DOCUMENT RESUME

ED 266 102 SP 026 995

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TITLE Reflective Thinking as a Basis for Teacher Education.
PUB DATE 85
NOTE 14p.; Paper presented at the Annual Meeting of the American Educational Research Association (69th, Chicago, IL, March 31-April 4, 1985).
PUB TYPE Speeches/Conference Papers (150) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cognitive Processes; Conceptual Tempo; Field Experience Programs; Foreign Countries; Higher Education; *Preservice Teacher Education; *Self Evaluation (Individuals)
IDENTIFIERS Netherlands; *Reflective Teaching

ABSTRACT

The Mathematics Department of the Stichting Opleiding Leraren (SOL) is responsible for the education of secondary school mathematics teachers in the Netherlands. This education takes four and a half years, and includes one year of professional preparation. The program trains teachers to reflect on their experiences by means of directing their own growth in the teaching profession. The model of reflection used in the program has five phases: (1) action; (2) looking back at the action; (3) awareness of essential aspects; (4) creating alternative methods of action; and (5) trial. It is called the ALACT model after the first letters of the phases. These reflective teaching procedures are taught to prospective teachers before they undergo field experiences. Although some prospective teachers have rated the program highly, it is suggested that the program needs to consider the differences between student teachers who lean toward reflection and those who need more external support. (CB)

REFLECTIVE THINKING AS A BASIS FOR TEACHER EDUCATION

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Paper presented at the annual meeting of the American Educational Research Association, Chicago, 1985.

REFLECTIVE THINKING AS A BASIS FOR TEACHER EDUCATION

In spite of the emphasis on reflective teaching in the literature on teacher education, there are only a few descriptions of complete programs based on this principle and their results (e.g. Feiman, 1979; Wirth, 1975). In the Netherlands there is an institution for preservice teacher education in which reflective teaching has been the basis of the preparation program for years, viz. the Mathematics Department of the Stichting Opleiding Leraren (SOL), a teachers' college in Utrecht. This department's view on teacher education is closely related to that of Zeichner (1981) and also to the inquiry-oriented approaches of Zeichner and Teitelbaum (1982), Berlak and Berlak (1981) and Feiman (1979). It is fundamentally different from Cruickshank's (1981) more technical view on reflective teaching.

This paper gives a description of the program, the underlying learning theories and some of the results. Before that, here is some information about the organizational structure of the program.

The Mathematics Department of the SOL is responsible for the education of mathematics teachers for secondary schools. This education takes 4½ years, consisting of 1 year professional preparation, spread evenly over the total program. Students enter the program after secondary school (at an age of about 18) and choose two subjects, e.g. mathematics and geography. Those who choose mathematics as their main subject, get their professional preparation in the Mathematics Department.

The basic principles of the program

The program is based on the assumption that it is impossible to prepare prospective teachers for every situation they may be confronted with during their career. However, it is possible to train them to reflect on their experiences as a means of directing their own growth in the teaching

profession.

A related principle which is basic to the program is that the subjective way in which the student teacher sees reality (for example the reality of a classroom experience) is taken as a starting point in the supervision. After all, when the student has become a teacher he or she will have to manage with this subjective view on reality. This is why in the SOL program helping processes are based on the student's own reflections, written down in his or her 'logbook'.

Theoretical support for the reflective teaching principle has been found in cognitive psychology, especially in theories which use cybernetics to build models for human behavior. Well-known is the model of Miller, Galanter and Pribram (1960). Central concepts in their theory are 'plan', 'image' and the 'TOTE-unit'. The term 'plan' refers to all organized processes in the organism which direct actions. The word 'image' is used for an internal body of knowledge and experiences. 'TOTE' stands for test-operate-test-exit; this is the elementary feed-back loop. Miller et al. (1960) paid much attention to metacognition.

The model of Skemp (1979) is closely related to the above mentioned cybernetical model. The starting point of Skemp's model is that human actions are based on cognitive schemata. When a person wants to reach a certain goal, such a schema is transformed into a plan of action. He can direct his actions by means of this plan and continual feed-back from the environment. This leads to the concept of a director system. Skemps's model discriminates between two levels: delta-one systems deal with the direct interaction between the individual and the physical environment. The process of improvement of delta-one systems is necessary for survival. This process is called learning and is directed by delta-two systems (fig.1).

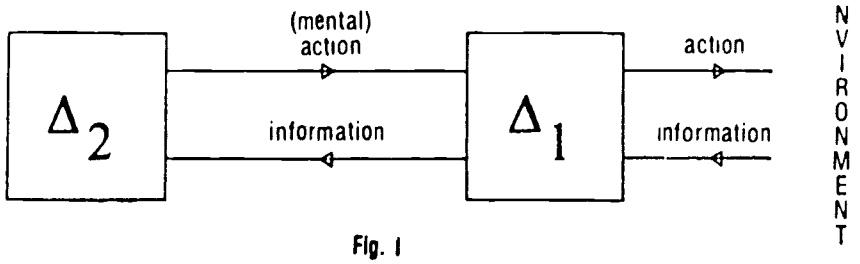

Fig. 1

Learning does not always take place in a conscious way. If it involves reflection, five phases can be distinguished:

1. action
2. looking back on the action
3. awareness of essential aspects
4. creating alternative methods of action
5. trial

This will be called the ALACT-model (after the first letters of the phases). The final goal of the SOL program for teacher education is that the prospective teacher learns to go through such cycles without the help of the teacher educator. As an example we give a small part from a student's logbook (translated). Phase A was a mathematics lesson given by him.

L { This lesson went fine.
They were a bit noisier than usual, but I could control them all the same.

A { Ronnie was not present, that may have been a cause of the extra noise.
In my opinion he is a kind of 'leader', and because he was always co-operative, the others co-operated too.
Now that he wasn't there, the others didn't know how to behave. Yet, they all worked well.
Another cause may be that we started at 8.30, which is earlier than usual. The children hadn't blown off steam yet, but I wanted to start quickly all the same, for I had only one hour.

C - The next time I will take more time.

(This next lesson will be phase T, which is also phase A of the following cycle.)

Reflective teaching starts within the teacher education institute

The ALACT-model starts with a phase of action. Indeed, the reflective teaching principle requires experiences on which the student teacher can

reflect, but these need not be classroom experiences only:

> Reflection which is directed toward the improvement of practice does not necessarily need to take place within the boundaries of the classroom to have an impact. (Zeichner, 1981, p.10)

Small task groups of student teachers (e.g. those in which the students work on a subject like mathematics) offer many opportunities for reflection on the process of helping and being helped, on the process of co-operation within the group, on the way problems are solved, etc. Didactical, psychological and sociological principles can become clear as a result of this reflection and can be deepened afterwards by more theoretical study.

There are more ways in which experiences within the teacher education institute can be used for reflection. There is a special first year practicum in which the student learns to reflect on his or her own thoughts, feelings, attitudes and actions in relationships with others, especially in those with fellow students. A wide variety of activities is used in this 'reflection practicum', e.g. role plays, discussions and exercises in social skills. Some important issues in the practicum are empathy, expressing feelings and solving co-operation problems.

The courses in mathematics are also used to stimulate reflection. At regular intervals the students are asked to hand in a written report on the way they worked at a mathematical problem. In this way the process aspect of mathematics gets as much attention as the product aspect. Because this is in contrast with most students' attitudes towards mathematics, caused by their experience with the subject in school, the teacher educators confront them with many mathematical problems for which no straight solution exists or which can be solved in various ways. This makes it interesting to discuss (mathematical) methods.

The second basic principle in the program is that reflective thinking is already a fundamental learning goal before the field-based experiences. The idea behind this principle is that it is possible to arm student

teachers against socialization into established patterns of school practice, but that requires a lot of preparation before the student is confronted with this practice. In order to be able to resist patterns of conduct and utilitarian perspectives imposed by others in the school, the student has to have an idea of who he or she is, of what he or she wants and above all of the ways in which one can take responsibility for one's own learning processes. The generally stressful period of the first field-based experiences in which concerns about survival often play a central role, is very unsuited for learning to reflect on those experiences. Student teachers have to develop a reflective attitude before this period in order to become aware of the influence of utilitarian perspectives on their own activities in school.

Field-based experiences

As was explained above, in the first year the accent lies on such questions as: how do I learn, how do I communicate with others, who am I, what are my goals? It is not before the second year that the students become active in the schools.

Then the first stage is individual help of secondary school children. Because this does not present the problem of having to control a whole class, the prospective teacher can pay full attention to learning processes and didactical aspects. Again the logbook plays an important role in stimulating the student's reflection.

At the end of the second year of teacher education the first classroom experiences are planned. A primary school class (6th grade) is divided between three (sometimes two) student teachers. During a period of 6 weeks the student teachers work in different rooms with their own group of about 8 children, for 1 to 1½ hours a week. Characteristic for the second year field-based experiences is, that the student teacher works alone with the children; the co-operating teacher is not present. The group of 3 (2) student teachers who teach children from the same class are supervised in the

teacher education institute. The starting point of each supervision session lies in the logbooks and oral reports of the student teachers. The supervisor does not visit the student teachers during their lessons in the school, which means that the student has a lot of freedom and responsibility. This is important in order to enable the prospective teacher to find his or her own personal style of teaching and above all it stimulates reflection on this personal style and his or ner growth process. Again an essential aspect is that the problem of controlling the class is not dominating.

In the 3rd and 4th year the student works with whole classes in secondary schools. Now they are tutored by co-operating teachers. These teachers are trained by the SOL, so that they can help the students to use the ALACT-model also in situations where the problem of controlling the class is dominant. For this supervision these teachers need to acquire specific helping skills, the most important of them being the ability to set aside their own schemata of 'good teaching' and to help the students to develop theirs.

The diagram (fig.2) gives a view of the necessary helping skills corresponding with the phases of the ALACT-model.

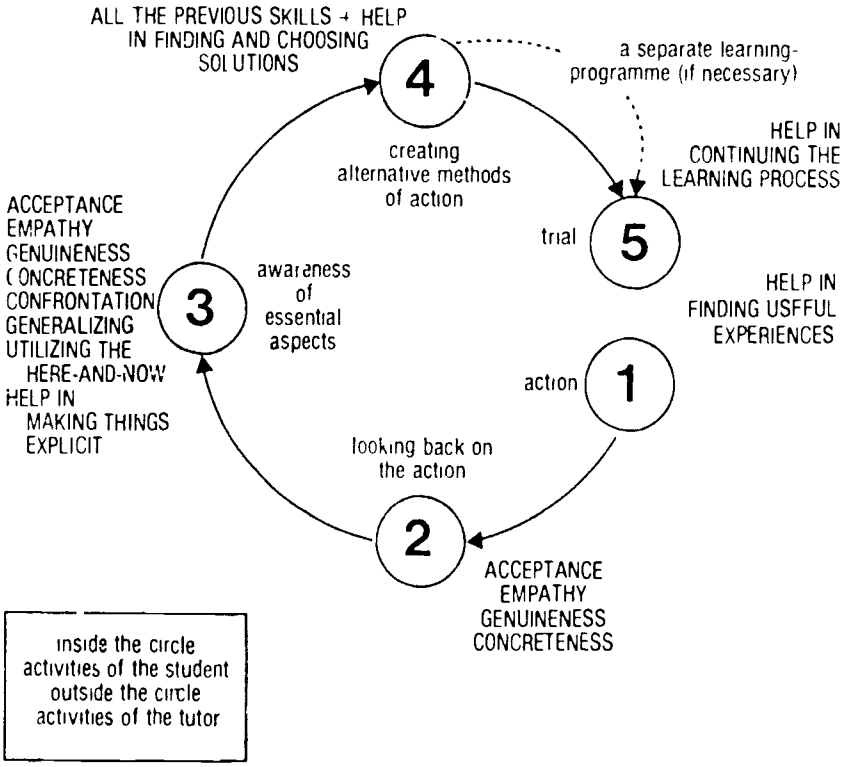

Fig. 2

A strategy of gradualness

Generally first year student teachers who have just left secondary school, are not very willing to take responsibility for their own learning. As Cantor (1972,p.111) points out, their general attitude may be expressed as follows:

> Here we are. Talk to us and we'll do what we're supposed to do. Only please let us alone. Don't pick on us, don't ask any embarrassing questions. Just talk, we'll take notes. Let us know when the exam comes around, we'll do a bit of cramming, go through our notes of your answers and we'll pass. Only please don't bother us. We don't know the stuff. That what you're here for. Tell us. (Cf. Combs, 1974, p. 35, Rogers, 1969, p.130)

The resistance to other ways of learning can become very serious and can even obstruct growth. This is why a strategy of gradualness has been chosen. Essential aspects of this strategy are structure and safety. These concepts will now be further explained.

Although it is important that the prospective teacher acquires a problem solving attitude, the teacher educator must offer some structure. He should not force the student to find out everything without help. To begin with, the teacher educator can give assignments, he can indicate possible choices and give feed-back. The comment that the teacher educator writes in the student's logbook is often a suitable means for giving this support. Gradually more and more decisions can be left to the student teacher, although the teacher educator has to consider individual differences. Learning contracts and monitoring schedules are useful aids for giving the student the structure he or she needs (cf. Gibbons & Phillips, 1979). After a while students can also share the responsibilty for the evaluation of their own achievements, even at mathematics tests. In fact self-evaluation is basic to reflective teaching. But gradualness is always the motto. Reflective teaching starts with reflection on simple and short experiences, e.g. the process of solving one mathematical problem or a situation of explaining a not too complex

concept or principle to fellow-students.

The term safety has to do with the personal relationship between the teacher educator and the student. As Maslow (1968, p.49) says: "safety needs are prepotent over growth needs". If the students feel that their activities are continually evaluated and criticized by their educators, they will not learn to take responsibility for these activities. Acceptance, empathy and genuineness are basic in the helping relationship between the teacher educator and the student (Rogers, 1969, cf. fig.2).

Evaluation of the program

As a first step in the evaluation of the program a questionnaire was sent to 116 former students of the Mathematics Department of the SOL and to 13 students who were close to their graduation. The most important (open) questions were

- what have you learned in your teacher preparation?
- what have you missed in your teacher preparation?

After categorization of the answers the conclusion was that more than 50% of the respondents reported learning effects in the field of reflective teaching and directing one's own growth. This is a striking result, because there was not a single suggestion in the questionnaire or in the accompanying letter that this was a main issue in the research. Included are answers like:

- I have learned to reflect on my teaching. I think this is important because I think it can be helpful when I am teaching alone.
  How can I correct myself, what did I do well, what did I do wrong, what was the cause, etc.
  I think that this capacity can be important in problematic situations in your class.
- I have learned to have confidence in myself: develop things that I am reasonable or good at, accept things that I am not very good at, or not at

all good at, without resigning to it passively.

- I have learned to learn from my experiences (as best I can).
- I have learned to notice my mistakes and how to improve myself.
- I have experienced that it helps, and that it is necessary, to ask myself continuously why I do things in a certain way.
- I have learned to evaluate myself. A central issue during the preparation was to give your own opinion about how things went, e.g. if you thought it went well, you had to say why; what went well? The same applied when you thought it went wrong, so that you became critical towards your own teaching. Terribly important for school practice!
- I think the most important thing I've learned is to look at myself, to be able to solve problems myself, or at least to know the ways toward the solution.

On the other hand, many teachers reported that they had been insufficiently prepared for handling problems of discipline and motivation. Especially those teachers who work in lower vocational schools feel that there is a gap between teacher preparation and teaching practice.

Further study of individual reports made clear that the respondents could be placed on a continuum which contains at one end those who stress the acquired competence for reflection (delta-two) and at the other end those who need (more) directions for their teaching practice (delta-one). In order to study this difference between the respondents more thoroughly, five former students who could be placed at one of the ends of the continuum, were interviewed. This led to the conclusion that the program seems to be appropriate for those who already have a certain reflective attitude, whereas those who have not, seem to benefit less from the program.

The research also made clear that even students who acquired a reflective attitude during the preparation program, did not benefit much from this attitude during the first period of their career. The competence in reflective teaching seems to disappear in the stressful transition period. However, this competence reappears after some time and then enables the

teacher to use his or her experiences (also those from the first difficult period) to make deliberate choices in behavior. Lost ideals then get a new chance too.

Another conclusion of the inquiry was that the field-based experiences in the third and fourth year of the program do not have much impact. Students do not see the classes they teach as their own and this absence of responsibility reduces the relevance of field-based experiences. Other elements in the program however, appeared to be seen as very important by former students, especially the first year reflection practicum.

Finally the questionnaire and the interviews indicate that the effect of the program depends largely on the personal characteristics of the teacher educators, which is not surprising when one knows that they were trained themselves for four years in order to acquire the necessary helping skills. Such a professional training seems to be a basic condition for reaching goals in the field of reflective teaching.

Implications

The foregoing conclusions have implications for both practice in teacher education and research.

First, it is shown once again that practical experience in schools need not be as beneficial as many teacher educators think. More research is necessary in order to find answers to questions like: what is learned during field-based experiences, how do students learn during these experiences, which ways of helping and supervising are adequate for reaching which goals? As Zeichner (1980) points out:

> What students appear to learn during field-based experiences is often in conflict with the expressed intentions of those in both the schools and universities and indicates that these experiences are often miseducative rather than helpful.

Most of all teacher educators should be careful not to plan field-based

experiences too early in the program. For reflection one needs time and rest and in general these are not available during the first confrontation with classroom teaching. A reflective attitude should be developed before this confrontation.

However, learning effects in the field of reflection and directing one's own development are not enough to help the starting teacher. Teacher educators should be available when the transition shock takes place. At the end of the teacher education program the student should be given full responsibility for one or two classes while he or she has a supervisor in the teacher education institute. In this way the responsibility for the teacher's work in the classroom and the responsibility for the learning process can be separated. Only the latter responsibility should be shared by the supervisor and the student, which means that the teaching situation itself is real, but also that there is a way to make an integration possible between this teaching situation, elements from the preparation program and this unique student. Experiments with this kind of supervision (both individual and group supervision) have led to the hypothesis that this is a very effective way of helping the students to actually reap the fruits of the preparation program, although research results are not yet available.

Finally, teacher educators should consider the difference between student teachers who learn on reflection and those who need much external support. The growth processes of students from these two groups seem to be quite different.

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