

USE OF FOCUS GROUP INTERVIEWS IN MATHEMATICS EDUCATIONAL RESEARCH

Bodil Kleve

Oslo University College

In my doctoral work I studied three mathematics teachers in lower secondary school in Norway and how they interpreted a curriculum reform, L97 (Hagness & Veiteberg, 1999). This study included methods as focus group interviews and individual interviews with teachers, teachers' self estimations and classroom observations (Kleve, 2007). In this paper I discuss how I used focus group interviews both for the purpose of obtaining information from teachers about their mathematics teaching, about their beliefs about teaching and learning mathematics and also for the purpose of validating the whole research and its findings.

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RESEARCH METHODS FITTING INTO AN ETHNOGRAPHIC APPROACH

If one wants to find out something, one “goes out and has a look” (Pring, 2000, p. 33). In my research I wanted to find out how teachers interpreted the curriculum and how they implemented it in their classrooms. I therefore decided to enter the mathematics classrooms to investigate teachers' practice, and to have focus group interviews with the teachers to find out what they said about L97, their own teaching practice and about mathematics teaching and learning.

I conducted an empirical study using research methods fitting largely into an ethnographic style of inquiry. The study was a case study of mathematics teachers' interpretation of the curriculum reform L97, both in terms of what they said about it and in terms of their classroom practice. Focus of the study was how teachers' practices were related to their beliefs about teaching and learning mathematics.

I chose methods of data gathering in line with methods suggested in the literature to carry out research with an ethnographic approach (Bryman, 2001; Eisenhart, 1988; Walford, 2001; Wellington, 2000). I used focus group interviews, individual interviews with the teachers, classroom observations, estimation form and teachers' own writings about ideal teaching. All these research methods provided me with data to analyse with regard to teachers' teaching practice and their beliefs about teaching and learning mathematics. Use of focus group interviews which this paper is about, was thus one of several research methods I used in addressing teachers' beliefs.

I used focus groups both for the purpose of selecting teachers for my study and as a research method. I contacted the school leader of a community outside Oslo. The teachers who participated in the first meeting were selected by her. None of these teachers became part of my further study. The next two focus groups were conducted with teachers from three different schools in another community. They were selected by their headmasters whom I had contacted. Four of these teachers became part of the

whole study and participated in the fourth focus group meeting which took place after the classroom observations. The process by which the teachers for my study were selected is beyond the scope of this paper. However, it is outlined in Kleve (2007).

Focus groups contain elements of two research methods: it is a *group interview* and the *interview is focused*. The members of a focus group are invited because they are known to have experience from a particular situation which in this case was teaching mathematics. A focused interview is to ask open questions about a specific situation (Bryman, 2001).

According to Krueger (1994) focus group interviews are useful in obtaining information which is difficult or impossible to obtain by using other methods. Using focus groups generally means that the researcher can intervene into the conversation and pose questions to probe what somebody just has said. According to Bryman (2001) the use of focus groups has not only a potential advantage when a jointly constructed meaning between the members of the group is of particular interest. Participants' perspectives are revealed in different ways in focus groups than in individual interviews, for example through discussion and participants' questions and arguments. However, Bryman pointed out possible problems of group effects in a focus group situation that must not be ignored. I experienced such group effects and I realise the importance of treating group interaction as an issue when analysing data from the focus groups.

TEACHERS' BELIEFS ABOUT MATHEMATICS TEACHING

In my study I use the term belief, and I look upon teachers' beliefs about teaching and learning mathematics and about L97 as cognitive constructions highly influenced by socio-cultural factors such as teacher's own experience and the school context, and also influenced by the teacher's knowledge in mathematics and about mathematics teaching. The insight I can get in my research into teachers' beliefs is through what the teachers say and write and through my interpretations of what I have observed in their classrooms. I do not look upon beliefs as something that can be directly observed. Through the use of different theoretical lenses, my conceptions about teachers' beliefs have to be inferred from what they say about what they are doing in the classroom; what they say they think about their practice; what they say they think is good mathematics teaching and what they say about L97.

It has been important for me both to study teachers' beliefs about teaching and learning mathematics and also what I observed them doing in their classrooms. Thompson (1992) wrote that in order to understand teachers' teaching practices from the teachers' own perspective, understanding teachers' beliefs with which they understand their own work is important. I do not see a teacher's beliefs and his/her practice as a cause-effect issue, but rather as a reflexive process. A teacher's beliefs are influenced by his/her practice and the interactions in the classroom are again influenced by the teacher's beliefs. A teacher's practice can both act as a reinforcement of his/her beliefs but also as an incitement for change.

One component of the teacher's interpretation of the curriculum is what s/he did in the classroom, the enacted curriculum (which is also influenced by incidents in the classroom, students' interactions, behaviour, and so on). The other component is what the teacher said in focus groups and in conversations, what s/he wrote and his/her responses to an estimation form. It was the relation between these two components I studied. It is the latter I term teachers' beliefs.

ANALYSING DATA FROM FOCUS GROUPS

A challenge in using focus groups was to what extent I was able to interpret the meanings lying behind and looking through the words the participants were saying and from that make inference about the teachers' interpretation of the curriculum. In analysing the data from my focus groups it was important for me to be aware of the different levels of information the data give. On one level teachers speak from their inner thoughts and meanings, struggling to express what are really inside their heads, they speak from their individual constructions they have perceived viable in their own practice. On another level they speak from what they know as a teacher and what they say is deeply embedded in social practices of being a teacher, and thus socio-culturally rooted. A third level can be rhetoric: The teacher knew who I was, and could try either to express what s/he was thinking I wanted to hear or since s/he knew what the curriculum said, s/he could express that or s/he could challenge that. In such cases the teachers would respond to me and who I am rather than to who they are. When analysing what teachers said in focus groups it is important to be aware that the teachers' views were revealed in different ways than in individual conversations. What they said could be a way of positioning themselves rather than trying to express their inner thoughts. Information revealed that way illuminates other aspects of teachers' beliefs than aspects illuminated through use of other research methods. Krueger & Casey (2000) encourage use of questions leading persons to speak from experience rather than wishes for or what might be done in the future. That increases the reliability since it focuses on particular experience from the past.

What the teachers said in focus groups conducted before classroom observations was not influenced by my presence in their classrooms and individual interviews. In that respect data from these focus groups provided me with information about teachers' beliefs and practice which went beyond what was obtained through the other research methods. On the other hand, data from the focus group meetings were also valuable for the purpose of triangulation and supporting the other sources of data from the teachers' utterances (individual interviews, self-estimation, writings and questionnaire). I audio recorded and transcribed the discussions that took place in these groups. Below I present some findings from these meetings which highlighted issues from perspectives of L97.

FOCUS GROUPS AND TEACHERS' BELIEFS

I will now present an analysis of the third focus group (FG3), which was conducted before I started the classroom observations.

The teachers participating in this focus group were the four teachers in my study: Alfred, Bent, Cecilie and David. In addition Petter, Kari and Tom, one of my former students, participated. For this focus group I had prepared the following questions for discussion:

- What in your opinion is important competence for mathematics teachers?
- In what way do you relate your work to L97?
- Has L97 inspired you to try out new activities in your mathematics teaching?
- What is the greatest challenge in your work as a mathematics teacher?
 - What have you succeeded with?
 - What do you think you have not yet accomplished?

I started with the first question explicitly, and aspects of other questions were addressed as part of the discussion. However, there was no time to discuss the last two parts of the fourth question. What the teachers felt they had succeeded with and what they found they had not accomplished, were issues explicitly discussed in the fourth focus group meeting later in my study. An analysis of this focus group interview (FG 4) is presented in the final part of this paper.

Focus groups from a socio-cultural perspective

How does what participants say reflect meanings of the group or society more widely? How does what they say reflect aspects (including criticism) of the political and cultural society, of dominant groups influencing the official educational discourse (Lerman, 2000), of their own school situation as a teacher or the one they had as a student themselves? Or how does what they say reflect aspects of the curriculum?

To illustrate this I will provide an example from FG3 which shows use of rhetoric. David knew who I was; he knew I was a teacher educator; he knew I had carried out courses for teachers in relation with the curriculum reform. Therefore, I conjecture David thought I wanted to hear nice things about the curriculum. Based on his understanding of what L97 said, he challenged it. This could have been because he wanted to position himself within the group, but it could also have been because he really meant that L97 is not a good curriculum for the mathematics subject. Yet another way to interpret what he said and why can be that he did not really know what the curriculum was saying, and he wanted to react reluctantly to it from the very beginning. In the quotation below, Petter (P) indicated he was sceptical to L97. David (D) then said (sarcastically?): “there are some nice pictures in it”. That illustrated how teachers argued for or against a new curriculum, how they interpreted it. The language (also what was not said) was a mediating tool in the exchanges of meanings. Petter was the most experienced teacher in the group and had a special role here. He indicated something to which David responded and it illustrates how what they said was deeply embedded in the socio-cultural setting in the group and their experience. (I is me)

- I: L97, how well do you know it? P, you seem dying to say something...
- P: Yes, I feel I am getting hot-headed when you mention L97.
- D: There are some nice pictures in it (sarcastic?)
- I: Now we have talked very much about how L97 is weighting the mathematical topics. But what about the working methods it initiates? Do you have any opinions about that?
- D: Read the newspaper, many interesting writings about it there.
- [There had been written many critical articles in the newspaper about L97 recent days]
- I: But what do you mean?
- D: I am critical to the correct pedagogical view we are served from above. I am not sure if it is right.
- I: Can you say some more about it?
- D: I believe that maybe pupils learn most if they have a teacher, who knows their things, is enthusiastic, finds teaching being fun, who is a good motivator, and good in making the pupils function together. I really believe that the learning outcome becomes better than than if the students have lessons outdoor, working schedules and so on. I dare being that old fashioned, I think so.
- P: One must be allowed to disagree with L97? Or?
- D: Disagree, and say it over and over again, everywhere you are
- I: I want to know what your disagreement is about. What is the pedagogical view coming from above?
- D: I think it implies knowledge's loss of flavour. Projects where pupils find something on the internet print it out and read it with a few replacements of words in front of the whole class.
- I: Is that what L97 says?
- D: No, but that is what happens.

My experience with Petter and David, and to a certain degree also Alfred (he was not so outspoken as the other two) in this focus group was that they were supporting each other with regard to a kind of ignorance towards L97. They had been teaching mathematics for many years, and they expressed their frustration of how the "old" kind of mathematics, especially algebra, was not in the curriculum any more to the extent they wished. Their mutual support in these views expressed in the focus group can be looked upon as communication of a rhetorical kind.

Next I will provide an example of how what teachers said in the focus groups reflected aspects of their experience as a teacher. Reflecting on the utterance from Bent below, he talked from a socio-culturally related everyday experience. Bent

offered us something about the way he operated in the classroom. He spoke from his experience as a teacher, and what he had learned from this experience. From the quotation below it may be hard to understand what he meant, which demonstrates his struggle to express his experience. He said that teaching from the board could start off from a simple level. However, very soon what was presented from the board became too difficult for some students whereas others wanted to proceed even further. This illustrates the challenge of having students with different abilities in the same class. He said:

I think a typical course, when you shall start with a new topic, is to teach from the board in the beginning and to start with something simple and then build it up to a certain level, and to work on tasks parallel to that. At a certain level you just have to stop the lecturing and separate. Some disappear far up and some remain on that level if they have at all reached the level they should. After that it is almost impossible to deal with teaching.

Below I will discuss how Bent went beyond his experience and offered us some of his reflections on his teaching.

Aspects of teachers' confidence

When studying the transcripts, which I had imported into NVivo, I noticed how the teachers expressed differing degrees of confidence throughout the discussion. Bent suggested the ability to motivate the students, and the importance of having mathematical knowledge to get an overview of the subject oneself, as competencies for a mathematics teacher. He used the expression "I am trying to ..." when relating these competencies to his own practice: "I am trying to relate to practical issues, trying to make a relation to real life in a way, however I don't always manage". He was "trying to" make the students see the relevance in what they worked with; he was "trying to" convey the mathematics' intrinsic value, especially when it was not so easy to relate the mathematics to students' everyday life. He also said that he was trying to be enthusiastic. His use of words when speaking from his classroom practice revealed that he was not sure if he succeeded in doing what he thought was important, but he was trying. Continuing the quotation from Bent above, he went beyond his everyday experience in saying something about the issues that arose for him when he operated in certain ways, and his thoughts about it. Bent also revealed some of the "weaknesses" he perceived in himself as a teacher. He had tried out something but through what he said he demonstrated awareness that this might not have been the right thing.

Then you have to walk around giving tasks. Last year I optimistically tried MUST tasks, OUGHT tasks and MAY tasks, that they should try to stretch themselves, but I didn't succeed in making it work. It turned out to be that they did what they had to (MUST) (agreement in the focus group), and some just tried OUGHT. But if they had homework in other subjects, they chose the less challenging way. So then it was easier to do as P says, give many tasks and rather reduce for those who need it. It is easier to put pressure on those who need challenges.

By saying this Bent also demonstrated that he had reflected on his own practice as a teacher. Being able to put his weaknesses as a teacher on the spot like this and sharing it with me and the other teachers in the group, I do not interpret as lack of self confidence but rather as reflecting a teacher who had faith in himself and had self confidence enough to be able to see his own teaching from more than one point of view. He had been able to step aside to consider his own teaching.

Bent also offered us his reflections on different levels of students' learning of mathematics, in which the other teachers consented, but without any further discussion. Bent said: "I have a feeling that they learn on different levels". He said that on one level they learn to solve a problem theoretically and perhaps manage to solve a similar problem in a same kind of context: "you have learned it in one setting on one level". He said:

The next level is being able to carry out what you have learned theoretically for example about symmetries, and applying that when searching for and finding symmetrical patterns in a carpet: Going out looking in math-morning [which was the project work he talked about], having to apply it, then you learn and experience on a higher level.

He called this an "application competence". On yet another level you learn by expressing a problem orally. He said: "Formulating a problem for others is yet one level of learning".

When Tom said he felt that he did not know how to make students understand, especially those with "two"¹ in mathematics, David responded:

I believe you'll have to live with that as a teacher. It is classical. You can work with some students throughout three years and they do not see /understand /remember the difference between $2x+2x$ and $2x \cdot 2x$. Even if you stand on your head and invent all possible variations you can think about there will still be some I believe [who will never manage], regardless of how clever you are as a teacher.

By saying this David demonstrated confidence as an experienced teacher. He spoke from his own experience as a teacher, an experience he knew that Tom did not have. This utterance also reflects a view that not all mathematics is for everybody, and that you cannot put the responsibility for this (the "two-students" not understanding or remembering) on the teacher. Through his long experience as a teacher, David had learned to accept this and he was now telling that to Tom who was a younger and less experienced teacher.

Cecilie also demonstrated self-confidence when telling about how she was handling the issue that students with different abilities in mathematics were placed in the same class. She had mixed two classes and grouped them according to interest in mathematics. She expressed her disagreement with Tom who had said that clever

¹ He referred to getting the grade (mark) 2 in mathematics which is the lowest passing grade. 6 is the best grade.

students will always manage, and she recommended the other teachers to group the students according to abilities (“interests”) the way she was doing.

The above discussion about aspects of teachers’ confidence demonstrates how such information can be obtained through the use of focus groups. The way in which teachers expressed their confidence in own teaching practices highlighted issues of their teaching practices and informed my investigation of how they responded to a curriculum reform.

Mathematical focus

To highlight issues of my study of teachers’ mathematics teaching, it was useful to study what aspects of mathematics they talked about in the focus group. One significant aspect throughout the conversation in the focus group was that *algebra* was the mathematical focus teachers mentioned most frequently when expressing their meanings and exemplifying from their teaching. David referred to algebra several times and was very concerned about algebra having been toned down in the new curriculum and said that he put more weight on algebra, equations and functions than L97 suggests. He also said that he would keep doing it because some students would need it for further studies. David said he was not so eager to force all work within mathematics into an everyday context: “I am more concerned that mathematics is a ‘logical and playing subject’. When the students have done a huge algebra task and say ‘YES I have managed’, that makes me happy”.

Bent also referred to algebra when expressing the importance of the mathematics’ intrinsic value. He expressed the value in itself of having the knowledge to solve an algebraic task or equation. Furthermore, Bent talked about having carried out a project work in mathematics which had been very successful. L97 encourages interdisciplinary project work and also project work within each subject. It was one of the latter in mathematics Bent referred to.

Cecilie mentioned algebra together with mathematics history as exciting topics to work with in her teaching of mathematics.

With regard to my study, what the teachers said in this focus group and how they said it gave me information about how the teachers responded to L97 in terms of what they were saying about it and what they were saying about their own classroom practice. The focus groups highlighted key issues and gave me a starting point for working with each of the teachers, Alfred, Bent, Cecilie and David, who became part of my further study.

FOCUS GROUPS FOR THE PURPOSE OF VALIDATING THE RESEARCH

The last focus group I had with the teachers who had been part of my study took place towards the end of my work with them. I have chosen to comment briefly on my findings from Focus group 4 for the purpose of cross case-analysis and also to illuminate and validate my findings from the rest of my study with the teachers.

I had asked the teachers to prepare two issues to share with the group; first, one issue they felt they had succeeded in carrying out as a mathematics teacher and one issue they felt they not yet had accomplished. They found the task difficult. However, after a few minutes discussing and reflecting on the difficulty of the task, Cecilie volunteered to start with hers. She felt she had succeeded in challenging and motivating the clever students, which is in accordance with what she had expressed in our conversations. The task she felt she had not yet accomplished was enabling the students to copy out their written work in mathematics clearly. Bent responded by expressing that more important for the students than the written presentation of mathematics is for them to understand when to multiply and when to divide in working it out. This emphasises Bent's focus on students' conceptual understanding which I also found through my work with him in the classroom and in our conversations.

Bent chose to present issues from two of the lessons I had been observing with regard to what he felt he had succeeded in and what he not yet had accomplished. His presentation of the issues revealed that he had been reflecting on these lessons. About the fraction lesson he said that he felt he had succeeded to a certain extent. However, he could have done more with it. With regard to the use of concrete materials, he expressed a disappointment that the effect had not been as intended. It had however been better in the other 9th grade class he was teaching. He thus expressed a feeling of having succeeded with the use of concrete materials in that class (in which I did not observe). This suggests that the complexity of the classroom and the classroom discourse often influence the outcome of an activity, and thus the enacted curriculum which is jointly constructed by the teacher and the students and the materials used.

Presenting what he felt he had been successful with, David said: "I have managed to make them cleverer in doing percentage calculations". This emphasises how he looked upon himself as conveying mathematics to the students and that students' learning is dependent on the teacher's ability to explain. When he was asked by the others in the group how he had done it he said: "It is just to explain as well as possible". This emphasises further how he looked upon explaining as the most "efficient" teaching strategy, which also characterised his teaching. However, he also offered an elaboration of how he had done it which revealed that he as a teacher was consciously systematic when presenting mathematics for his students. He said:

I have been very systematic with percentage types 1, 2, 3, 4, 5. Therefore, when one of the types turns up, I refer to the type. Number 1 is like "3 students absent how many percent?" Then it is in connections with changes, then having to calculate backwards, and then comparing two numbers.

David's systematic way of preparing the mathematics to be taught was a feature in his teaching.

With regard to what he had not yet accomplished, David focused on kinds of errors students made, especially how they used the equal sign wrongly, and he also

supported Cecilie in her suggestion: how to enable students to copy out mathematics in a lucid written way which clearly showed how they had solved the task.

What was said in this last focus group emphasises my findings from the analysis of the individual teachers: Cecilie felt she was successful in her work with the clever students, but had difficulties enabling students to present written mathematics with a clear overview; Bent reflected upon both success and not-yet-accomplished aspects of the issues presented; and David felt success in explaining and had not yet found out how students could avoid making errors. For detailed portraits of the three teachers see Kleve (2007).

This last meeting provided me also with information beyond what I had observed in the classroom, and what I had talked with the teachers about in the conversations. Bent offered his reflections around his work with fractions and use of concrete materials. Cecilie shared her difficulties with enabling students copying out their written work clearly, in which David supported her. By challenging David about *what* he had done to make students become good in percentage calculations we were initiated into a systematic way of preparing his teaching. This demonstrates that the use of focus groups provide researchers with information beyond what can be obtained otherwise.

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