

“TELL THEM THAT WE LIKE TO DECIDE FOR OURSELVES” – CHILDREN’S AGENCY IN MATHEMATICS EDUCATION

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Interviews with primary school children about their lived world of school mathematics, unanimously and strikingly revealed that the practical/creative school subjects were their favourites. These subjects granted them agency and modes of bodily expressions that were not available in mathematics and the other academic school subjects. The interviews are analysed from a perspective of school mathematics education as a social practice that draws attention to and valorises the children's perspective. The question is raised whether the children's preferences reflect a genuine perception of postmodern life conditions that should be taken seriously.

Keywords: children’s agency, embodied agency, children’s perspectives

INTRODUCTION

If learning is assumed to involve intentional action (Skovsmose, 2005), then students’ agency in mathematics teaching and learning is an important issue. Yet, studies on agency in mathematics classrooms (e.g. Boaler & Greeno, 2000; Klein, 2001b) have rarely considered the perceptions of primary school children. In high school classes and teacher education situations, agency has been discussed in terms of students’ opportunities to make choices and to have authorship within the discourse around mathematics. Interviews with 10-year-old children in a Year 4 class in Denmark also revealed restrictions on agency in mathematical activity in these respects. As well, the children perceived their bodily actions as being restricted. When asked about their preferred school subjects, almost unanimously, the children pointed to design (needlework), visual art, physical education, and swimming as the subjects, they liked the best. These subjects provided opportunities for creative, physical, and/or playful forms of agency. This was in stark contrast to the subjects they considered to be the most important subjects, i.e. Danish, mathematics and English where they experienced very little, if any, agency and much tighter bodily control. They felt that they had to do what the teachers requested and could hardly imagine the situation being any different, i.e. what agency could be in these subjects.

The children's preferences could be a reflection of the long-term effort of learning mathematics and the challenges involved, as opposed to the immediacy of the practical/creative subjects, or they could be a voicing of popular notions of so-called academic schools subjects as tedious. Regardless of their validity, these explanations to children’s views seem unlikely to be exhaustive, and troubling questions remain. Could it be that the children's preference for practical/creative school subjects – with their space for creative playful whole-body agency – reflect a valid perception of

what is important for them to develop in order to grow up as competent citizens in a postmodern world [1]? What does the perceived absence of agency do to their perception and learning of mathematics? Are children in difficulty in learning mathematics especially affected by this apparent lack of agency?

THE NOTION OF AGENCY

The Oxford English Dictionary defines *agency* as “the faculty of an agent or of acting; active working or operation; action, acting”. *Agent* comes from Latin *agere*, to act, or to do. An agent acts or exerts power, as distinguished from the *patient* and the *instrument*; the agent acts upon the patient/instrument. Hence, in sociology and social sciences, *human agency* denotes the faculty to act deliberately according to one’s own will and thus to make free choices. A central issue in these sciences is the relation between *structure* and *agency*; i.e. how social and cultural factors such as social class, religion, gender, ethnicity, customs, etc. shape the opportunities that individuals have, and how does human agency change these factors.

Schooling, and mathematics education as part hereof, constitute a major social and societal arena in the organisation and rhythm of children's daily life as well as their future lives as independent adult. In this arena of mathematics teaching and learning, children's agency could be seen to involve three aspects. The first is based on an assumption of *children as social actors* (Højlund, 2002; James, Jenks, & Prout, 1998; Kampmann, 2000). Consequently, they make sense of their experiences in school mathematics irrespective of the agency granted to them at school. They ascribe meaning (Skovsmose, 2005) from a ‘global’, holistic life world perspective (Kvale & Brinkmann, 2009) that integrates their experiences in mathematics learning with their future life perspectives (Lange, 2008a). The second aspect concerns the organisation of their *mathematical activity*, which may leave them more or less agency in the sense of opportunities or expectations to (co-)create mathematical concepts, discuss mathematical ideas, make choices, think for themselves, etc. as part of their learning process (Boaler & Greeno, 2000). The third aspect relates to *embodied agency* (Benner, 2000; Shilling, 1999) in that school norms impose physical restraints on students’ bodily freedom such as requiring them to sit on their chair at their desk, keep quiet, have their mobile phones turned off, etc. As is discussed later, children are very aware of these restraints.

Interviewing high school students in advanced calculus classes in USA, Boaler and Greeno (2000) found that ‘traditional’ mathematics education, dominated by instruction in and training of procedures to find the one correct answer to diverse mathematical problems, afforded virtually no agency to students, but required them to “surrender agency and thought in order to follow predetermined routines” (p 171). Boaler and Greeno discussed students’ agency with reference to the notion of *figured worlds*, a key term in Holland, Lachicotte, Skinner and Cain’s (1998) discussion of social systems. Within this framework, agency is conceived in terms of authorship and as a prime aspect of identity. Seeing mathematics classrooms as figured worlds

and agency as authorship, draws attention to the children's/students' and teachers' interpretations of the rituals of their shared practice and their positions and roles, and to the shaping of their sense of self, their identities, in the social practices of mathematics education. Boaler and Greeno (2000) found that:

[i]n the schools in which the students worked through calculus books alone, the students appear to view the domain of mathematics as a collection of conceptually opaque procedures. The majority of students interviewed from the traditional classes reported that the goal of their learning activity was for them to memorize the different procedures they met. Such a figured world of didactic teaching and learning rests on an epistemology of received knowing. In this kind of figured world, mathematical knowledge is transmitted to students, who learn by attending carefully to teachers' and textbook demonstrations (Boaler & Greeno, 2000, p. 181).

In order to be successful, students in 'didactic' classes needed to "assume the role of a received knower and develop identities that were compatible with a procedure-driven figured world" and be willing "to build identities that give human agency a minimal role" (p. 183). The students saw success as requiring "a form of received knowing, in which obedience, compliance, perseverance, and frustration played a central role" (p. 184). Some students, girls in particular, rejected mathematics because

they were not prepared to give up the agency that they enjoyed in other aspects of their lives, or the opportunities to be creative, use language, exercise thought, or make decisions. ... [T]hey wanted to pursue subjects that offered opportunities for expression, interpretation, and agency (p. 187).

Referring to Pickering's (1995) discussion of agency in mathematics and science Boaler and Greeno concluded that the students only had opportunities to learn what Pickering termed "the agency of the discipline" which is the agency aspects of mathematics, in which human agency play the least role, thereby seriously distorting their perception of mathematics as a scientific discipline.

While Boaler and Greeno criticised procedural teaching for its reduction in students' agency, Klein (2001a; 2001b) criticised pedagogical practices that base mathematics education on conjecture, reasoning, investigation and inquiry. Writing from a poststructuralist position, she claimed that current practices are framed by humanist notions of rational, autonomous learners. These notions take students' agency for granted, overlook always present power relations, disregard that identity and agency are discursively constituted and not an individual disposition, and hence do not recognise that students' agency needs to be considered in every learning encounter (Klein, 2001a). Like Boaler and Greeno (2000), Klein discussed agency in terms of *authorship*, but with reference to Bronwyn Davies:

[S]tudents can experience a sense of agency in a discourse where they have a knowledge of themselves as respected and competent in (a) speaking and writing the commonly accepted truths of the discourse, in (b) enacting established ways-of-being, and in (c)

going beyond these to forge something new (Davies, 1991). Agency has to do with authority, not in the sense of control over but in the sense of *authorship*; authorship of voice and action in a community conversation. All pedagogic discourses, regardless of whether we see them as transmissive, child-centred, constructivist or social constructivist, support agentic behaviour to the extent that they impart a robust knowledge and skills base and authorise student initiated constructions and ways of making sense of experience (Klein, 2001b, p. 340).

Boaler and Greeno (2000) looked at high achieving high school students perceptions of agency in USA, and Klein analysed agency in an Australian teacher education context. I am exploring young children's perspectives (Lange, 2008b) on agency in a Danish *folkeskole* (public primary and lower secondary school). These children also seem to experience restrictions on expressing their agency in their mathematics lessons. However, apart from illustrating their perceptions of lack of choice and ability to author discourse, I discuss how bodily aspects of agency may be particularly relevant for smaller children. My contention is that the children seem to be suspended between two conflicting experiences. On the one hand, they experience joy and engagement arising from spaces of agency in the practical/creative school subjects that they do not believe is important. On the other hand, they think of mathematics as a school subject that are important for their future, but the agency they value so much is virtually absent in their perception of their learning experiences in this subject.

METHODOLOGY

The empirical material for this paper comes from interviews with children about 10 years old in a Danish Year 4 class. I observed their mathematics classes for almost a year and interviewed students in groups, pairs and individually. The aim of the research was to explore children's knowledge about their mathematics education, especially the meaning they ascribed to and the sense they made of their experiences with being in difficulty in learning mathematics (Lange, 2007). As I took the children's meaning ascriptions to be in a narrative form, my conversations with them invited them to tell about their experiences. Hence, the interviews I conducted were semi-structured life world interviews, i.e. interviews that "seek to obtain descriptions of the interviewees' lived world with respect to interpretation of the meaning of the described phenomena" (Kvale & Brinkmann, 2009, p. 27).

There were twenty children in the class. All but one participated in one of three group interviews early in the school year. Half of the children were interviewed in pairs or individually a little later, and again near the end of the school year, with some overlapping of the two groups. The interviews took place at the school, lasted 30-45 minutes, and were audio recorded; the group interviews were also video recorded.

Taking *children's agency* to be a theoretical construct, only "visible" in the interviews from theoretical perspectives, I wanted my interpretative activity to be as transparent

as possible. This was especially necessary because my empirical material was interviews with young children whose life world and linguistic universe are rather different from mine. I contend that children's meaning ascriptions, the “web of logic”, the discourse in which they embed their experiences with school mathematics, are to be found in stories about their lived school mathematics world. The children's narratives that I was looking for were rarely found as rounded well-formed stories ready to be copy-pasted into research papers. More often they unfolded as dialogues involving my active listening and questions (Kvale & Brinkmann, 2009). Consequently, a longer transcript is given rendering an example of the children's voices. The following interpretation shows the analytical process. For reason of space, extracts from other interviews are summarised within the interviewees' horizon of understanding and such condensates are used as a points of departure for the interpretation (Kvale, 1984; Lange, 2008a).

WE LIKE TO DECIDE OURSELVES

In an interview in October 2006, Maria and Isabella (all names apart from mine are pseudonyms) expressed that they liked the school subjects of design, swimming, physical education and visual art. Recently Maria had also started to like maths. When asked to comment on my observation that all the children seemed to like these subject the dialogue went as follows [2].

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|---|----------|---|
| 1 | Maria | ... because in design we do something creative and such. I like that and in physical education it is not only think, think, think, think, think, think, think, think all the time ... |
| 2 | Isabella | It is also more that you, for instance in design we are allowed to decide ourselves how it [a teddy bear] should look like, how it should be, and also in physical education and such we sort of run around and play. (<i>She explains the different ball games they play assisted by Maria</i>)... |
| 3 | Troels | Ok. And some of the good things [about visual art and design] is that you are allowed to decide more yourself? |
| 4 | Isabella | Yes I think so because |
| 5 | Troels | Yes, is it so that in mathematics and Danish and English you are not allowed to decide very much? |
| 6 | Maria | I don't think so |
| 7 | Isabella | No, yes but (Maria: you are not allowed so much) we are not allowed like decide (Maria: ourselves how) we must just like do the problems we get and |
| 8 | Maria | And then we must do them and we may decide ourselves the way we do it, just that it is right. And that, then I like better some (Isabella: yes some) subjects where you just “Ah, what sh[ould]? How? Oh, I think I will do like this.” |
| 9 | Isabella | Yes for instance you decide (Maria: how you yourself also) if you are going to draw a drawing if it should be a face or it should be, yes then you decide yourself and then. Yes it is like more, you can just sew |

- 10 Maria Also where you can come up with ideas yourself. You cannot really do that, 'cos you cannot really come up with ideas. _ I don't think _ I just think it would be a good idea if like this sum came in because it was more difficult or a little easier because you cannot just
- 11 Isabella No decide just like that
- 12 Maria Here you can come up yourself, because when we should sew those teddy bears then you figured out yourself. I figured out myself that mine should have dots and that it should have such long legs
- 13 Troels So it is important that about deciding for yourself?
- 14 Maria Yes
- 15 Isabella Yes I like that

By the end of the interview Maria and Isabella asked me for what I was going to use the interview and if it was because I wanted to become a teacher. I told them that I was a “teacher teacher”.

- 16 Maria So you can see what you should do to make your class better?
- 17 Troels You may say so. It is because I would like to know how children think about mathematics
- 18 Maria Are you only teaching mathematics?
- 19 Troels Yes that is I teach how student teachers, people who want to become teachers, I teach them how they should teach mathematics
- 20 Maria And then you can tell it to them
- 21 Troels Yes
- 22 Maria And then they can do it and then they can see that you like to decide for yourself
- 23 Troels Yes
- 24 Isabella Yes
- 25 Maria I think that is good

Maria likes design because they do something creative (1; numbers refer to the transcript lines). She also likes physical education because it not only about thinking (1). Isabella likes that in design they may decide how a teddy bear should look like and that in physical education they run and play ball games (2, 4). In mathematics, they must do the problems they get (7); they may decide how they do them as long as they get them right (8), but they cannot really come up with their own ideas (10, 11). They like to use their imagination (8-12) and find it important to be able to decide for themselves as they can in visual art and design (13-15). This is the message they want me to bring to my teacher education students (16-25).

Interpreting the interview excerpt from my adult, research perspective, Maria and Isabella express that they appreciate when school subjects make space for their creative imagination (1, 8, 9, 10, 12) and decision making (2, 4, 9, 12-14, 22-25) and/or the presence of their whole playful body (1, 2). They experience these spaces in design, visual art, and physical education but not in mathematics (7, 10, 11). Here they are given problems that they have to get right (7, 8), and they cannot imagine

how ideas of their own could come into play (10, 11). They do not talk about getting a right *answer*, which would presuppose that there was a question. In Danish, Isabella talks about “lave opgaver” (“do problems”; 7), which is common “school mathematics” Danish. Nonetheless, it is a linguistic mix between the older phrase from the days of arithmetic “lave regnestykker” (“do sums”) and the language of the more recent reform curriculum “løse opgaver” (“solve problems”). There is a linguistic consistency between how they describe their activity as *doing* problems (7) and getting them *right* (8) – as opposed to *solving* problems, or *answering or exploring* questions as stipulated in the curriculum – and their experience of not being able to *come up with ideas* (10).

The other children interviewed in the same round of interviews as Maria and Isabella also liked practical/creative subjects and by and large for the same reasons: that they could use their imagination, do something with their hands, decide something, or engage in playful, physical activity often with competitive elements. They also thought that they did not make decisions in mathematics. The following paragraphs add more details to the picture drawn from the interview with Maria and Isabella.

Asked about differences between the subjects, in regards to what the children could decide, some children, all of immigrant background, said that there were no differences. After all, children cannot say no to what the teacher says (Hussein and Kamal); the teacher tells them what to do and then the children do it (Sahra and Bahia). Responding to the question, Kamal said that in history they are told off the least. Sometimes, they may decide a little in swimming. In maths, they are not allowed to decide anything and they are not told off so much either. Jette [the maths teacher] gives many five-minutes [short breaks]. An interpretation of this statement could be, that in the absence of agency in learning situations, what becomes of interest is how the teacher control is exercised (amount of telling off) and the allowance for time and space that is free of teacher control.

In school discourse, the academic subjects, in particular Danish, mathematics, and English (as a second language), are positioned and resourced as more important than the practical/creative. The children have incorporated this in their meaning ascription to their school experiences. Mathematics is important because being good in mathematics gives access to education which is a prerequisite for at future of their own choice (Lange, 2008a). Some children are explicit about the different valorisation of school subjects. Bahia and Sahra said that apart from mathematics, Danish was also an important subject; visual art not so much, design a little bit, and physical education was there in order to have fun. Kalila reflected the valorisation indirectly. When I asked which subjects she liked, she said that she liked mathematics and Danish, and asked, “Is it not that kind of subjects you are thinking of?” In reality, of all the subjects, she liked design and swimming the best. “That is more like something for me, I think”.

Many of the children described physical and bodily restraints imposed on them at school. Kalila in particular gave a vivid and heart-felt description of this and of her joy of using her imagination: In design, the teacher explains something if you keep your mouth shut. After that, you may run around, get up, talk and jump. In Danish, you must remain seated and not talk to your neighbour. In swimming, you may talk and be together and you cannot do that in maths. In design you make your own imagination of a doll, for instance, one crooked and one long eye, no nose, eyebrows – you may decide yourself. It is good to use your imagination. Kalila imagines her doll while the teacher tells about it. In Danish and maths, you cannot use your imagination. You must calculate in maths and not make your own numbers. After school, the smaller children in the recreation centre cannot go out and then come back whereas in the club for the bigger children like her you may go home and come back, go to the kiosk, bring lollies and have your mobile phone open. Children are generally very aware that they are growing. Agency is an important marker in this process; as Kalila explained older children have more physical freedom to move and to decide for themselves than younger children.

Thus, the subjects that the children like because of the agency, imagination and bodily freedom they are allowed, are positioned as not important, and the subjects positioned as important grant them little agency, space for choice or creativity, and exert a tight control of their bodies.

I DON'T LIKE MATHS WHEN I DON'T KNOW WHAT TO DO

These children grow up in a society where it is highly unclear which experiences of the older generations are valid, where the faculty to choose in almost every issue of life is paramount, and where creativity is highly valued in public discourse about present and future needs of individuals and society. Choice making and creativity are prime examples of agency, and the children in this research really appreciated when such features were part of their learning. The practical/creative subjects, thought of in the school discourse as recreational, seem to have more to offer in this respect, than mathematics and the other subjects positioned as the most important.

When making sense of their experiences, the children perceived no agency for them in school mathematics learning, and they could not imagine what it could be either. You are not supposed to make up your own numbers, as Kalila put it. Like the much older US high school students that Boaler and Greeno (2000) wrote about, these much younger students in a Danish comprehensive school were ascribed identities with minimal human agency. In the terminology of Klein (2001b), they did not perceive invitations and support to develop their authorship of mathematical constructions and ways of making sense. They did make sense – the sense seen in the interviews, but their sense-making was not part of their “official” mathematical activities. These sense-making processes are active undertakings on part of the children in which they contribute to the construction of the discursive field embedding mathematics education and thus need to be seen as an aspect of children's

agency. As such, they are co-creators of the social practices of mathematics education, even when these social practices lead to a restriction on agentic behaviour.

The “no agency” experience of mathematics learning is problematic for several reasons. It gives a distorted picture of academic mathematics, and it reinforces instrumental learning rationales (Mellin-Olsen, 1981). Such rationales are not conducive to the learning of students in difficulty with mathematics (Lange, 2008a) – if they were, they would not be in difficulty. When such children do not succeed in “getting it right” in what to them seem unrelated tasks, void of inherent meaning and agency, they are left with having to cope with unproductive and awful feelings of helplessness. Maha expressed these feelings when she said that she hates Sudokus and metre and centimetre, and that she does not like mathematics when she does not know what to do, and nobody comes to help her, and she just sits and waits and waits.

NOTES

1 I understand *postmodernity* as “a social condition, comprising particular patterns of social, economic, political and cultural relations” (Hargreaves, 1994, p. 38)

2 The Danish transcript is rather detailed and forms the basis of the interpretation together with the audio recording. The translation into English is a compromise between a direct translation, an attempt to retain some of the linguistic features of children's spoken language, and a light approximation to written language by removing some of the repetitions and incomplete sentences.

REFERENCES

- Benner, P. (2000). The roles of embodiment, emotion and lifeworld for rationality and agency in nursing practice. *Nursing Philosophy*, 1(1), 5-19.
- Boaler, J. & Greeno, J. G. (2000). Identity, agency, and knowing in mathematical worlds. In J.Boaler (Ed.), *Multiple perspectives on mathematics teaching and learning* (pp. 171-200). Westport, CT: Ablex.
- Hargreaves, A. (1994). *Changing teachers, changing times. teachers' work and culture in postmodern age*. London: Cassell.
- Højlund, S. (2002). *Barndomskonstruktioner. På feltarbejde i skole, SFO og på sygehus*. [Kbh.]: Gyldendal Uddannelse.
- Holland, D., Lachicotte, W., Skinner, D., & Cain, C. (1998). *Identity and agency in cultural worlds*. Cambridge, Mass.: Harvard University Press.
- James, A., Jenks, C., & Prout, A. (1998). *Theorizing childhood*. Cambridge: Polity Press.
- Kampmann, J. (2000). Børn som informanter og børneperspektiv. In P.Schultz Jørgensen & J. Kampmann (Eds.), *Børn som informanter* (pp. 23-53). Kbh.: Børnerådet.
- Klein, M. (2001a). A poststructuralist analysis of mathematics inquiry in a Year 6

- classroom: The rhetoric, realisation and practical implications. In J. Bobis, B. Perry, & M. Mitchelmore (Eds.), Proceedings of the 24th annual conference of the Mathematics Education Research Group of Australia, Sydney, (Vol 2, pp. 347-354). Sydney: MERGA.
- Klein, M. (2001b). Correcting mathematical and attitudinal deficiencies in pre-service teacher education: The conservative effect of blaming the victim. In J. Bobis, B. Perry, & M. Mitchelmore (Eds.), Proceedings of the 24th annual conference of the Mathematics Education Research Group of Australia, Sydney, (Vol 2, pp. 338-345). Sydney: MERGA.
- Kvale, S. (1984). Om tolkning af kvalitative forskningsinterviews. *Tidskrift för Nordisk Förening för Pedagogisk Forskning*, 4(3/4), 55-66.
- Kvale, S. & Brinkmann, S. (2009). *InterViews: Learning the craft of qualitative research interviewing*. (Second ed.) Los Angeles - London - New Delhi - Singapore: Sage Publications.
- Lange, T. (2007). Students' perspectives on learning difficulties in mathematics. In L. Ø. Johansen (Ed.), Proceedings of the 3rd Nordic Research Conference on Special Needs Education in Mathematics, (pp. 171-182). Aalborg: Adgangskursus, Aalborg Universitet.
- Lange, T. (2008a). A child's perspective on being in difficulty in mathematics. *The Philosophy of Mathematics Education Journal*, (23) Retrieved 1 Nov 2008a, from <http://people.exeter.ac.uk/PErnest/pome23/index.htm>
- Lange, T. (2008b). The notion of children's perspectives. In D. Pitta-Pantazi & G. Philippou (Eds.), Proceedings of the Fifth Congress of the European Society for Research in Mathematics Education, (pp. 268-277). Department of Education University of Cyprus: European Society for Research in Mathematics Education.
- Mellin-Olsen, S. (1981). Instrumentalism as an educational concept. *Educational Studies in Mathematics*, 12(3)
- Pickering, A. (1995). *The mangle of practice: Time, agency, and science*. Chicago: University of Chicago Press.
- Shilling, C. (1999). Towards an embodied understanding of the structure/agency relationship. *British Journal of Sociology*, 50(4), 543.
- Skovsmose, O. (2005). Meaning in mathematics education. In J. Kilpatrick, C. Hoyles, & O. Skovsmose (Eds.), *Meaning in mathematics education* (pp. 83-100). New York: Springer Science.