FICTIONALISING EXPERIENCES – EXPERIENCING THROUGH FICTION

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Understanding and reporting students' affective experiences with mathematics is difficult if those experiences do not resonate with personal experiences. Utilising fiction-writing in narrative reporting can be a technique that helps both the researcher and the reader of the research report to immerse themselves in the student's experiential world. In this article, I will explore some methodological justifications for such writing, giving an example of the use of fiction-writing techniques in a narrative account of a student who experiences anxiety in an interaction with her mathematics teacher.

All my life I have been an eager reader of both science and fiction. Good science can be entertaining. Good fiction can open my eyes to new understanding. My favourite author, Ursula LeGuin, lets an alter ego describe how truth and facts depend on the style of telling

> I'll make my report as if I told a story, for I was taught as a child on my homeworld that Truth is a matter of the imagination. The soundest fact may fail or prevail in the style of its telling: like that singular organic jewel of our seas, which grows brighter as one woman wears it and, worn by another, dulls and goes to dust. Facts are no more solid, coherent, round, and real than pearls are. But both are sensitive.
>
> The story is not all mine, nor told by me alone. Indeed I am not sure whose story it is; you can judge better. But it is all one, and if at moments the facts seem to alter with an altered voice, why then you can choose the fact you like best; yet none of them are false, and it is all one story. (1981/1999, p. 9)

When I think of the thousands of pages of research literature that I have read, I can recall four kinds of things that I have learned.

> *Concepts* are like the building stones of my world, the words I can use to describe it.
>
> *Facts* tell me how to assemble the building stones that I have – they are the grammar of my sentences. Some of the facts are solid, well-tested, inevitable truths. Most though are less-warranted, relative truths that I accept only until someone provides a more solid alternative.
>
> *Theories* are systems of concepts and facts. Systems are the constructs in my world. Words and sentences make sense only in a context. Only through belonging to a system that I use do concepts and facts remain in my active usage. Theories also guide my world-building. They are like architectural drawings that send me to seek the right building stones and to test the needed constructs. Some are strong, while others crumble.
>
> *Narratives* are the colour and texture of my world: the fine carved ornaments on a doorknob and the graceful colour-play of a glass painting. Narratives relate me to the theories; they give meaning to what I know. Only through narratives do concepts and facts become alive. Narratives speak to my heart and move me. Concepts, facts and theories are powerful tools that I can use to explore the world. Narratives are even more powerful because they can change me.

Empirically-based fiction

When emotions or other subjective experiences are studied, researchers and their audience face the problem that each person's subjective experience is inaccessible to others. The chasm between the inner worlds of two persons needs to be bridged. In qualitative research methodologies, this problem, the "crisis of representation", has been framed as the problem of representing the lived experience of subjects of the study in the research report (Denzin and Lincoln, 2000; Richardson, 2000). Even if the report survives this crisis there is another chasm, between the report and the reader, to cross (see Figure 1).

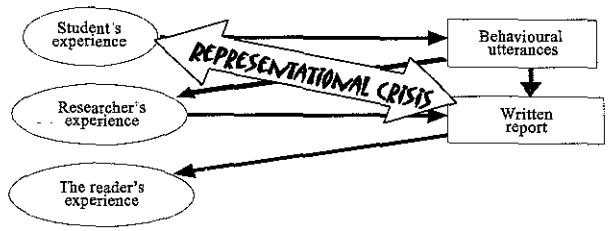

Figure 1: The pathway for transmitting the experience and the representational crisis

Bruner (1986) distinguished between paradigmatic and narrative modes of knowledge (see Figure 2). The paradigmatic mode represents knowledge in logical propositions (e.g. the table overleaf). The narrative mode, on the other hand, represents knowledge in the form of stories (e.g. the quotation by LeGuin above). The narrative mode is a more holistic way of knowing, and affective elements are more important in this mode. Scientific writing has traditionally relied on the paradigmatic mode, which aims at assuring the reader about the truth of the statements. Narrative writing, on the other hand, aims at assuring about the lifelikeness and verisimilitude of the story. The reader ought to feel the story to be true (Bruner, 1986). The narrative and

paradigmatic modes do not exclude each other. In fact, some fields of scientific research, for example ethnography (Tedlock, 2000), have used narrative elements in reporting for a long time

Paradigmatic mode	Narrative mode
Represents knowledge in logical propositions	Represents knowledge in the form of stories
Aims at assuring the reader about the truth of statements	Aims at assuring the reader about the lifelikeness of the story

Figure 2: Table showing Bruner's (1986) two modes of knowledge

Denzin and Lincoln (2000) and Richardson (2000) conclude that writing the report is part of the analysis and interpretation of data, not a separate process. The experience is created in, or together with, the text and there is no difference between writing and fieldwork.

> Writing is also a way of 'knowing' - a method of discovery and analysis. By writing in different ways, we discover new aspects of our topic and our relationship to it. Form and content are inseparable. (Richardson, 2000, p. 923)

This blurring of text and experience has led to new forms of experimental writing. Richardson (2000) elaborates on what such 'creative analytical practices' are and lists references to dozens of examples. Often these texts are intense personal accounts of the writer's experiences, either when the researcher is sharing a first person account (e.g. Tanaka and Cruz, 1998) or when the researcher does not 'present' the data but 'steps aside' and allows the subject to report their account with their 'own voice'. Fiction has been used as a form of reporting, but such texts often face the problem of convincing the editors of the validity of the report. Then there is also the grey area of using poetry and fiction-writing techniques in shaping the original data. These are not 'true' stories in the same sense as the autobiographical accounts, but neither are they really fiction.

These creative analytical practices (e.g. fiction-writing techniques) provide one method for building bridges between the different worlds of subjective experiences. The researcher and the readers of a report will interpret the subject's experiences from the background of their own biographies. It is difficult to share what one has never experienced oneself. How could an adult male share the experiences of a young girl being sexually harassed? How can the mathematically talented share the anxiety some students feel when facing mathematical tasks? Fiction-writing techniques may help the reader - and the writer - overcome such obstacles. Firstly, the process of writing may help the researcher gain closer intimacy and empathy with the persons they write about. It is often difficult for subjects to verbalise their feelings, and empathising with their experience may rely heavily on the tacit knowledge of the researcher. In the process of writing we explore data from new perspectives. Secondly, narrative writing may also allow writers to express some aspects of their tacit knowledge that refuse to be bent into logical propositions. As for the readers, the narrative may help them to approach experiences empathetically that are not familiar to them.

On methodology

The topic of my research is the development of students' attitudes to and beliefs about mathematics. For various reasons, the study was designed as a longitudinal three-year ethnographic study of students in one class, where I acted as the teacher for the class for two years (Hannula *et al.*, 1996). The specific case of a classroom interaction to be presented here is based mainly on one interview and observations of one lesson. However, I have interviewed the student several times and, once each, her elementary school teacher and her mother. I taught her for two years. Altogether, I have a rich and varied data collection related to her and, through this process, I have gained tacit knowledge of her that has guided the interpretations I have made.

I see myself as a researcher positioned in my life history (preconceptions and situation), in a research community, and in relation to the research field and the research data I am analysing (see Figure 3). I acknowledge my influence on the students I study and the data I collect, as well as the influence of the writing process on my analyses.

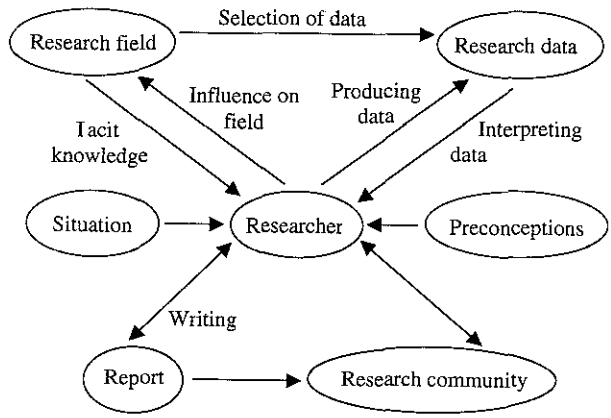

Figure 3: Aspects of methodology in a qualitative paradigm

In this article, I will present the case study of one student, illustrating her anxiety with mathematics and how it influences her interaction with her teacher. I want to increase the intensity of the reading experience and the lifelikeness of the story, therefore I shall include an inner monologue of the student, writing it in the first person and in the present tense, as a stream of consciousness. This writing will require a shift from presenting 'raw' data to creating plausible, less- structured impressions. Such a process is extremely subjective. I do not only focus on certain utterances of the subject, but I also create connections that do not exist in the original data. I will be moving into the grey area between 'truth' and fiction. I will, however, keep the distinction between data and the fictional inner monologue of the student clear throughout the story. Fiction will be italicised.

This case study is my narrative, but not mine alone. The

fictional monologue is not created from a void since much of it has been extracted from both the episodes that I observed during classes, and from the stories that Helena and her teacher told me in their interviews. I will begin with an 'objective' reporting of an interview, and then continue with the classroom incident where the fictional inner monologue will be presented alongside my observational data.

The case study (2)

It was the ninth grade, and I was conducting an interview with Helena and her classmate Maria. Helena was an exceptionally well-behaved girl and rather quiet in the class. She was a diligent worker, but achieved below average marks in tests.

Am I stupid or what – or feeble-minded?

For Helena, mathematics was characterised by strong negative emotions. She did not, however, express these emotions in the classroom (she was always calm), but only in an interview.

Helena: Mathematics makes me at least so quite anxious [ ] and agonised and distressed.

This negative emotion seemed, at least sometimes, to create a vicious circle that paralysed her thinking. Sometimes this circle might be broken by a successful mathematical action.

Markku: How about it, Helena, as you in mathematics class feel anxious and agonised and distressed [...]

Helena: I dunno, maybe then mood goes really down or you start sort of depressed that "I don't understand this again" and then just wait for the next exam horrified and try to somehow just listen and understand and sometimes you sort of (give up) totally that "this is not going to work". Try to work at home and maybe understand and if don't understand and then again comes such horrible depression.

Markku: How about when you do succeed? At least today when you went on the board so /you did it completely right/

Helena: /Umm, well/, yes, then when you do understand, it is nice then. Then sort of you in a way have the energy to do and [ ] then you feel quite nice when you can [...]

Markku: So it depends a lot [ ], that if you do not /understand [...]/

Helena: /Yes/, yes, that it depends on, at least for me.

Helena felt that she lacked something that the others had, and lacking this something made her fail in certain kinds of tasks. This made her feel helplessly inferior to others.

Markku: What do you, Helena, think about problem solving?

Helena: Hehheh [ ] (well) well cannot say that I would like, honestly. I have said to my mother, that these IQ tests or these tests, I feel that I have a compartment in my brain that locks everything like that [...] I cannot handle such [ ]

Markku: How do you feel, when you have [ ] and you cannot grasp it?

Helena: For me that is exactly what makes me feel anxious and then sort of like, in a way, somewhat unpleasant feeling that, sort of "Am I stupid or what – or feeble-minded?", 'coz everyone else can solve this. So why can't I?

Did you understand?

During one of the mathematics lessons that I observed, I had an opportunity to follow closely an illuminating incident with Helena and her teacher. The situation was by no means ordinary in this classroom. On the contrary, in its exceptionality the situation provided a magnified view into how anxiety may disrupt the interaction. Alongside the 'objective' reporting of the incident, I will give a fictional narrative, in italics, on Helena's thoughts during the incident.

The mathematics during the incident dealt with translating graphical representations of equations into algebraic ones. Students had had the following task for homework: "Select two points on an x-y plane. Find the equation for the line that connects these points." If the student had chosen, for example, points A(1, 2) and B(2, 0), the solution would have been $y = -2x + 4$. The formal notation used for such an equation in general form is $y = kx + b$, and the 'k' in the transcript refers to this notation.

At the beginning of the mathematics lesson the teacher instructed the students to check their homework themselves. An example was shown on the board. With the above-mentioned points and equation, the solution would have been written as follows:

A: $x = 1, y = 2$	B: $x = 2, y = 0$	
$2 = -2 \times 1 + 4 = 2$	$0 = -2 \times 2 + 4 = 0$	
checked	checked	*q.e.d*

I enter the room after the students, and choose to take my favourite seat on the right side of the classroom, closest to the door, almost at the back corner of the room. When I sit there, I can see most of the students quite well, yet appear to be focusing mainly on the teacher. Helena is sitting at her usual place, back row, next to her best friend Jaana. Her seat is next to where I am sitting down. Our eyes meet. Knowing that she knows that I am here to observe, I try to make a small joke, "Here I come again to sit by your side." She plays the game with me and says, theatrically, and with a smile, "Yikes!"

We both start working. I start to record observations (starting with what had just happened). Helena takes out her exercise book.

I could not do the homework. It was so complicated. Maybe I can understand it when we go through the homework on the board.

Two students say that they are having problems with the homework.

The teacher gives the students a task to check their homework with the following method: replace x and y in the equation with the coordinates of the points. An example was given on the board.

Oh, no! The homework will not be done on the board. I haven't even solved the equation and I ought to do something with it. Now I am going to lag behind the others and then I will not understand anything and it will be so awful again. I must get help from the teacher.

Several students, including Helena, raise their hands to get the teacher's assistance. Some students help each other. So many incidents are taking place in the classroom simultaneously. I try to follow my focus students, but there are too many things going on and I can catch only fragments of interactions. The teacher is helping Jaana. Helena is patiently waiting for her turn. Later, I confirmed that she had not been able to do the assigned homework. Another of my focus students, at the other end of the class, is also waiting for teacher assistance. I record some of the interactions between others of my focus students. The teacher turns to Helena. He stands there like a mountain and leans over Helena's desk, overshadowing the fragile Helena, who tells her problem, "I do not know how to determine the equation."

Maybe now I can learn the things I missed during the previous lesson.

The teacher begins to explain the procedure for the homework. Helena looks serious and seems to concentrate hard.

That is not how we solved it before. I'm confused.

Helena reacts, "Oh, [...]. I thought that...", but the teacher interrupts Helena and continues explaining.

I'd better just listen.

I hear most of what they talk about but am only able to write down some key phrases in the interaction. I choose to focus on discussion that goes beyond the actual task. The teacher dictates how to begin with the task, and Helena writes figures in her exercise book according to his instruction.

I'll write what he says, maybe then I will understand.

The teacher tells Helena to write 'k' somewhere in the formula. Helena obviously misunderstands and the teacher reacts rapidly and somewhat aggressively, "No, no, no. Not 'k', but the value of k."

Oh, no! I made myself an idiot.

It looks as if Helena slightly bent down at her desk, as if she is shrinking in size. Her teacher continues to help her with the exercise and Helena continues writing in her exercise book, erasing occasionally. After a while the teacher asks Helena, "Did you understand?" She gave no answer.

Well, I have understood each step, so far. But I do not know what we are aiming at.

The teacher continues dictating the exercise. After some time he checks again that Helena is following, "Right?" Helena nods, and they continue.

I know how to do that step.

The teacher tells Helena what to write next. She misinterprets the instruction. "Write [...]. No, no! Not up there."

Oh, no! I was stupid again. I'm confused. This is so complicated.

The teacher continues his efforts to engage Helena intellectually with the task with, "What is minus times minus?"

Minus times minus? There was a rule for signs. How did it go? "The sign in common remains in the result."

Helena: Minus

Teacher: No. Minus times minus?

Wrong, again. Now he knows that I can't do the signs. If it is not minus it must be plus.

Helena: Plus

I just can't do this. It's too complicated.

They continue. After a while the teacher again asks if Helena is following.

Teacher: Did you understand?

If I tell that I don't understand we'll go through it all again. I want to finish it and I won't understand it anyway. I think I'll just have to check the rule for signs, but I cannot say that I do understand because he would see that I don't understand when he asks me anything.

Helena gives no answer. I am surprised that the teacher just continues dictating the solution. After a while he himself gets stuck for a moment, looks at the task, and wonders, "What's wrong there now?" He sorts it out and continues dictating, "Now replace x with [...]. What is minus times plus?"

I got it wrong with the signs earlier. What's the rule? "When you multiply, minus changes the sign." So it becomes plus.

Helena: Umm. Plus.

Teacher: What is two times two?

I have to know that one, right.

Helena: Four

Teacher: [..] Write that here

I've completely lost track. I'll just write all this stuff down Maybe I'll understand it later.

They continue with the task. After a while the teacher asks again.

Teacher: Did you understand this? No?

He knows that I don't understand. I'd better confess.

Helena: Nnno

Teacher: Write here [..]

He doesn't bother if I understand. I'll just write what he says. Maybe I can make some sense of it at home. Honestly, I don't think so If I don't understand it when the teacher is explaining, how could I do it alone? It's no use for me to come to these lessons, because I don't understand anything. There must be something wrong with my brain, because I just can't do it and everyone else can

Teacher: What is minus four times plus four?

Why must he ask me again? I'm just going to look like an idiot again If he could just tell me what to write and then leave! What did he ask? It was something about these numbers here.

Helena: Four.

I record the statements and wonder what Helena could be thinking.

Teacher: No! [..]

I wish I could vanish. I just can't do mathematics Can't he just let me be? He's asked me again. The answer must be a number. A number with a sign.

Helena: Plus 2.

What is wrong with Helena? I know that she cannot do the signs, but she fails on the multiplication, even when given a second chance! I look at her In her voice I sense the tone of crying just below the surface. Is she panicking? At the other end of the class, one of my other focus students is complaining, "I have waited here for an hour. **But he seems not to notice!**" Oh my, he has waited for the teacher for more than ten minutes No wonder he is irritated.

The teacher has spent such a long time with me, they must all think that I am an idiot.

The teacher drags Helena to the end of the exercise.

Don't ask me any more questions. Just tell me what to write. Just don't ask! You tell, I write Please don't ask any more

The teacher and Helena finish the task and the teacher walks to the other student at the other end of the class to help him.

I thought we'd never finish it. I hate mathematics. I just can't do it What's wrong with me? I'll just have to try and remember how it is done. Maybe I can replicate the example to solve another similar task

Helena begins to solve another task. She changes a few words with her friend Jaana. I see a smile returning to her face

Jaana knows how I feel. She can't do mathematics either.

Helena stretches her neck. Jaana says something funny to Helena and they both laugh. Helena turns back to her exercise book and continues to work. Later, I learned that she was able to solve for the 'k' in her equation, but was currently stuck at that point. She did not get further with the task than she had at home

The mathematics lesson lasts 90 minutes and I keep recording incidents in the classroom. After the lesson, I ask Helena to stay for a short interview before her next lesson When the others have left, I ask her to recall the situation where the teacher spent 15 minutes helping her with the task.

Markku: Tell me How did you feel then?

Helena: Not anything special

Not anything special? What was it I thought I saw happening? I tell Helena that I had an impression that she had not learned anything from her teacher's explanations - that afterwards she did not understand any more than before She agrees - not fully, but to a large extent. Then I remind her of an earlier interview

Markku: You remember the interview we had earlier?

Helena: Yes.

Markku: You told me about your anxiety and the agony you often feel during mathematics lessons. I just thought that this was one of those situations. (All of a sudden, Helena burst into tears.)

Helena: I feel that it's no use for me to come to lessons, because I do not understand anything, and I never [.]

Her despair strikes me off guard I feel it strongly and deeply. I want to help. Hush, baby, don't you cry But she is not a small child whom I could embrace in my arms to let her cry out her sorrow. I keep my distance and intellectualise the problem. I try to reframe the situation for her She has no need to lose hope She is not the only one having problems

with this undeniably difficult issue. She needs to work on it. One of her friends has helped her in the class before There are resources in the school to help her. I recall that after the previous interview I recommended her to seek for these resources I ask if she has actually done so She had a few times and it had been useful, but doing this meant that she had missed the normal lessons when new things were taught. "Oh great!", I say to myself, "this has to be organised by idiots." It had, however, been her own choice not to miss any lessons of other subjects, and outside the regular classes she had a tight schedule with her art education. I question her for a while and find a solution that I can recommend. She promises to go for it, but I am not sure if she really is going to do it. Anyway, I feel that I have been able to offer her something and let her leave

Discussion

In an earlier report (Hannula, 2000) of this incident, I presented the factual observations and made the following paradigmatic conclusions.

> Looking at this episode closely we can see exaggerated versions of several things that do happen quite frequently in classrooms.
>
> 1) The teacher did not really listen to the student. She (the student) was not even given a chance to say what she was thinking
>
> 2) The teacher reduced the task into (its) most simple bits and pieces ("what is two times two?") and gave these for the student to solve.
>
> 3) The teacher was impatient with the wrong answers, and might have even appeared angry to the student.
>
> 4) Helena degenerated under the pressure and was totally unable to think clearly at the end. Certainly she knew that four times four is sixteen, even if she had difficulties with the signs
>
> One striking thing in this episode was the level of emotional pressure Helena kept for the whole lesson - for over an hour. She used her social connection (chatting, smiling) to relieve her anxiety. And yet under the surface she was feeling so bad, that being reminded of the incident she burst into tears. Noteworthy is also her reluctance to reveal her bad feelings, when I asked her about the situation. (pp 81-82)

The question remains, what added value does the fictional element give for this report? Among Richardson's (2000, p. 937) five criteria for good ethnography are impact and expression of a reality. I believe that with fiction-writing techniques I have been able to increase both of these related aspects. It should now be easier for you to engage with the story and experience something similar to what I did. That could increase your sensibility to anxiety in classrooms. Vivid, emotional reading experiences also allow us, as mathematics educators, to feel empathy towards anxious students and hopefully that motivates us to act. If inquiry is seen as a moral act, such effects (empathy, enabling exchange of experience, initiative for action) become pragmatic criteria for truth (Lincoln and Denzin, 2000, pp 1052-1055).

This version of the story of Helena only moderately takes the element of fiction into the writing. The inner voice of Helena is to a large extent based on her own statements in interviews and then created as plausibly as possible. Although I know that it is my construction (and only one of several possible) of what she might have been thinking, I also honestly believe that she could have been thinking roughly what I wrote Taking a more radical position, I could have abandoned the factual background and focused on expressing the experience (Denzin, 1994)

Although techniques of fiction writing have not been used in mathematics education research, it seems to be a trend in qualitative research such as in the field of ethnography. Denzin and Lincoln (2000, p. 3) claim that the narrative turn in qualitative research has already been taken:

> We care less about our 'objectivity' as scientists than we do about providing our readers with some powerful prepositional, tacit, intuitive, emotional, historical, poetic, and empathic experience of the Other via the texts we write. (Lincoln and Denzin, 2000, p 1058)

This article should not be read as a statement against paradigmatic writing in the field of subjective experiences. I am not suggesting that narrative reporting replaces more traditional writing, but is seen in addition to it Clearly, creative writing could be accepted as one important method of analysis within qualitative methodologies and as one style of reporting. The art of writing needs to be emphasised in qualitative reporting, and the field should be open to different forms of writing, including fiction Naturally, the readers should always be informed of the nature of the text they are reading

This article should not be read as making the claim that 'anything goes', as it is argued that postmodernists claim. However, I cannot but accept the postmodern multivocality: "We do not 'choose' to be postmodern. The historical moment has chosen us" (Lincoln and Denzin, 2000, p 1060). Although the criteria for science writing are different within different paradigms, they should remain high in all of them For 'new' forms of ethnographic writing, Richardson (2000, p. 937) has explicated her five criteria: substantive contribution, aesthetic merit, reflexivity, impact, and expression of a reality. These criteria are by no means easier to accomplish than the traditional criteria for scientific writing.

In Figure 1, I illustrated the problem of bridging the chasms between the student's and the reader's experiences In Figure 3, I illustrated aspects of qualitative methodologies. In both figures there is the 'final frontier' that we try to reach with our work: the reader, the research community or maybe the community of mathematics educators. Focusing on writing is just one way to reach out in that direction Researchers may also explore alternative ways to meet their audience directly through, say, reading out a story or acting out a play for them. Such a perspective will open up yet another aspect of methodology. Experiments in that direction have already been made Lincoln and Denzin (2000, p. 1048) "anticipate a continued performance turn in qualita-

tive inquiry, with more and more writers performing their texts for others." I am looking forward to that turn.

Reflecting further on LeGuin's thought that "truth is a matter of imagination", I want to say that imagination is a necessary precursor of truth. If I cannot imagine it, I cannot believe it. *The* truth may be out there in the world, but I can only reach *a* truth towards in myself. My quest to understand the world becomes an exploration into myself. The act of writing is the phase where I dive into the depths of myself and use my own experiences to reconstruct what I have learned during my research. And the readers will have to do their own reconstruction from what they read. Yet I believe that there are facts 'out there' and we may even gain an understanding about them. Although the facts may be independent of the style of telling, the style will give a particular flavour to the facts. One flavour may reason the truth of the statements, while another flavour will fill one's heart with empathy and a desire to act. Am I a transparent and objective reporter, or a poetic and polemic proclaimer? Do I live in an ivory tower or on the stage? Where is truth? Is it out there or is it within me? What is my quest as a researcher?

Acknowledgements

I wish to express my appreciation both to the Finnish Academy, for the funding of my research, and to the research group *Citizenship, difference and marginality in schools – with special reference to gender*, at the University of Helsinki, for encouragement and constructive feedback when I began to fictionalise.

Notes

[1] M. S. Hannula (Markku) is not to be confused with M. M. Hannula (Minna). They are both Finnish researchers in mathematics education, Minna publishing on young children's mathematical thinking (ed.)

[2] The following symbols have been used in the transcript: square brackets indicate text inserted or omitted by the author, ordinary brackets indicate plausible utterances for an unclear part of the original recording, and slashes mark simultaneous speaking by two persons.

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Seeing comes before words. The child looks and recognizes before it can speak.

But there is also another sense in which seeing comes before words. It is seeing which establishes our place in the surrounding world; we explain that world with words, but words can never undo the fact that we are surrounded by it. The relation between what we see and what we know is never settled. Each evening we *see* the sun set. We *know* that the earth is turning away from it. Yet the knowledge, the explanation, never quite fits the sight.

(Berger, J., 1972, *Ways of seeing*, Harmondsworth, Middlesex, Penguin Books, p. 7.)