COMMUNICATIVE POSITIONINGS AS IDENTIFICATIONS IN MATHEMATICS TEACHER EDUCATION

Hans Jørgen Braathe

Oslo University College, Norway

Student teachers positioning related to own emotions and experiences, the mathematics and the teaching and learning of mathematics, and the classroom, teachers and others are theorised, and exemplified, as aspects of identifications as becoming mathematics teachers.

INTRODUCTION

As a teacher educator I have searched for signs of how the student teachers in the pre-service mathematics courses change from seeing themselves as students of mathematics to seeing themselves as teachers of mathematics. That is negotiating identities as mathematics teachers.

Teaching is not a knowledge base, it is an action, and teacher knowledge is only useful to the extent that it interacts productively and dynamically with all of the different variables in teaching. Therefore connecting the act of teaching and teacher identities focuses on identities as something people do which is embedded in social activities, and not something they are.

Identifications as teachers of mathematics, through acting, or performing, as teachers in mathematics, are closely associated with meaning making in mathematical contexts. In this paper I will outline descriptive devices in order to analyse the properties in texts and the technical skills of mathematical communication that are employed in the service of mobilizing teacher identities by student teachers.

Dewey (1916) examined the purpose of education in a democratic society. He writes: "society not only continues to exist *by* transmission, *by* communication, but it may fairly be said to exist *in* communication" (p. 4, emphasis in original). He further holds that "This transmission occurs by means of communication of habits of *doing, thinking* and *feeling* from the older to the younger" (p. 3, emphasis added by Ongstad 2006).

Conceiving teachers' knowledge as part of a complex set of interactions involving *action, cognition and affect*, places teaching as a complex practice. A main perspective then is a view of teaching and learning as communication (Braathe, 2007; 2009; Ongstad, 2006; Sfard, 2008).

POSITIONING THEORY

"Positioning Theory" has been discussed and developed among others by Harré and van Langenhove (1999). Their concept of positioning is offered as a dynamic replacement of the more static concept of role. Role identity theory views society as made up of roles, and explains how roles are internalised, as cognitive schemes, as

identities that people enact and try to live up to (Stryker and Burke, 2000). "'Position' will be offered as the immanentist replacement […] of transcendentalist concepts like 'role'" (Harré and van Langenhove, 1999, p. 33).

Harré argues that during communicative interactions, people use narratives, or "storylines", to make their words and actions meaningful to themselves and others. They can be thought of as presenting themselves as actors in a drama, with different parts or "positions" assigned by the various participants. Positions made available in this way are not fixed, but fluid, and may change from one moment to the next, depending on the storylines through which the various participants make meaning of the interaction.

> In positioning theory, the concept of positioning is introduced as a metaphor to enable an investigator to grasp how persons are 'located' […] as […] participants in jointly produced storylines.

> One mode of positioning of particular interest to us […] is the intentional self-positioning in which a person express his/her personal identity (Harré and van Langenhove, 1999, pp. 61-62).

IDENTITIES

Identities have been used as a strategic concept in research addressing the relationship between individuals and society, and, related to this, in formulating how selves are socially constituted, and in explaining how social structures or processes affect individuals' lives.

The kind of questions asked in traditional social science are *what* identities people have, what *criteria* distinguish identities from each other, and what *part* identities play in the maintenance of society and in enabling the functioning of social structures and institutions. In this respect social identities are assumed to have an overarching relevance (Stryker and Burke, 2000).

Underlying most of these approaches, whether sociological or social psychological, are concepts of identities that can be characterised as essentialist and realist. The concepts are essentialist in the sense that identities are taken to be properties of individuals or society; and realist in the sense that it is assumed that there is some kind of correspondence between identities and some aspects of social reality (Sfard and Prusak, 2005).

Across the social sciences, the main criticism of, and alternatives to, traditional models of identities are found in a variety of social constructionist approaches. The concept of identity produced is designed in part to deal with variability and flexibility and how even the most obvious identities are negotiable. Although they are various, these approaches share in common an emphasis on the multiple ways that social identities are constructed, negotiated and performed. Contrary to the use of identity for the purpose of classification, or as a causal variable related to other phenomena,

this view of identities, it is argued, enables a social constructionist to provide a more dynamic view of individual-social relations.

A social constructionist approach also draws on the idea that symbolic or cultural resources influence identities, and how identities are constructed through historical, political, cultural and discursive practices. It is argued that the symbolic or linguistic resources available in the discourses provide possibilities and constraints on identities individuals can take. Methodologically this is used empirically to identify the linguistic resources or repertoire available in a culture for individuals to construct their self-understanding. In other words, they aim to show how cultural narratives become a set of personalised voices and positions. This offers alternative 'texts of identities'.

IDENTIFICATIONS

The positioning theory developed by Harré and van Langenhove (1999) is based on social constructionism. They see positioning in terms of a triad of interrelated concepts: storyline, positions and actions/acts. The storyline is the narrative that is being acted out in the metaphorical drama. Within it, the positions are the parts being performed by the participants. The actions of the participants are given meaning by the storyline and the positions available, and once given meaning become social acts. This positioning can be seen as interactors identifying themselves as actors, and being identified by others, in a metaphorical drama.

The focus on identifications as a participant's resources generates different questions and a different focus. Thus, instead of asking what identities people have, the focus is on *whether*, *when* and *how* identities are used in social acts, for example performing as teachers of mathematics.

In their pre-service teacher education student teachers have to produce texts answering different tasks and reporting from group works and from practicing teaching in practice schools. Text in this connection will also include mathematical text. These texts can be seen as utterances in a dialogic relation to their teachers in the teacher education, or as social acts within the storylines of mathematics teacher education. These social acts are seen as positionings, or identifications as becoming teachers of mathematics.

I investigate student teachers' identifications relative to the three aspects of action, cognition and affect. Instead of methodologically trying to identify available positions in these storylines as categories following a social constructionist methodology, I will use another related dynamic concept of communicative positioning derived from Bakhtinian thinking searching for these three aspects. This concept of positioning is used as an analytic tool to analyse the student teachers texts as they are seen as struggling for making meaning of teaching and learning of mathematics.

POSITIONING AS A TRIADIC DISCURSIVE CONCEPT

The communicative positioning developed and used by Ongstad (2006) is partly generated from Bakhtin's essay "The problem of speech genres" (Bakhtin, 1986, pp. 60-102). Ongstad identifies Bakhtin's communicative elements necessary for an utterance to communicate in dialogic relations. One of these is how the utterance is positioning, and positioned, as such by addressing someone, referring a semantic content, and expressing feelings and intentions.

Methodologically the utterance is seen as the unit of analysis. We communicate through utterances. Utterances are any sufficiently closed use of sign that makes sense. All utterances are uttered and interpreted related to expectations of genres, i.e. contexts that helps us to understand the utterance. Genres are ideological, i.e. they give tacit premises for the utterances' positioning in the communication (Bakthin, 1986). Ideology is broadly defined as unspoken premises for communication (Braathe and Ongstad, 2001). It is something we think *from*, not on. Genres can be described as kinds of communication.

The genres are to be seen as triadic in the same sense as the positioning of the utterance, that they simultaneously give potential for the addressing, referring and the expressing. The three aspects are seen as parallel, inseparable, reciprocal, simultaneous processes (Ongstad, 2006).

In the mathematics teacher education context the three aspects are seen as positioning related to addressing the classroom, teachers and others, referring the mathematics and the teaching and learning of mathematics, and expressing own emotions and experiences. Students' different texts relate to different components of teacher education. Consequently they are positioned differently with dominance either on the expressive, referential or the addressive aspect. However, as utterances, all three aspects are simultaneously present, and consequently identifying the student as becoming teacher of mathematics related to all three aspects. This identifying process focuses identities as something the student teachers do, as communicative positioning, which is embedded in the social activity of teacher education.

MATHEMATICS AS GENRES

Seeing mathematics and mathematics education as a kind of communication will be to see mathematics and mathematics education as genres. I will hold the view that in their pre-service training student teachers are parts of different genres, kinds of communication, including mathematical, and potentially experiencing different ways to act as a teacher. It is helpful to call this process 'learning'. This will theoretically be connected to seeing learning as semiosis in the field of teaching mathematics. This connects to seeing learning as communication. This shifts seeing development from a psychological to a semiotic perspective so as to locate developmental principles in the making of meanings. As I see learning, or developing of identities, as being positioned in communicational genres, I locate identities as dialogically situated in, negotiated and formed by genres, and so can have many expressions dependent on

the context. Identity can then be seen dynamically combining the personal, the cultural and the social (Braathe, 2007).

Sfard (2002; 2008) takes a similar "communicational approach to cognition" (2002, p.26), where she holds that "[t]hinking may be conceptualised as a case of communication" (2002, p. 26), and even constructs the concept of "commognition" (2008, p. 296) to emphasise the necessary connection between the two. She further holds that "[l]earning mathematics may […] be defined as an initiation to mathematical discourse, that is, initiating to a special form of communication known as mathematical" (2002, p. 28).

Furthermore Sfard holds that "[c]ommunication may be defined as a person's attempt to make an interlocutor *act, think or feel* according to her intentions" (Sfard, 2002, p. 27, emphasis by me). Discussing factors that give discourses their distinct identities Sfard identifies meta-discursive rules as

> usually not something the interlocutors would be fully aware of, or would follow consciously, […] there are special sets of meta-rules involved in regulating interlocutors' mutual positioning and shaping their identities (ibid. p. 30-31).

TELLING IDENTITIES

In Braathe (2007) I discuss the theoretical framework presented in Holland et al (1998), especially their use of the Bakhtinian diverted concept of "the authoring self". I relate this Bakthinian concept to Sfard and Prusak (2005) and their conception of identity (Braathe, 2009). They define identities as stories about persons. In a communicative and dialogic sense they adhere to that "[i]dentity […] is thought of as man-made and as constantly created and re-created in interactions between people" (Sfard and Prusak, 2005, p.15). Stories about persons, the term identifying, is in their context to be understood as "the activity in which one uses common resources to create a unique, individually tailored combination" (p. 14). From seeing the processes of identifying as discursive activities, the activities of communication, they suggest that "identities may be defined as collections of stories about persons or, more specifically, as those stories about individuals that are *reified, endorsable and significant*" (2005, p. 16, emphasis in original). This definition is an attempt to avoid the problem of essentialism, the extra-discursive existence that often is either implicit or explicit in the use of the concept of identity in educational research.

Discursive acts of positioning, identifying, are seen in my context as communicative acts for establishing meaning. In the teacher education students' produced texts can be seen as utterances that communicatively position the student teacher dynamically combining the personal, the cultural and the social.

These texts/stories are not about persons, but about the explorative mathematics activities in their pre-service training, where the students have to explain mathematical patterns, connections and reasoning. These texts are seen as utterances in the genres of teacher education, told by the students of "themselves" to their

teacher. Sfard and Prusak (2005) call these stories the student teacher's first-person identity. On the other hand my analysis of positioning of these texts will be called stories about stories. These stories about stories can also be seen as the student teacher's third-person identity told by me as the researcher. In teacher education the resources, voices, used by the student teacher when writing in the different genres of mathematics educational texts, are found in dialog both with practice, theory and experience, and as such seen as influencing the negotiation of their semiotic identifications as teachers of mathematics.

The analysis of positioning, applying the triadic discursive concept to these texts, explores how the students position themselves in relation to 1) own emotions and experiences, 2) the mathematics and the teaching and learning of mathematics and 3) the classroom, teachers and others.

Analysis of positioning

To illustrate the analytical tool, I give a short extract of a text produced by a student teacher. The text is translated into English by me.

The student teacher, Ina, is solving a task on finding and describing the pattern of a given number sequence. This text is produced in her second semester in her teacher training.

The number sequence is given: 2, 7, 12, 17,….

The student teacher is asked to:

A: Find the next two numbers in the sequences.

B: Find the recursive and the explicit formulae for the sequences.

C: Explain why the formulae are correct.

The handwritten extract:

A
a)
2 - 7 - 12 - 17 → 22 - 27
Man finner det neste tallet ved å legge til 5
til det foregående tallet.

B
Tallfølge a er en aritmetisk tallfølge og det vil
si at differansen, d, mellom leddene er konstant.
Rekursiv respektiv eksplisitt formel er som følger:

REKURSIV FORMEL: $A_{n+1} = A_n + differanse/5$
EKSPLISITT FORMEL: $A_n = A_1 + (n-1) \cdot d$ /
$A_n = 2 + (n-1) \cdot 5$

De rekursive formlene er logiske og er allerede
forklart med ord og viser altså hva vi må
gjøre for å finne neste ledd i tallfølgen.

De eksplisitte formlene fungerer annerledes
for de skal hjelpe oss til å finne et hvilket
som helst ledd i tallfølgen.
Tallfølge a viser at vi må ha med det
aller første tallet i tallfølgen (A₁), dette
adderes med (n-1)·d (multiplisering først.)
og n-1 er viktig, for vi skal finne f eks det
10. leddet blir n=10. Vi må her trekke fra
én hvis ikke regner vi ut det 11. leddet.
Eks fra tallfølge a der de 6. leddet er 27:
$A_6 = 2 + 5 + 5 + 5 + 5 + 5 = 2 + 5^5 = 27$

The written text in <u>A</u> is:

a) One finds the next number by adding 5 to the previous number.

In <u>B</u>: The number sequence a is an arithmetic sequence and that means that the difference, d, between the terms is constant. Recursive respectively explicit formulae are as follows:

In <u>C</u>: The recursive formulae are logical and are already explained in words and shows what we must do to find the next term in the number sequence.

The explicit formulae functions differently because they shall help us to find any term in the number sequence.

The number sequence a shows that we must include the first number in the number sequence (A_1), this is added to (n-1)·d (multiplication first..) and n-1 is important, because if we shall find f. ex. the 10. term then n=10. Here we must subtract one if not we are calculating the 11. term.

Ex from the number sequence a where the 6. term is 27:

The expressive aspects of utterances are related to form and what this form symptomatically can express. One can read how Ina uses the arrow connecting the next two numbers in a) either as a (rough) draft she does to help her own thinking, and/or it can be read as a communicative utterance where she explains how the next number in the sequence is constructed. In both cases Ina uses an informal, illustrative, nearly oral, genre. The written text in a) is referring to an impersonal "one", which is quite familiar in mathematical texts in textbooks. We can read it as a "rule giving" genre; written in an impersonal voice, in present tense and in general terms (it is about "the next number").

In <u>B</u> Ina lists the two formulae. In her writing of the recursive formula she writes /5 to indicate that the difference is 5 in this case. The / is kept in the explicit formula, but "difference" is replaced with the variable d. This form may be a symptom of insecurity in the mathematical terminology. It could be read as if the difference in meaning, expressed with written symbols, is not quite clear to her yet. In both cases, writing formulae, she is writing in what can be identified as from a technical genre, as in her mathematics textbooks. Ina seems to have grasped the ideas, but I read this as she has not yet acquired the genre as a cultural tool, and have difficulties in expressing these ideas in writing. This mix of genres could be seen as voices from her earlier school experiences and also from the lectures at the teacher college.

The referential aspects of the utterance are related to the mathematics in her text. She has got the answers correct. The notions of pattern and generalisation, in particular generalisation expressed in formulae, plays an important role both in the immediate context of situation through the instructions given in the statement of the task to "Find the […] formulae" and to "Explain why the formulae are correct" as well as through the assessment criteria and more generally through the genre of investigation in which 'spotting' and generalising patterns is highly valued.

Her explanation of the recursive formula refers to what she has written in a), and she uses 'logical' as a self-explaining argument. Both formulae are given an authority as mathematical objects that can perform activity. The recursive formula "*shows what we must do",* and the explicit formula "*help us to find any term".* However when Ina presents the process she is also including actors in addition to the mathematical objects, as inclusive *"we"* and *"us"* respectively. This is also expressed in: "*One finds the next number", "The number sequence a shows that we must include", "because if we shall find", "Here we must subtract one if not we are calculating the 11. term".* These actors can also be read as a general "one" or "we", rather than specific persons. Thus, the process of varying values in the problem is not shown as

something done by the author herself. It shifts from being a process that may be carried out by any mathematician, to a process performed by mathematical objects themselves or by some unspecified agent, and finally, using the grammatical metaphor of nominalization, to an object which may itself have properties and variations. This expression of agency in the utterance serves as construction of a picture of her mathematical world.

The addressive, or relational, aspects of the utterance are related to normativity, here in the sense of usefulness related to role of mathematics teacher in the primary school. Usefulness here includes ethical values concerning teaching and learning. Her explaining text in a) can be identified as "rule giving" genre within mathematics, and as such as part of the repertoire of the becoming teacher. In <u>C</u> she has included in brackets "*(multiplication first..)*". This can be read as addressing the reader as a reminder of the rules for the priority of the numerical operations.

The normative claim can be understood as part of an instrumental view on teaching and learning mathematics. This can be seen as an element of Ina's experience and praxis as part of her stories of mathematics as a subject where she has to learn the rules, and where you have true or false answers. That is an ideology within the genres of teaching mathematics.

In the utterance Ina uses a mix of genres. However, one genre seems dominant, the "Explaining" or "Introduction" genre. This is demonstrated by the explicit formula in <u>C</u> as she is both explaining the general by an example and by the nearly tactile metaphor she uses in explaining the explicit formula. This is a genre which is frequently used in the mathematics texts in her study. Explaining by examples is used frequently both in educational texts and also in teaching sessions, both at the college and in the practice schools. One could see this as a sign on her appropriating the voices of mathematics educational genres. This appropriation, making meaning of mathematical communication, is seen as the negotiation of identity as becoming teacher of mathematics. This shifts seeing development from a psychological to a semiotic perspective so as to locate developmental principles in the making of meanings.

THEORIES FOR RESEARCHING TEACHERS IDENTITIES

In this paper I have presented Positioning Theory as Rom Harré and associates have developed it. Their concept of positioning has been interpreted as persons' identifications in a social psychological sense. From seeing teaching and learning as communication I have inserted a semiotic related concept of positioning based on Bakhtinian dialogism. This triadic discursive concept of positioning is then used as an analytic tool in analyzing identities according to the definition of identity proposed by Sfard and Prusak (2005). Here the utterance, as student's text, in the genre of mathematics teacher education is used as the unit of analysis.

I see development of identities as learning, and theoretically investigating negotiation of identities from a semiotic perspective, not a psychological one. Therefore I explain

identifications exposed in student teachers' utterances as meanings within the genres, and the underlying ideologies, of teacher education. In the Norwegian mathematics classroom there are different ideologies simultaneously represented by different actors (Braathe and Ongstad, 2001). Essentially these are ideological conflicts within which the student teachers are struggling to create and negotiate their teacher identities. Going back to Dewey and seeing education as communication of doing, feeling and thinking from the older to the younger, has given me support for searching within theories of communication for a triadic understanding of learning to become mathematics teacher. Becoming a mathematics teacher includes building professional identities. This again includes knowledge of and identification with both mathematics and teaching and learning of mathematics.

The concern then is to focus on identities and the settings in which those can change, as a way of conceptualising mathematics teacher development as learning processes including the personal, the social and the cultural. Seeing development from a semiotic perspective, and learning as semiosis, all these aspects will have to be taken into consideration simultaneously.

REFERENCES

Bakhtin,M. (1986) *Speech, Genre and Other Late Essays*. University of Texas Press. Texas

Braathe, H.J. and Ongstad, S. (2001) Egalitarianism meets ideologies of mathematics education – instances from Norwegian curricula and classrooms. *Zentralblatt fur Didaktik der Matematik* vol 33 (5), 1–11.

Braathe, H.J. (2007) Identity and Agency in Mathematics Teacher Education. In C. Bergsten, B. Grevholm, H. S. Måsøval, & F. Rønning (Eds. 2007) *Relating Practice in Mathematics Education. Proceedings of Norma 05, Fourth Nordic Conference on Mathematics Education* (pp. 189-202) Trondheim: Tapir Academic Press.

Braathe, H.J. (2009) Identity and genre literacy in student teachers' mathematical texts. In Winsløw, C. (Ed. 2009) *Nordic Research in Mathematics Education.* (pp. 185-192) Sense Publishers, Rotterdam.

Dewey, J. (1916) *Democracy and education*. New York: The Free Press.

Harré, R. & van Langenhove, L. (1999) *Positioning Theory*. Blackwell Publishers Inc, USA.

Holland, D., D. Skinner, W. Lachicotte Jr., and C. Cain (1998) *Identity and Agency in Cultural Worlds.* Harward University Press.

Ongstad, S. (2006) Mathematics and mathematics education as triadic communication? A semiotic framework exemplified. *Educational studies in Mathematics* 61, 247-277.

Sfard, A. (2002) There is more to discourse than meets the ears: Looking at thinking as communicating to learn more about mathematical learning. In Kieran, C., Forman, E., and Sfard, A. (Eds. 2002) *Learning Discourse. Discursive approaches to research in mathematics education*. Kluwer Academic Publishers.

Sfard, A. (2008) *Thinking as Communicating: the Growth of Discources, and Mathematizing (Learning in Doing: Social, Cognitive and Computational Perspectives).* Cambridge University Press.

Sfard, A. & Prusak, A. (2005) Telling Identities: In search of an analytical tool for investigating learning as a cultural shaped activity. *Educational Researcher* 34(4), 14-22.

Stryker, S. and Burke, P.J. (2000) The Past, Present, and Future of an Identity Theory. *Social Psychology Quarterly*, Vol. 63, No. 4, Special Millenium Issue on the State of Sociological Social Psychology. (Dec., 2000), pp. 284-297.