asked to explain how they think their reactions to pupils with the various characteristics differ. This question becomes especially interesting when they start to compare their reactions to pupils with opposite characteristics, which can lead to the restructuring of their subjective theories. An illustration is given in the 'results' section.

Arrows

This technique corresponds to type (4) relationships, i.e. those between goals, pupil characteristics as perceived by the student teacher, and teaching strategies. The activity 'arrows' may be seen as an integration of 'the wall' and 'the repertory grid' and should be introduced after these techniques, as it can then build on the previous results.

A particular pupil characteristic, say, 'dependent' is taken together with an educational goal which one finds important, such as 'seeing relationships between the subject matter and everyday life'. Both are written down on separate cards. Then a paper arrow is placed between the two cards and the student teacher has to fill in the strategy he or she would use in order to attain that goal in the case of a student with that specific characteristic. The same question can also be asked with respect to the opposite characteristic, for example: How do you work towards the goal of seeing relationships between subject matter and everyday life with an 'independent' pupil? This procedure is repeated several times, using various other goals and student characteristics. Group discussions on the strategies formulated will, of course, promote further reflection. We use to explain to the student teachers the role of subjective theories in teacher behavior, and challenge them to discover the subjective theories of their fellow students by asking questions about the how and why of the strategies written on the arrows. This is, in fact, the most important part of the technique, as it often leads to the restructuring of the student teachers' subjective theories.

Research method

The techniques described above were gradually developed over a period of several years, in which they were used in many groups of student teachers, as well as in professional training groups of teacher educators. When we had the feeling that they were working really well, we decided to investigate these techniques more thoroughly, in a group of student teachers and in a group of 13 teacher educators. The first group consisted of 18 student teachers of a variety of subjects, such as economics, biology, mathematics and history (but excluding languages). We investigated the results of the techniques, and examined in depth the accompanying learning processes in a smaller sample of five students. This smaller sample was chosen not because it was representative, but rather for

practical reasons: it included two mathematics and three biology students, who had been supervised and taught as a group throughout a large part of the program. Although we have no reason to assume that these students were not individually representative, we must point out that this group was characterized by an atmosphere of security and mutual concern, which was undoubtedly beneficial to the work involving the techniques. As we are convinced that the effects of these techniques will invariably depend on factors such as these, and on the individual teacher educator who uses the techniques, our goal was not to prove that the techniques "work" or show how impressive the results were, but to investigate how they work and whether they are capable of influencing student cognitions, in particular with regard to the four relationships formulated above.

The 'wall' technique was used in the group of eighteen students right at the start of the teacher preparation program, which is a one-year program, following on a four-year subject-oriented university curriculum. The 'wall' was repeated in the smaller group of five students after six months, about 400 hours of study on campus and 400 hours of field experience. The students themselves had by then taught for about 80 hours in secondary school classes.

The 'columns' technique was used in the first and second month of the program, during the first field experience of the small sample of five students, which was a one-to-one teaching experience: for six weeks each student worked with one pupil for one hour a week, and reflected on these lessons with the aid of audio recordings of the sessions. The audio recordings resulted in verbatim transcripts of small episodes from the lessons in the fourth column. We assessed the student teachers' learning processes during this stage of the program with the aid of interviews and group discussions. Like the 'wall', the 'columns' assignment was repeated after six months, when the "individual teaching practice period" started, in which the students work as regular teachers in two secondary schoolclasses, i.e. without the cooperating teachers or fellow students being present and with full responsibility for such matters as grades, contact with parents, etc. For purposes of the 'columns' assignment, the student teachers had to choose one of these two classes.

At this stage we introduced the 'repertory grid' and 'arrows', in both the larger and the smaller group of student teachers. We used interviews and group discussions to assess the cognitive processes which these techniques induced.

The four techniques were also evaluated by means of a questionnaire with open questions, asking for cognitive and affective learning outcomes and for points of critique.

In the group of teacher educators, we used the four techniques during two sessions, applying them to the educators' own teaching situation. This means that the 'wall' bricks con-

tained statements about goals and principles in teacher education, and that the other techniques were also used in the context of the educators' work with prospective teachers.

Results

We now present the results of our study of the way in which each technique works, and our own experiences in using them. We will start with the student group.

The wall

We found that student teachers have no difficulty in choosing the bricks that match their views on education, and discarding the others. Arranging the bricks to form a wall was more difficult. It led to considerable reflection, since one cannot place one brick on top of another without manifesting certain ideas about relationships between the various goals and values. When asked about the reasons behind their choices, the students clarified their subjective theories, using sentences like: 'in order to reach goal X you need principle Y, and it is only later on that you reach Z, which I think will more or less solve itself'. The arrangement of the bricks, together with such statements, often showed that there was one central underlying principle guiding the students. In our small sample the five students formulated these principles as follows:

- education should be directed towards promoting processes in pupils rather then towards products;
- it all comes down to a good atmosphere in the classroom;
- first of all, you have to be able to make the subject matter clear to pupils;
- there should be a proper balance between the demands made on the pupils and good teacher-pupil relationships;
- there must be a clear understanding about rules and discipline.

At the very beginning of the preparation program there were obviously more differences than similarities between the walls and the views on education expressed by the different students, which supports the assumption that student teachers enter the program with quite different subjective theories.

An important discovery (not least for the students themselves!) was that the guiding principles behind the students' walls were essentially the same the second time they made their walls, six months later. This is noteworthy, because in the meantime these students had gained quite a bit of teaching experience; as we explained, they had taught for about 80 hours in secondary school classes and all of them had been allowed by their schools to take responsibility for two classes, which means that they were deemed to have acquired the necessary basic competence as teachers. In addition to their field experiences, they also had about 400 hours of study on campus.

The questionnaire showed that the students' assessment of the 'wall' was favorable. Typical answers to the question

"What did you get out of it?" were: "I learned a lot from thinking about which things should take priority", and "It was an incentive and a help, and made it easier for me to think about my views on teaching".

Columns

The most obvious result of the 'columns' activity was that it made the student teachers look at their teaching goals and behavior more closely and more critically.

This revealed things which before had been implicit. To take an example, the questionnaire produced statements, like:

- It is surprising to see that sometimes you choose goals that are unrealistic. When it becomes clear from the last column that you aren't going to reach your goal, you can choose a more realistic one.
- When your goal is not achieved, you start to make concrete plans to try to do better in the next lesson.
- It gives me a means for monitoring my progress.

The processes illustrated by the student teachers' columns had all apparently helped to teach these students how to differentiate between general goals and subgoals. A common observation made by the prospective teachers was that they had discovered that stating a goal is one thing, but that a lot of thinking, planning and careful evaluation is needed in order to realize it. Moreover, they were confronted with the fact that realizing a goal involves more then just a few comments during a lesson.

One student teacher observed that what he was doing in the classroom did not really match his own goals, but that he was influenced far more by the need "to teach the way other people think you ought to". This discovery made him look more critically at his cooperating teacher, whom he had originally admired somehwat uncritically, and helped him to go his own way. The student was so pleased with the 'columns' technique that he kept making his columns throughout the whole year of teacher preparation. Every weekend he evaluated his week of teaching, and adjusted the first three columns on the basis of the concrete classroom experiences which appeared in the fourth column. He reported that it helped him to find his own teaching style.

The repertory grid

When we used this technique in the small group, it produced a great deal of joking and giggling, although the student teachers went about their task very seriously. It appears that the technique confronts student teachers with their own conceptions of pupils, and with the often quite idiosyncratic constructs they use. This may cause them to feel somewhat ashamed. The students had only a few constructs in common, such as "clever", "interested", "diligent" and "lively". Some rather personal constructs were mentioned, such as "crazy", "plays the marimba" and "uses her looks".

The formulation of the constructs helped the students to

become aware of their subjective view of pupils and their preferences with regard to young people in general. The discussion about the ways in which the students react to pupils with different characteristics was especially interesting when the interactions with pupils with opposite characteristics were compared. This helped the prospective teachers to reflect on the question of whether their behavior was adequate. This may be illustrated by the following example.

One student teacher formulated the construct 'interested-uninterested', and reported that she kept looking for stimulating examples and activities for the uninterested pupils. However, she did not make the same effort in the case of interested pupils: "I just start the ball rolling and expect them to take it from there". Reflection on these two different types of teaching behavior made her see that there was a danger that the uninterested pupils might become more and more dependent on the teacher's inspiration. The interested ones on the other hand, could become less motivated because of the lack of stimulating and challenging activities. This discovery created a moment of confusion, in which the adequacy of her subjective theory was questioned by the student teacher herself. Such a situation, when the status of an existing subjective theory is lowered, is an ideal starting point for a discussion of motivation theory. We believe that this kind of theory is more likely to become part of the student teacher's restructured schemata after this type of analysis of her own teaching behavior, than without such reflection.

Arrows

We suspect that in many cases the 'arrows' activity was the first time the student teachers had ever thought in a critical and analytic manner about the relationship between individual pupil characteristics, educational goals and their own teaching behavior. Such probing into the reasons for their behavior, makes explicit subjective theories which we believe student teachers had never reflected on before. This may be inferred, for example, from the observation that the students often had difficulty in formulating their teaching strategies in the case of one certain type of pupil and one basic goal from their 'wall'. As one student put it: "I discovered that I am so occupied with trying to come across well, that everything else sort of gets forgotten. For others, the "arrows" activity helped them to differentiate between their strategies for different pupils. Although we have no clear evidence to this effect, we had the distinct feeling that before this activity they saw the class more or less as a unit, with very little differentiation with regard to goals and strategies. The 'arrows' technique can also deepen the student teachers' strategies. One example of this is the case of a student teacher who formulated his 'arrow' between the pupil characteristic 'rude' and the goal 'learning to interact with other pupils in a respectful manner'. He was already using the

strategy of giving the class feedback about the way he perceived the pupils' conduct in concrete situations, but while formulating this strategy, the student teacher became aware of the fact that he should do this in a more respectful way.....

Group discussion about the arrows resulted in a collaborative search for solutions to special situations, in learning from each others' strategies and, last but not least, in doubts about one's own strategies and the subjective theories behind them. As we have said, we believe that such doubts are important starting points for the next step in a learning process, a step in which the student teacher feels a natural need for educational theory. Our own strategy, then, was to offer this theory in close relation to the special situations with which the students had to deal. The readers may decide for themselves whether this reveals any of the authors subjective theories.

The training group of teacher educators

The results of the four techniques and our experiences were essentially quite similar in the training group consisting of teacher educators. Although the promotion of reflective teaching played a central role in the walls constructed by these teacher educators, the repertory grid technique showed that when they considered individual students, the constructs which the educators used differed considerably from the reflective/nonreflective construct, which was mentioned by only one teacher educator in the repertory grid. Many constructs had a bearing on qualities that were also characteristic of one's personal perceptions of people outside the context of the program, such as "shy", "spontaneous" and "cheerful". Those most frequently mentioned were "reserved" (6x), "inventive" (5x) and "industrious" (4x).

Probing into the relationship between student teacher characteristics and strategies by means of the 'arrows' activity showed that the teacher educators often abandoned their goals, or were at a loss to know how to attain these goals in the case of certain student teachers. In many cases, the educators became aware of the fact that they had moderated their demands on certain students for fear that increased resistance would prevent these students from learning anything at all. This spontaneous differentiation in strategies appeared to be based on all sorts of personal beliefs. The educators came to the conclusion that they themselves relied too much on unquestioned subjective theories, and that reflection and discussions with colleagues about strategies could help to optimalize the effects of teacher preparation. Like the student teachers, the teacher educators found the techniques very helpful in promoting reflection on their work.

Conclusions

We conclude that the four techniques helped both student teachers and teacher educators to reflect on their subjective theories, and on the constructs they use in the perception of the people they work with (pupils or students). Each technique focusses on special types of relationships which constitute subjective theories. In line with other research results in this field (see for an overview Clark & Peterson, 1986), our data show that these subjective theories and constructs are often implicit. The student teachers and the educators in our study were stimulated by the techniques to make them explicit, which in some cases revealed that the theories were inadequate or inconsistent. The techniques promoted lively group discussions about teaching practice, and created a need for educational theory. We found many examples of the restructuring of existing schemata. However, our study also showed that basic principles in student teachers' subjective theories about educational goals and values are hard to change.

In our study we used four techniques, which correspond to special types of relationships in cognitive schemata about teaching. In this respect, the techniques should be seen as examples of a more general principle in the promotion of reflection in teacher education. This principle may be formulated as "making relationships concrete". On the basis of our theoretical framework, we assume that cognitions about teaching are structured by means of relationships and that these relationships should be the object of reflection. This promotes the restructuring of inadequate or inconsistent cognitive schemata, for example with the aid of educational theory. Making the relationships concrete is helpful in the reflection process, as it is a means of reducing the Van Hiele level of thinking, and thus stimulating a shift to a higher level.

Our experiences with the four techniques have resulted in the hypothesis that a stepwise approach might be helpful in the promotion of reflection, and the restructuring of student teachers' cognitions which conflict with the educational theory taught in a teacher education program. We distinguish four phases:

1. A phase in which the student teacher is stimulated towards reflection on a unique and concrete situation from his or her own teaching experience.
2. A phase in which the student teacher is stimulated to reflect on the subjective theory he or she uses in this situation and other comparable situations.
3. A phase in which dissatisfaction with this subjective theory is created by making its weaknesses apparent to the student teacher. Thus the "status" of the subjective theory is lowered (compare Hewson & Hewson, 1989).
4. A phase in which an empirically tested educational theory is offered to the prospective teacher. We agree with Hewson

and Hewson (1989) that this educational theory should appear intelligible, plausible and fruitful to the student teacher. Hewson and Hewson discovered these criteria in their research into conceptual change processes in the field of science.

A study into the effectiveness of this phase model is in preparation.

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