EXAMINING TEACHERS' DISCOURSE ON STUDENTS' STRUGGLE THROUGH FIGURED WORLDS

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We apply the lens of figured worlds on teachers' pedagogic discourse to understand their identity and practice in relation to offering students opportunities to struggle. The study involved 12 elementary mathematics teachers who were interviewed based on teaching vignettes - short stories exemplifying teaching that is high/low in students' opportunities for struggle. Two distinct figured worlds were identified: the world of "acquisition" and the world of "exploration". Teachers belonging to each of these worlds differed in their interpretations of identical vignettes depicting students' struggle, and their identities as teachers cohered with these interpretations. Implications of these results on attempts to reform teachers' practice towards explorative instruction are discussed.

BACKROUND

Figured world is defined as "a socially and culturally constructed realm of interpretation in which particular characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others" (Holland, Lachicotte, Skinner, & Cain, 1998, p. 52). Artefacts and signs are attributed meaning that might differ from how those outsides of the figured world interpret them. People, actors in the figured world, have expectations for how events unfold and how others will behave in these events (Ma & Singer-Gabella, 2011). Identities are created and crystallized or consolidated in the process of participation in organized activity by the figured world. Within the figured world, people give distinct meaning to actions, results, objects, and events. They value certain actions and outcomes, while devaluing others. They position themselves in relation to these valued actions and outcomes thereby constructing an identity within this figured world.

Relying on the definition of identity as a collection of narratives (Sfard & Prusak, 2005), the theory of figured worlds makes it clear that such narratives are not created in a vacuum. They stem from social and cultural contexts that can be explicated through the examination of the figured world to which they belong.

Mathematics teachers' identity has received increasing interest in the past years (e.g. Beauchamp & Thomas, 2009). Though most of this literature has looked at the process of becoming a teacher, the lens of teachers' identity is also useful for examining change in teachers' practice. In particular, the tracing of teachers' identity narratives to particular figured worlds can be a powerful tool for understanding the challenges of change required by demand to "reform" instruction.

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Boaler and Greeno (2000) were the first to point out that "reform" and "traditional" teaching belong, in fact, to different figured worlds. They connected traditional teaching with the figured world of "received knowledge", characterized by procedure-oriented, teacher-centred instruction and the figured world of "connected knowledge" with discussions oriented, problem-solving instruction. Ma and Singer-Gabella (2011) have continued this line, showing that pre-service teachers indeed sway between the "traditional" and "reform" figured world as they go through their teacher-training program.

Over the years, accumulating evidence has shown that the "connected knowledge" figured world is more productive for mathematics learning (Schoenfeld, 2014). In particular, Hiebert and Grouws (2007) pointed to the importance of two aspects in such teaching: Explicit Attention to Concepts (EAC), and Students' Opportunity to Struggle (SOS). Based on Hiebert and Grouws' (2007) work, Stein and her colleagues (2017) presented a framework that classified teaching into relatively simple "types". A simple 2x2 matrix of high and low levels of SOS and EAC produces four quadrants: Q1 (High EAC, high SOS), Q2 (high EAC, low SOS), Q3 (low EAC, high SOS) and Q4 (low EAC, low SOS). In our own work (Shabtay & Heyd-Metzuyanim, 2017), we have shown that contrary to the naive expectation that teachers would generally aspire towards Q1 teaching, some teachers have strong objections to it, and in particular, resist offering opportunities for students' struggle. This finding has urged us to look more closely at the reasons for this resistance. In particular, we were interested to see how teachers' identities, as elicited from asking them to identify with a particular quadrant, draw upon the figured world of mathematics instruction.

METHOD

The "teaching vignettes" interview: Our method relies on a procedure we have tested in previously (Shabtay & Heyd-Metzuyanim, 2017), where we interview teachers on the basis of Stein et al.'s (2017) "teaching vignettes". These vignettes describe a typical lesson of each of the four quadrants. The Q1 teacher (High SOS, High EAC) gives her students a cognitively demanding task, walks around the classroom while students work on it in groups and asks questions to advance their thinking. She concludes with a discussion that points to the equivalence of different representations of rational numbers. The Q2 vignette (Low SOS and High EAC) describes a teacher that uses the same cognitively demanding task, but divides it into small steps and leads her students through them with leading questions. She attends to the concept through pointing out to the equivalence of fractions, decimals and percentages in the problem, but the students do not take a significant role in this explication. The Q3 (High SOS and Low EAC) vignette starts with the same task. The teacher lets students struggle but does not mediate the task in any way. Though two students present their solutions at the end of the lesson, fractions, decimals and percentages are not connected explicitly. The Q4 (Low SOS, Low EAC) vignette describes a teacher who provides a calculational task that is supposed to offer opportunities to practice converting between fractions, decimals and percentages.

Procedure and analysis

We conducted the "teaching vignettes" interviews with 12 teachers. To the questions about the vignettes, we added questions about their identity as teachers and learners of mathematics, their common practices in the classroom and their beliefs about good instruction. Each interview took about 55-80 minutes and was audio-recorded with the teacher's approval. The recordings were fully transcribed and analysed.

Analysis started by highlighting narratives where teachers talked about themselves and their practices and about the teachers depicted in the vignettes. The second stage included marking and tabulating the different dimensions of the figured world. According to the definition of figured world described above, these included statements regarding valued and non-valued actions, valued and non-valued outcomes, and non-valued outcomes. We also examined the teacher and students' roles as they were described in teachers' discourse. Finally, we collected similar statements regarding valued actions, outcomes and roles into tables that depict the different figured worlds identified in the interviews. These enabled us to map the teachers into those belonging to one figured world or the other. Most teachers could be mapped into one of the figured worlds quite neatly, while a few were categorized as "in between". These decisions will be further explained in the findings.

FINDINGS

We start by presenting two contrasting figured worlds, extracted from the interviews of two teachers, Orit and Hani. These contrasting figured worlds were seen both in the teachers' interpretations of the vignettes, as well as in their descriptions of valued and non-valued actions and outcomes.

Orit, a teacher with 18 years of experience, chose "Orna", the teacher exemplifying Q2 teaching vignette, as the teacher who resembles her best. She explained her choice as follows:

> "Because I felt like she (Orna-Q2) was doing it in a very structured way, she did not let them (the students) directly explore, (something) which would sound very nice pedagogically (as in) 'explore and get it out of the child'. But when I look at (my) whole class, and I know I have several groups of students and several levels, if I do this (let them explore) it will only resonate with the strong group. And all those below, I will lose them completely. Those in the middle, I'll lose them too ... "(Line 53).

We see in Orit's identification with Orna (Q2) not just explanations for why Orna's practice is better, but also for why the alternative practice is wrong. This is made even clearer in the ways in which Orit relates to Daphna (depicted in the Q3 vignette):

> "Daphna (Q3) simply ... Believe me, I don't understand. What is she doing? Telling them to 'think again'? Will that really help? If they don't know, she just frustrates them. They will continue to not know. Or they will copy from the good students. That's why I don't like all these explorative tasks ... Only the best students answer, and the rest of the students are left behind." (Line 65).

Looking at these two descriptions of the teachers through the lens of figured world, we see that valued actions include "doing things in a structured way", while non-valued actions include "letting students just explore", which only result in "frustrating students" and "losing the middle/weak students completely".

The ways Orit describes her identity, and the role she takes in the classroom, is very much aligned with this figured world. In the example below, pronouns indicating the role of her as a teacher and the role of her students are marked in bold:

> "First of all **I go** for something **we already learned**, that **we finished** and checked that it 'sits well' (in the students) before the new content will be learned.... and **I make the connections** ... and then, **I explain**, I don't... **I don't usually ask the children to explore**; I don't (just) give them the task. Before **I give** the task, **I first do the instilment** (Acquisition), and ... **(I) check that they understand**, and (I) don't go straight to an explorative task, 'come and explore'. **I start** from the lowest level "(Line 42).

As indicated by the bolded pronouns and verbs, Orit is mostly concerned with what **she** does. She is the one that "explains", "makes the connections" and "starts from the lowest level". Though there is some talk about making sure students "understand", this is only mentioned as a part of a gradual step-by-step process that is designed to make sure students are not just "left to explore". An important word figuring in Orit's pedagogical discourse is "instilment" (in Hebrew: 'Haknaya'). 'Haknaya' in Hebrew comes from the stem "to buy" or acquire. It denotes the period of the lesson where a teacher explains or demonstrates. Interestingly, it goes very well with the metaphor of learning as "Acquiring" knowledge and the teacher as "deliverer" of this knowledge (Sfard, 1998). With the lack of a good English translation for this word, we chose to name the figured world exemplified in Orit's talk as the figured world of Acquisition.

A very different figured world could be seen in the discourse of Hani. Hani debated whether she identifies with the Q1 or Q3 teacher, saying that she tends towards the Q3 teaching in classrooms that "let her do that", but clearly opting for the vignettes that described high students' struggle. She explained her sympathy with the Q3 vignette:

> (First)… I like that they (the students in the story) struggle alone. Second, there are different options for a solution. The fraction is presented in several representations. I don't like drill and practice, like teacher Sharon (Q4) does. (Int: Why?) Because I think it's technical and if there's no understanding, I'm not sure they'll remember the calculation. If it's up to me, I'd rather they do it the longer way, but with understanding. If there's understanding along the way, the calculation will be OK. (Line 45).

When asked why she did not like Orna's (Q2) type of teaching, Hani answered:

> She's just very structured. I prefer to give more freedom. She gives them too many scaffolds, where I think she could have trusted them more. (Line 49).

In Hani's discourse we find that valued actions include offering tasks with "different options for solutions", "giving students freedom", and "trusting" students. Non-valued actions include "technical calculations" and giving "too many scaffolds". Valued outcomes include students "understanding the calculations". However, Hani does not

talk about "understanding the concepts" or "making connections". Thus her figured world seems to be more concerned with letting students struggle than with explicating mathematical concepts.

Similar to Orit, Hani also referred to students' level as determining her practice:

> "In classrooms where there are more difficulties, I act more like Nitsa (Q1). And in stronger classrooms, I'm more like Daphna (Q3), and if there's frustration, then I become more Nitsa. There are classes that are more open, and then I throw them more to the water, like Daphna does". (Line 43)

However, her choice was between Q1 and Q3 (both high SOS), thus she took it for granted that her students would be given opportunities to struggle. Also, she did not mention the difference between Q1 and Q3 as being related to the explication of mathematical concepts (as intended by the authors of these vignettes) showing, again, that the main focus in her figured world was on students' struggle.

Orit and Hani thus exemplify two quite contrasting figured worlds: one of Acquisition and one, which we termed Exploration. The later naming was based on the prominence of the world Exploration (Hebrew: Heker) in this discourse. As expected by the definition of figured worlds as "realms of interpretation", teachers' whose discourse belonged to the different figured worlds displayed different interpretations of the identical vignettes. While Orit was exasperated by the Q3 teacher who "just asked the students to 'think again'" and saw this as "only frustrating" students, Hani liked that this teacher "lets her students struggle". Notably, the emotional words used for describing students' reactions (such as "frustration") were nowhere described in the vignettes. Thus the teachers' "filled in" information about the depicted situation according to their figured world.

In our sample of 12 teachers: 5 teachers identified with Q2 and valued actions and outcomes according to the Acquisition figured world, and 4 teachers identified with Q3 or Q1, talking in ways that accord with the Exploration figured world. We found no relation between teachers' experience or the school in which they taught and their figured worlds. Also, most teachers were found to be coherent in their figured worlds meaning that their valued actions (e.g. practicing calculations) cohered with their valued outcomes (being able to follow procedures) and their role as a teacher (demonstrating the procedure and easing its enactment by students). However, a small group (of 3 teachers) were found to be "mixed". One such teacher was Sofi. On the one hand, Sofi declared her teaching mostly resembles the vignette depicting Q2 teaching. She justified this with "It's easier to teach a new subject step by step. Not all at once". However, Sofi also declared that:

> "But in elementary school it's not good if the teacher explains all the time. So I came to the conclusion, in elementary school for sure, that it's better to do Acquisition of 10 or 7 minutes and then give a task. A task that has many questions. But that's when we really really have a new subject. And then with the worksheets, let the children think, let the children talk."(Line 60).

Sofi's words reveal that she has some conflicts regarding the value of struggle. On the one hand, she values students thinking and talking. On the other hand, she declares that in her classroom, she first explains and does "Haknaya" (Acquisition) and only later lets the students work alone. In addition, although she declares she has realized that in elementary school students need to work alone, she structures her worksheets with incremental step-by-step tasks to avoid too much struggle.

Following is how Sofi relates to Daphna (Q3 teaching style):

> "I thought about my students, what would have happened if I gave them this task. And then I said (to myself) that I would have loved giving them this task without support. But unfortunately, I have such students that need mediation, instruction and so I understood that I don't really act like Daphna" (Line 62).

Notable in the discourse of Sofi about Q3 teaching are the conflicts between the two worlds. She talks somewhat regretfully ("unfortunately") about her students that "need mediation" and her words "so I understood that I don't really act like Daphna" indicate that she may have wanted to identify herself with teachers affording high-struggle, but had to admit she is not like them. Interestingly, like most of the other teachers in our sample, Sofi lays the responsibility for her teaching style on her students. She *would have* wanted to act like a Q3 teacher, had it not been for her students who "need instruction". This was a common theme in those teachers who chose not to identify with Q1 or Q3 teaching. The underlying message was that affording high struggle was "a nice pedagogical idea" (as phrased by Orit), but not suitable for "their" students.

To conclude, the overall analysis of the 12 teachers' discourse revealed the following blue-print for the two figured worlds of Acquisition and Exploration. As Table 1 reveals, offering students opportunities to struggle is interpreted differently through the two figured worlds. Valued actions connected with the word "struggle" in this world are letting students solve tasks without first explaining the steps and offering them freedom. Valued outcomes include students' "understanding" and "discovering on their own". In contrast, within the Acquisition world, letting students explore on their own is interpreted as "frustrating" and favouring only the strong students. In accordance with these valued actions and outcomes, teachers' roles and the ways they identified themselves differ significantly in the two worlds.

Teachers belonging to the Acquisition world talked mostly about what **they** do, focusing the responsibility of the teaching-learning interaction solely on their own shoulders. Teachers belonging to the Exploration world talked more about what **students** do. In their talk, the results of the teaching-learning interaction were divided more equally between them and their students.

Figured world	Valued actions	Valued outcomes	Roles and responsibility	Interpretation of Q2, Q3 vignettes
Acquisition	Explanations, Working gradually, Structured lessons	Students following procedures successfully	Teacher is the main actor. Students' roles are to listen and acquire	Q3 teaching is a nice "pedagogical idea" that is disconnected from the realities of classroom life
Exploration	Students struggle and discover by themselves. Students have freedom	Students understand the meaning behind calculations.	Both teacher and students share the responsibility for the learning process	Q2 teaching is too "structured", too "scaffolded" and too "technical"

Table No. 1: Comparison between Acquisition and Exploration Figured worlds

DISCUSSION

In this study, we applied the lens of figured worlds to better understand teachers' reported practices which afford students' opportunities to struggle with cognitively demanding tasks. Using the vignettes interview has proved successful for eliciting from teachers both narratives about their identity as teachers, and narratives about the depicted lessons of high/low student struggle. Our method of analysis, where we categorize teachers' discourse according to valued and non-valued actions, outcomes and roles proved beneficial for operationalizing the concept of figured worlds and enabling its application on transcripts of teachers' interviews.

Similarly to Boaler and Greeno (2000) and Ma & Singer-Gabella, (2011) we identified two distinct figured worlds in the discourse of our teachers. These are the Acquisition world and the Exploration world, which roughly can be connected to "traditional" and "reform" worlds identified in these previous studies. The fact that the Acquisition and Exploration figured worlds could be found in an Israeli sample, where the politics of reform in mathematics instruction are quite different than those found in the US, shows that this division is indeed a powerful one. Yet we have also found teachers whose figured worlds were not coherent and contained conflicts between valued actions belonging to the two worlds.

Another contribution of this study is the application of the theoretical lens of teachers' identity to the issue of reforming teachers' practice in the classroom, issues that have so far mostly been dealt with by examining teachers' beliefs (e.g. Stein,et al., 2017). We contend that examining the issues of reform or explorative practices through the lens of teachers' identity can offer insights into the reasons that such teaching practices are often found to be very resistant to change (Spillane & Zeuli, 1999). This, since not just particular beliefs need to be changed for teachers to change their practice. Their whole identity and the figured world on which it draws upon need to change too. Arguably,

such a change is a deep and all-encompassing process, including both how teachers narrate themselves and how they interpret the teaching-learning world in which they engage.

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