

AFFECT TOWARDS MATHEMATICS; NARRATIVES WITH ATTITUDE

Markku S. Hannula

University of Turku, Department of Teacher Education

Abstract

This article will combine three different approaches used by the author before. One case study will be analysed from the point of view of different aspects of attitude influencing the student's behaviour (Hannula 2002a; 2002c), and, at the same time, from the point of view of students' goal regulation in the situation (Hannula, 2002b; In print). With fiction writing techniques, an effort is made to make it possible for the reader to immerse into the inner worlds of the students and into the feelings they experienced (Hannula, 2003).

Introduction

"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 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." (LeGuin, 1991/1969, p. 6.)

The structure of this report is different from the usual. Data, conclusions and theory are scattered throughout the report and intertwined at several places. The structure of the report will follow the logic of a story that I want to tell you. In fact, I am telling you several stories in this one report, and you may choose which ones you focus on. There is the story of two students and their different emotional experiences with school mathematics. There is also a story of an analytical framework, in which I tackle the many-headed monster called 'attitude' (Hannula, 2002a). Yet another story is telling about a desire and a need to expand the nature of stories told in mathematics education research. And, there is even the meta-story of how this story was weaved.

Empirically based fiction

When we study emotions or other subjective experience, we 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 fact, it needs to be bridged twice: between the student and the researcher and between the researcher and his audience (Figure 1). In qualitative research methodologies this problem has been framed as the problem of representing the lived experience of subjects of the study in the research report ("crisis of representation") (Denzin & Lincoln, 2000; Richardson, 2000).

Bruner (1986) distinguished between paradigmatic and narrative modes of

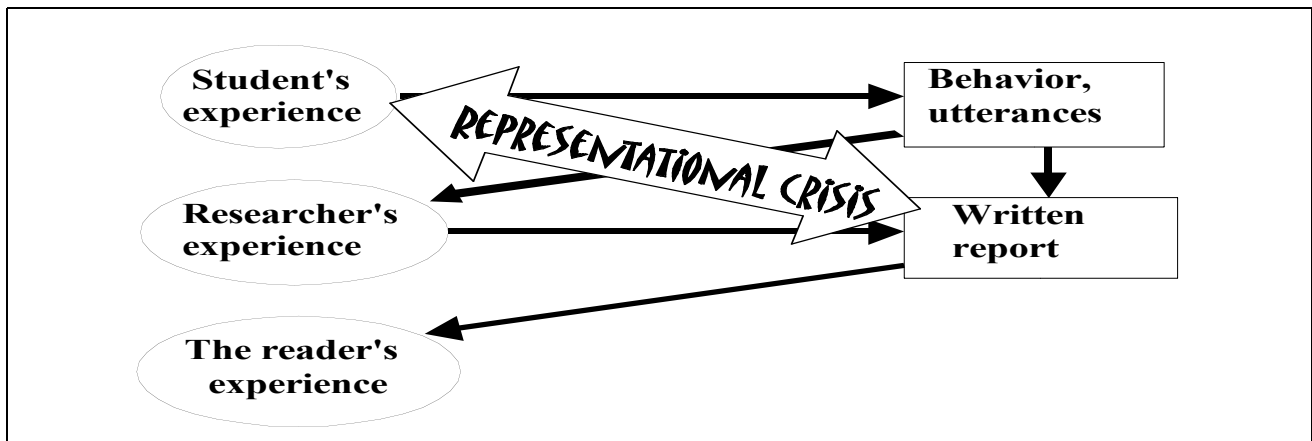


Figure 1. The pathway for transmitting the experience and the representational crisis.

knowledge. Scientific writing has traditionally relied on the paradigmatic mode, which aims at assuring the reader about 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).

Denzin & Lincoln (2000) and Richardson (2000) conclude that writing the report is part of the analyses 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.

Narrative writing with fiction writing techniques is a possible solution to bridge chasms between individual subjective experiences. It may be even the only solution, when we want our reader to relate with strong affective experiences of our subjects. It is often difficult for students to verbalise their feelings, and understanding their experience may rely heavily on the tacit knowledge of the researcher. Even when there is 'objective' evidence of emotional experiences in the data, the reader will not necessarily be emotionally moved by it alone. The reader will interpret the data from the background of his/her own biography, and it is difficult to share what one has never experienced oneself. For example, how could an adult male share experiences of a young girl being sexually harassed? How can we mathematically talented share the anxiety some students feel when facing mathematics tasks? Fiction writing techniques may help the reader – and the writer – overcome such obstacles.

The story I am going to tell is based on empirical data from a mathematics class that I taught for several months. The overall plot is about the development of two seventh-graders, Anna and Eva. I conducted interviews with all students of the class (in groups of three to four) and one further interview with Anna and Eva, because I found it interesting that their reactions were so different.

In Hannula (1997) I reported data (edited and organised), and analysed it as an example of how experiences influence beliefs. In Hannula (1998) the case was

analysed within a framework of affective and cognitive representational systems: emotions, affective schemas, values, schemas, beliefs, scripts, and planning and executing. Later, I revisited the case from the point of view of students' attitudes (Hannula, 2002c) and of goals (Hannula, in print). In these earlier reports, interview quotes were presented to support the interpretations. However, that data were already edited, and much of it were omitted to increase readability. The logic of the narrative required telling tale in certain order, and therefore the data were reorganised.

In present paper, I want to go further. While typical scientific writing is objectified, this time I want to increase the intensity of the reading experience and the lifelikeness of the story. Therefore, I shall write in present tense and from the first person view, as a stream of consciousness. That will require a shift from repeating 'raw' data to creating plausible, less structured, impressions. Such writing process is always extremely subjective. I do not only focus on certain utterances of the subject, but I also create connections and impressions that do not exist in the original data.

In the present paper, some original data is presented as endnotes to give a critical reader a possibility to evaluate the trustworthiness of the fictional narrative. However, it should be noted that text is based also on a syntheses of previous analyses and it is not easy to link each sentence to specific empirical data. I will also provide an example of how the fictional narrative is based on empirical data and how some aspects of it are – fictional. I will take the first chapter of Act I as an example.

In an interview Anna told about her primary school mathematics lessons as follows:

“... I've always stressed over math homework in primary school if I couldn't do them ... we always called each other each night, so that all tasks are correct, so you won't be embarrassed on the board. ... And we were always desperate, if we could not do it.”

“I was, for example, left with quite a trauma from the primary school about fractions, because I didn't understand them.”

That data indicate that mathematics had been a cause of stress for Anna, and that she had put a lot of effort to cope with it. I chose to write of an extreme case of this pressure. Hence, in this story, Anna is the one to receive help from her classmate, although at other occasions she could have been the one to give help.

There are also fictional elements that I used to express the emotional experience. Sighing and rain are elements I added to create gloomy mood. The metaphor of snow I have read somewhere, plausibly it was interview data of a student in some article, but I do not recall the actual reference. However, it seemed to fit nicely into this scene. The result of the process can be seen in the first paragraph of act 1.

Act 1. Past

[Anna] Fractions. Sigh. Looking out from the window: vertical rain. Homework, have to continue. Concentrate! Difficult, feels like struggling through deep snow.¹ Later. Julia calls, and we check solutions². Erase errors. Rewrite.

At school. Mrs. Jones does the customary checking of homework and her regular yelling. The last task. Almost half of the class has not done the task³. I have. Pride! She is angry, but not at me. She assigns students to present homework⁴. “Anna, you take 132.” A cold hand grabs deep in the stomach. “Relax,” says a voice in the back of my head, “It should be OK.” Take the exercise book. Walk to the blackboard. Copy the task – which number was it? Yes, 132. Copy it on the board. Go to your desk. Will the teacher grumble about the solution? Not today. Relief.⁵

A new topic. I think I’m getting this⁶. Teacher moves on to preach on the brackets again⁷. Dentist? Today? Check it! It’s in the calendar. In the bag. Look for it. It should be here! Can’t find it! Teacher calls: “Anna?”⁸ The question? The board! Not on the board. Blood rushing - hot! Question? Not a clue! Mrs. Jones? Sharp eyes on me. She’s got me.

[Eva] A voice from behind: “Eva?” Turn and see Johanna and Ginger. Smiling. We all are. Chirping silly things with friends. Sparkles of joy. Giggling and gossiping⁹. Teacher coming. Not angry. Good teacher. Continue work. Calculations flow smoothly. Sparkles fade into serenity. The rule echoing in mind. Like a poem. “Multiply crosswise, those you put on top, bottom numbers multiplied, that is under both. Simplify if you can.” Our teacher can explain so that everyone understands¹⁰. Not like Mr. Smith¹¹. Even mother could explain better. Annoyed mother: “Why can’t you understand this, yakety-yak?”¹² Scorn in her eyes. Mother thinks I am stupid. “I AM NOT!” shouts a voice in my head. And another whispers: “Am I?”¹³

Framework 1: situational emotions

These episodes illustrate different experiences that Anna and Eva remember from their primary grades and their different relationships with mathematics.

In the analysis, I shall focus on students’ attitude towards mathematics. Attitude is defined as “a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour.” (Eagly & Chaiken, 1993, p.1) In this definition, evaluation includes cognitive, behavioural, and affective evaluations.

In the episodes above, there are examples of emotions that arise from the situation, as affective evaluations. More specifically, these emotions are related to approaching a goal or not approaching a goal. Anna is struggling with her homework, and the difficulty of approaching that goal is inducing frustration. At school, her teacher catches her while she is not focusing on the lesson, and she feels fear of being punished verbally. Eva is feeling serenity, while doing the mathematics tasks without problems. She is reaching her goal without problems. Some other emotions are not related to mathematics, but to different goals, such as Eva’s joy with her friends.

However, not all evaluations are based on the situation alone. Eva’s memories induced emotions that were not situational. Why was Anna afraid to write a solution on the blackboard? We shall analyse those after act 2.

Act 2: New beginnings

[Anna] Excited. First day in new school. Everything is new. More new teachers today than during all primary years. A few familiar students. That is good. Chatting with Helena before the first mathematics lesson. Helena says: “My friend told that math at secondary school is much harder than in primary school.” And I reply: “Yeah¹⁴, and this school has high standards¹⁵.” It won’t be easy. It won’t be fun.

[Eva] Standing in the crowded hall. Hear them; see them – not one of them. Will they accept me? Laughter. It’s those three girls over there. Sigh. That could be me with Ginger and Johanna – if I didn’t move¹⁶. I won’t find friends like them here.

During the first lesson the teacher introduces himself and shares material to students. The students are divided into groups and they are asked to get to know their group members. Mathematics has to wait until the next day.

The teacher: “Ok, class. We continue with same grouping as the first lesson. You come from different classes and know different things. Take the first page and start from there. You may use textbook. If you find a task easy, you may move forward. When you find a task that is not too easy, try to solve it. If you cannot solve it, ask help from others in your group. If the others can not help you, ask help from me.”

[Eva] Start with the first task. Which rule? Start with brackets. Then? Don’t know. Others? Their pencils dance on the paper. I must be the only one who can not even do this first task¹⁷. The whispering voice in the mind, and the other voice shouting louder: “NO, I’M NOT!” Teacher will help me. “Teacher?” “Ask your group,” he says and walks away. My group? I don’t know them! Scorn in their eyes? Ask them?¹⁸ I haven’t done a single task yet. They think that I am stupid. Swallow the lump down the throat. Next task, maybe that is easier. Swallow the lump.

[Anna] New maths teacher is nice. Not to fear. Relief. No need to strain all the time¹⁹. Task done. Not correct. “Helena? Have you done 3d?” We compare solutions. Silly addition error. Hear the teacher stopping in close proximity. Feeling the blood rushing. Senses sharpen up. Stay alert²⁰! “Yes, teacher?” “I’m just checking how you proceed. Uhm. Don’t forget that you may jump forward if you think that these are too easy.” Silly me, no need to strain. He IS nice. He leaves. I say to Helena: “These are so easy. Let’s try the task seven, OK?” Helen glances through the tasks, and replies with a smile: “OK!”²¹

Framework 2: Expectations and associations

In these episodes, we see two kinds of ‘secondary’ emotions. Eva and Anna have different expectations about how things will turn out, and thus make different cognitive evaluations of the situation. These expectations include an affective ‘colouring’, based on cognitive knowledge (memory) of one’s own emotional reactions in similar situations (LeDoux, 1998, cited in Schlöglmann, 2002; see also Schlöglmann, this volume). Sometimes emotions are only expected (as before the

first lesson). At other times, expectations may induce also an emotional experience, as was the case in previous chapter when Anna was afraid to go to the blackboard.

I used the opportunity to illustrate here one further process, although empirical evidence in my data is vague. Instead, it is supported by research on automatic emotional reactions that operate in the unconscious and are not controlled by cognition (LeDoux, 1998, cited in Schlöglmann, 2002; Power & Dalgleish, 1997; see also Schlöglmann, this volume). Expectations can not explain Anna's reaction when her teacher stopped by her side, while she consciously knew that there is no need to strain. However, if the situation activates an automatic emotional reaction, it may be contradictory to student's expectations.

The episodes above illustrate also how the students' 'attitude' towards mathematics may change. Students face situations that induce emotional reactions. Based on these reactions and interpretations made of them expectations and automatic reactions may change. However, there is yet more to student's evaluations of mathematics.

Act 3: Confrontations

[Anna] Hate math. "To hell with it!" Math book flutters to the far corner of the room²². "He's such a clown. He never teaches anything." Outside: flakes of wet snow falling. Go pick up the book. Put it in the bag. "What the heck. Julia can tell tomorrow how to do it." Something is wrong. Not learning. Gossiping in math class. Future? Lagging behind students from other classes. Stupid clown teacher whining: "please try to work a little bit." Damn it! He should make us work!²³

[Eva] Sitting with Paula and Ursula. Not alone. Listen Paula telling about last night's party. Hear teacher tell to check homework in groups. Couldn't do the homework. Ursula's book remains closed. She has done all tasks. She thinks I'm stupid²⁴. I could learn if the teacher would teach²⁵. Hear next table, Julia explains to Anna: "This is, umm, - mathematical kind of a trick." Paula: "Don't say mathematical, it makes me puke."²⁶ Ha-ha! She said it! She has the guts to say it²⁷!

Framework 3: Values

Both Anna and Eva want to learn mathematics, but this goal has different value for them in relationship to other, competing goals in the mathematics class. For Anna, learning mathematics has much potential value in her life. She would even suffer the displeasures of a strict teacher, as the cost of learning. For Eva, mathematics is only a burden she needs to cope with. Acceptance from friends is more important.

I agree that this is a simplified interpretation of the multitudes of reasons behind how they feel about mathematics. Yet, it illustrates the fourth aspect behind students' attitudes toward mathematics, namely values. Learning mathematics is a goal among several competing goals in young adolescent lives. Do they choose to struggle to learn, or do they give up effort and pursue other goals? The question is not only of the emotions – experienced or expected – but also of the perceived value of

mathematics. This value can be instrumental, as when mathematics is seen as necessary for a desired career. The value may as well be socially mediated from family or friends.

Act 4: Resolutions

[Anna] Homework. Can do only the first task. So what? Just put the book in the bag. Worried. Tomorrow it'll be just Julia teaching this old stuff. We will get no further²⁸. Remember yesterday's math class: talking rubbish and nitpicking the teacher. Shame²⁹. Wish we had another teacher? Will not happen. But we need to learn. Remember good moments: enjoyed projects, teaching each other. Remember primary school: dry math. Strain. But we need to learn math faster. Wasted lessons, talking rubbish. Sigh. Pick up math book. Read the task once more. It should be explained somewhere in the textbook³⁰ ...

[Eva] Today I will study well! I'll sit alone so that I can concentrate. Paula comes next to me. And Ursula. I don't like working with them³¹. Smile to them. They think that whatever I say, I'm wrong. I AM NOT STUPID! Chitchatting. Remember working with Julia: she listened³². Teacher writing on the board. Teaching. Not teaching, just a task: " $-5 \times (-3) = ?$ ". We haven't done such calculations! Listen, maybe he is explaining. "Discuss in your group what you think the result could be." Not fair! He has not taught us how to do such calculations! Say out loud: "You have not taught it! How can we learn anything when you don't teach?" Anna: "It depends a bit on ones own attitude too³³".

Framework 4: Goal regulation

This finishing episode opens up a new issue. Earlier episodes illustrated changes in attitude towards mathematics as reactions to experiences in the classroom. However, a change of attitude is not only a reaction nor is it changed only in mathematics class. Attitude is also about choices. Furthermore, choices are made in social settings.

The case of Anna and Eva suggests that there are several necessary conditions for successful regulation of motivation (Hannula, in print; see also Hannula, 2002b). First, there must be a goal (learning mathematics) that is not accessible by old means (listen to the teacher). One must know of some other mean(s) (study more self) and believe that the goal is accessible by the new means (self-confidence). One possible obstacle is automatic emotional reaction to the available means (ashamed to ask for help). Another possible obstacle is conflicting goals (social goals), which have higher value for the individual.

Discussion

This story of two students should make clear how different the experiences of students may be in one class and how the development of their affects may follow very different paths. Comparing Anna and Eva will also give some ideas of how affect towards mathematics may change.

In Hannula (2002a) I presented an analysis of the concept attitude, and suggested that it consists of four different evaluative processes: situational emotions, expectations (memories of emotions), associations (automatic emotional reactions to certain stimuli) and values. The present paper is an example of using the analytical framework for an in-depth analysis of the development of student's attitude towards mathematics. Furthermore, I am combining it with a framework for self-regulation of motivation (Hannula, 2002b; in print). These two frameworks seem compatible and together they provide a functional framework for analysing these cases.

This article should not be read as a statement against paradigmatic writing in the field of subjective experiences. However, narrative reporting is needed in addition to writing that is more traditional. 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 reality. Fiction writing techniques can increase both of these related aspects. It should be now easier for the reader to immerse into the story. Immersing into such vivid emotional experiences allow us to be more sensitive to emotions in the classroom, which otherwise might remain unnoticed. For example, in case of Eva, I became aware of her feelings only when she expressed those in an interview. Furthermore, writing in new forms is also a way to see data in new ways. Rewriting the case study to its present form allowed me to comprehend the logic of Eva's behaviour from the point of view of her social relationships.

References

- Bruner, J.S. (1986). *Actual minds, possible worlds*. Cambridge, MA: Harvard University Press.
- Denzin, N.K. & Lincoln, Y.S. (2000). Introduction: the discipline and practice of qualitative Research. In Norman K. Denzin and Yvonna S. Lincoln. (eds). *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage, 1-29
- Eagly, A.H. & Chaiken, S.: 1993, *The Psychology of Attitudes*, London: Harcourt Brace College Publishers.
- Hannula, M.S. (1997) Pupils' reactions on different kind of Teaching. In G. Törner (Ed.) *Current State of Research on Mathematical Beliefs IV; Proceedings of the MAVI-4 Workshop April 11-14, 1997*. Schriftenreihe des Fachbereichs Mathematik, SM-DU-383, Gerhard-Mercator Universität Duisburg, 33-40
- Hannula, M.S. (1998) Changes of beliefs and attitudes. In E. Pehkonen & G. Törner (eds.) *The state-of-art in Mathematics-Related Belief Research, Results of the MAVI activities. Research Report 195*. Department of Teacher Education, University of Helsinki. 198-222.
- Hannula, M.S. (2002a). Attitude towards mathematics: emotions, expectations and values. *Educational Studies in Mathematics* 49 (1), 25-46
- Hannula, M.S. (2002b). Goal regulation: needs, beliefs, and emotions. In A.D. Cockburn & E. Nardi (Eds.) *Proceedings of the 26th Conference of the International group for the Psychology of Mathematics Education, Vol. 4*. Norwich, UK, 73-80

- Hannula, M.S. (2002c). "So I changed my attitude"; A case study of attitude and its development. In H. Silfverberg & J. Joutsenlahti (Eds.) *Tutkimuksella parempaan opetukseen*. Reports from the Department of Teacher Education in Tampere University A 26/2002, 63 – 72
- Hannula, M.S. (In print). A case study of two students' beliefs systems and goal systems in a conflict over teaching methods. Proceedings of Norma 2001 conference.
- Hannula, M.S. 2003. Fictionalising experiences - experiencing through fiction. *For the Learning of Mathematics* 23 (3), 33-39
- LeDoux, J. 1998. The emotional brain. Phoenix, Orion Books Ltd.
- LeGuin, U.K. (1991) (1st edition 1969). *The left hand of darkness*. Great Britain: Macdonald & Co.
- Power, M. & Dalgleish, T.: 1997, *Cognition and Emotion; From order to disorder*, UK: Psychology Press.
- Richardson, L. (2000). Writing: A method of inquiry. In Norman K. Denzin and Yvonna S. Lincoln, *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage, 923 – 948.
- Schlöglmann, W. 2002. Affect and mathematics learning. In A.D. Cockburn & E. Nardi (Eds.) *Proceedings of the 26th Conference of the International group for the Psychology of Mathematics Education, Vol. 4*. Norwich, UK. 185 – 192.

¹ "I've always stressed over math homework in primary school if I couldn't do them. ... I was, for example, left with quite a trauma from the primary school about fractions, because I didn't understand them."

² "...we always called each other each night, so that all tasks are correct,..."

³ "First we checked tasks. Or the first thing was that she asked who had not done the task, ha-ha. ... It took always a year or something. And then she scolded us, because nobody had done it, ha-ha."

⁴ "And we went through the tasks, so, that she just commanded someone from the class to do it on the board" "The teacher never even asked, who would like to do some task on the board, she just commanded."

⁵ "... so you won't be embarrassed on the board. ... And we were always desperate. ...The lessons caused awful traumas, 'coz one always strained somehow awfully."

⁶ "...theory went quite easily for me, ..."

⁷ "[The most boring thing was] when the teacher was explaining, ... she just reverberated the old stuff on and on."

⁸ "... I remember how our teacher, if someone was not listening, she would ask by name, for example, "Anna?" – and then I was digging for something in my bag and she noticed that I wasn't concentrating at all and didn't know at all where were we...."

⁹ Eva: "Well, at least for me, when our, hah, sort of. I was in a. No, nothing. ...While one could natter." I: "And that was fun?" Eva: "Nooo. Well, yes, heh {apolozisingly}" "And I remember the one lesson, when there were girls from our class, and we just chatted and told weather we shall marry some rich man {laughter}"

¹⁰ "We had a teacher ... who taught so well, that everyone got excellent marks." "[A good teacher] goes through the things so long time, that everyone understands. ... and explains in an easy way [and then Anna explains a memory rule that was taught by their teacher] ... she taught everything like that."

¹¹ "I had two teaches at primary school. One taught really well, and the other really badly."

¹² "I mean my mother doesn't. My mother doesn't. Well, mother *doesn't*. ... Well if she starts to help me and I don't understand something, then [she would say] 'Why can't you now understand this! Yak, yak, yak!' " Here I interpreted also the nonverbal communication: Although there were other students present in the interview, it was possible to see and hear that Eva was anxious about this issue.

¹³ Here, I am revealing my key interpretation of Eva. She was struggling to cope with the shame she feels, because of her own belief that she has no mathematical talent. This shame I related also to her anxiety with her mother. Evidence for this struggle came from several sources. First, there was evidence that Eva thought that others thought that she was stupid. In interview, she said: "It annoys me, that when I got a seven in a math test [scale is 4 to 10], then Ursula

looked [at me, with a face] that: ‘You are so bad at math.’ Really!’ In class, she asked, once, when she was having difficulties if I thought that she was stupid. I denied it. Later she commented: “... even though someone thinks that I am stupid.” While there was no explicit reason for Eva to believe that others thought she was stupid, I concluded that the reason was her own insecurity of her talent, which was evident in interview data. When she was asked if she thought she was good at math, her immediate reaction was a “No”, with a laughter, as if it the whole idea was funny. However, she didn’t quite accept it, and continued: “I don’t know. It like, umm, depends like what you are doing,”

¹⁴ “I expected that in secondary school one needs to be really sharp.”

¹⁵ This was the reputation of the school.

¹⁶ “For me, it was so total, the change when I moved here. ... All my friends remained there, and I had no one to talk with...”

¹⁷ “...and we had spent some three lessons. I thought that I was the only one not to understand anything.”

¹⁸ “I asked you advice and you walked away and said: ‘Ask your group.’ I didn’t know them. Sure I’d dare ask them.”

¹⁹ “...at the very beginning it was really nice, because from the first mathematics lesson I noticed, that somehow, at lower grade it was so strict, it was such a relief that I no longer needed to strain in math class.”

²⁰ There is only indirect evidence to the assumption that Anna had such automatic emotional reactions. In the beginning, all students behaved as if there was strict discipline in the class. Change to more relaxed classroom behaviour was gradual, which I see as an evidence of automaticity of emotional expectations.

²¹ In my observation data there is evidence of the effective and enjoyable collaboration of Anna and Helena.

²² “... had homework, so that I have tried, but then I’ve lost my nerves, ... then I’ve, hah, thrown the books against the wall ... I’ve done it a few times, too.”

²³ “And then, after a while, some couple of weeks, it started to annoy me, that one didn’t learn anything. Well, it must have depended from my own attitude most, and I begun to feel pissed off, and I insulted you and I insulted all the others and I only used bad language in the class, and I didn’t get anything done.” “... and you would have more discipline in the class” “... now it is too relaxed. Now I am doing the math homework just barely, so that I do when I have the energy for it.” “... but her teacher had been so strict that she had done her homework. So when she went to upper secondary school to a math class, she had it real easy. But are we going to have it easy, if ...” “so that if I have not understood something, and if ... Julia had understood, then she has always taught me, and that has worked well.” “Half of the students are always explaining, like “Paula, are you going to get the new trousers?”

²⁴ “I had to be silent, because I was so stupid, ‘coz I don’t understand it and all the others do.” See also footnote 13.

²⁵ “When we start with a new thing, you never explain it on the board. That’s annoying.”

²⁶ Paula’s utterance is a direct quote from my observation data.

²⁷ Eva: “Well, you can write at least this: that I have lost my nerves with your ‘theoriical asumptotes’. I am through with it. I want normal mathematics ... So that we first do the new thing for the lesson. Then that is asked from everyone in a row. Then you give pages and everyone counts and asks the teacher if something is wrong. Thus!”

²⁸ “Are we learning as efficiently as we should. Are we learning?”

²⁹ “...it is not only your fault, so that our own attitude is maybe somewhat wrong. Or like I had in the beginning ... really bad attitude.” See also footnote 23.

³⁰ “So I changed my attitude. I thought that it doesn’t help anyway and so on. So then I changed my attitude, and decided to study more myself.”

³¹ “I try to study well at the beginning of every lesson, but then I am disturbed so it annoys me. Well, I don’t know, coz at the beginning of every lesson I try. Today I went to sit alone. Then Paula comes next to me. And then Ursula comes there close and I can’t be calm. I just can’t be.” See also footnote 13.

³² “In that group I haven’t got a right to say anything. They thing that whatever I say, I’m wrong. Then in Julia’s group I might be right. It {laughter} isn’t necessary right, but I have a chance to say something...”

³³ Utterances of Eva and Anna are direct observational data.