THE MICRO-POLITICS OF STUDENTS' LANGUAGE REPERTOIRES IN COUNTING CONTEXTS

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Counting is mediated by language – the language used for counting reflects people's meaning and experience of the process, and their experience is impacted by the way language is used. We investigate children's language repertoires for counting in English. With this, we aim to understand better the political nature of counting at the most basic levels. This is to extend the literature, which already identifies political aspects of counting on the macro scale. We theorize the politics of language in mathematics learning as applied to this situation and, as a way of setting up our investigation, we illustrate how counting at the micro-level can be political.

Keywords: Classroom Discourse, Equity and Diversity, Number Concepts and Operations

Introduction

The understanding and experience of counting, like the understanding and experience of any mathematical idea, is mediated by language. Certain language repertoires are necessary to convey the ideas and perhaps even to perform counting action. At the same time, the language used to describe these ideas and enact the processes shapes the way people conceptualize them.

This recursive nature of language compelled us to develop a research project to investigate children's language repertoires in relation to conjecture. We began with contexts involving risk and prediction because we had noticed similarity in language repertoires between prediction and conjecture. We found political implications of the ambiguity in meaning of words that are used for conjecture, prediction, assessment of risk, and establishing authority (Wagner, Dicks, Kristmanson, 2015). Now we extend this work to explore students' language repertoires in contexts involving counting. Data collection will be complete in June 2015, and so we present here our theoretical and conceptual approaches along with some hypotheses that come from our experiences as mathematics teachers and mathematics education researchers. In the conference presentation, we will also present from our empirical results.

The politics of (mathematical) language

Our interest in the experience of counting includes the way counting positions people in relation to each other. Positioning theory (Harré et al, 2009) points us to the distribution of rights and duties, or, in other words, the politics of counting, just as it did in our work that revealed the politics of prediction language (Wagner, Dicks, Kristmanson, 2015). Careful language analysis helps us produce warranted claims about the politics within our research contexts.

> [Politics] is about how to distribute social goods in a society: who gets what in terms of money, status, power and acceptance on a variety of different terms, all social goods. Since, when we use language, social goods and their distribution are always at stake, language is always "political" in a deep sense (Gee, 2011, p. 7).

In this project we understand mathematical education as a number of created and re-created practices within social and cultural contexts. These practices are networked with other practices outside the mathematics classrooms (Valero, 2007). Thus they are political, indicating that power is distributed between the different networking practices. In line with Valero (2004), we understand power as situational, relational, and in constant transformation. Power works between these practices in the network as macro-level processes. However, power also works at the micro-level in the immediate situational contexts between participants and (un)available materials. These micro-level actions are the focus in this project.

The relations between the macro-level practices and participants' micro-level actions are dialectical. Macro-level practices give meaning to micro-level actions, offering participants subject positions. However, the participants' actions also give meaning to the mathematics practices and position themselves in ways that are reflexive, relational and contextual in relation to the discipline and to other individuals in their learning contexts (Wagner & Herbel-Eisenmann, 2009). Thus, participants are implicated in the construction and circulation of power within mathematical practices (Gutiérrez, 2013). We emphasize the importance of power relations between the macro- and micro-levels, through positionings and discourses – in other words how we fluently relate to each other (Gutiérrez, 2013; Wagner & Herbel-Eisenmann, 2009). In this project, the negotiation and distribution of power on the micro-level are foregrounded, while we acknowledge and connect to the related macro-level power distributions, discourses and negotiations (Morgan, 2006). Discourses are about "negotiating and maintaining relationships among its participants" (Morgan, 2012, p. 181) and hence establishing relations and positionings. These relationships also imply a need for us researchers to critically reflect on ethical questions about how we position ourselves and write about the Other, as suggested by Andersson and Le Roux (2015).

We use a systemic functional linguistics framework (SFL) to help us identify the qualities of interpersonal interaction as they appear in the distinctions made through grammar and lexicon. SFL is built on the recognition that language involves the interconnectedness among construction of experience (*ideational* metafunction), relationships with others (*interpersonal* metafunction), and connection with other circulating text (*textual* metafunction) (Halliday, 1973).

Number and Power

At the macro-level, number is often associated with power. School curriculum is positioned as equipping children to be powerful in and outside of school, and number skills are generally taken as central to such numeracy. Bishop (1990) has gone so far as to show how advanced counting systems – exponential based number systems, in particular – made colonialism possible. With rudimentary counting it is hard to organize and hold control over vast resources. Historically, technologies of counting (quantification) are associated with certain political structures (Porter, 1995).

We have not found research that focuses on the micro-level politics of number. When children count, who "gets what in terms of […] status, power and acceptance on a variety of different terms" (Gee, 2011, p. 7)? To illustrate the micro-level interactions in counting contexts, we suggest that, before you read further, you choose some friends and decide amongst yourselves who has been in the most countries. You will have to count the countries you visited of course. After engaging in this activity, the next paragraphs will be more meaningful.

Counting countries seems quite straightforward at first, but it doesn't take long to find controversy. For example, both of us have visited Yugoslavia before it was divided into smaller countries. Shall we count one for Yugoslavia because it was one country when each of us was

there? Or can we count three or four (different for the two authors) for the current countries represented by parts we visited? We may decide it counts as one, because it was only one country when each of us was there; a clearer question would be how many national political entities we have visited. However, Germany complicates such reasoning. We have both spent time in East Germany, West Germany and modern, unified Germany. Shall we count all three of these entities that we have visited? Furthermore, one of us travelled through some countries by train. Does it count to travel through a country on a train if one doesn't get off the train? What about flying over a country? Or landing in a country to refuel but staying on the plane? What about a one-hour stop that includes a passport stamp? Or crossing the border and being escorted out by police? And then there are disputed territories, like the West Bank (of the Jordan River), or First Nations (Aboriginal lands never conceded to colonialist governments). These are just some of our political controversies when counting countries. You probably have your own.

When we count, we have to decide what counts and what does not count. For example, what counts as being "in a country", and what counts as "a country"? This is political because different people will have unique reasons for wanting the counting to be done in certain ways. Furthermore, it is possible that you have not travelled outside your country, which highlights yet another political aspect. The question of how many countries privileges people for whom travel has been possible, and thus excludes others. Someone has to decide what to count and that decision sets up certain people's experiences as normative. For example, who decided that counting countries is a worthwhile endeavor (it was us, but you may have made the question your own as you started dialoguing about it with your friends)? Maybe it would be better to count our meaningful interactions with diverse people, or it may be even more appropriate to reflect on the qualities of those interactions instead of quantifying them. Indeed it is possible to travel to many countries and remain insular.

Methodology

As with our earlier work in this project, focusing on the language of prediction, we have students work in groups in class and subsequently interview them to extend the group work. We work with students with relatively limited repertoires and present them with situations that we expect to push them to the limits of their language resources. Thus we begin this work with 4- to 7-year olds, and engage them in counting in increasingly challenging ways. For these tasks, we draw on the tasks suggested by Wagner and Davis (2010), in their article distinguishing between quantity and number sense. We consider the micro-politics of quantification. We consider how participants construct and negotiate roles and responsibilities as they decide what counts (For example, how big does a tree have to be to be a tree? What kind of plant counts as a tree?), how to talk about a quantity when the numbers exceed individuals' quantity sense, and what benchmarks they use for communicating their sense of quantity. Selecting benchmarks requires identifying something that has a taken-as-shared meaning by one's interlocutors. We identify how these micro-political moves are manifested in language. At the end of the complementary interviews with the children we draw attention to things the participants have said and ask them to describe what they mean by these things.

In the interactions with participants, we avoid using specialized mathematical language ourselves and refrain from suggesting to participant students how they might perform the tasks and/or communicate their ideas. We want to identify their strategies for communicating their counting, and consider what these language strategies say about the process of counting and the related politics. Thus, we avoid a deficit perspective that would rate the students on the basis of which skills and language they know. We have already noticed the problems with such deficit

approaches – for example, we have evidence that a participant not using a language skill does not indicate inability (Wagner, Dicks and Kristmanson, 2015).

Language is used to make distinctions that are relevant to the people in an interaction. For example, the prevalence of gender distinctions in personal pronouns in many languages signifies that people in those cultures consider it important to make such distinctions. An individual may find a way to avoid making such a distinction and find this a challenge because our language does not have some gender-inclusive personal pronouns – e.g. using 'they' instead of 'he' or 'she'. Such practices may become acceptable to others and enter into a culture's language repertoire. Just as we invent ways to avoid a distinction, we can invent ways to make distinction when no language strategy is established for that distinction. This is a phenomenon at work in mathematical problem solving contexts (Wagner, 2009), and also in scholarship. Thus, in our research, we look for language strategies that enable the process of deciding what to count and what not to count (the process of establishing boundaries or categories). And we consider how these processes are political acts.

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