DIALOGICAL IDENTITIES IN STUDENTS FROM CULTURAL MINORITIES OR STUDENTS CATEGORISED AS PRESENTING SEN: HOW DO THEY SHAPE LEARNING, NAMELY IN MATHEMATICS?

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Assuming an historically-culturally situated approach of the learning process in which the curriculum and collaborative work can be used as mediational tools, we aimed at discussing the (re)construction of dialogical identities in students from minority cultures and to understand how they shape learning, namely in mathematics. From a 12 years research project - Interaction and Knowledge - we chose a paradigmatic case, from level 2 (action-research). The analysis of this case illuminates the role of the didactic contract, collaborative work and the relational interplay in the (re)construction of dialogical identities. The analysis of some episodes of peer interactions, taped within mathematics classes, and of some of the accounts collected in students' interviews, namely during the follow up, illuminates the appropriation of mathematical knowledge and how this process is connected with changes in the diverse I-positioning of the dialogical identities.

INTRODUCTION

Portuguese schools are multicultural and multiethnic. In the last decades Portugal changed from an emigration into an immigration country (César & Oliveira, 2005). Faced to the challenges brought by multiculturality and diversity teachers need to (re)construct the curricula, conceiving them as mediational tools for learning (Abreu & Elbers, 2005; César & Oliveira, 2005; Wertsch, 1991). Knowing students' competencies, elaborating meaningful tasks adapted to students' characteristics and interests facilitates transitions between students' knowledge and cultures, and the academic knowledge and the school cultures (Abreu, Bishop & Presmeg, 2002; César & Oliveira, 2005; Courela & César, 2007; Zittoun, 2004, 2006), assuming culture as a shared cognition (Cole, 1996a, 1996b). Through the negotiation of an adequate and coherent didactic contract (César, in press; Schubauer-Leoni & Perret-Clermont, 1997), teachers give a voice (Bakhtin, 1929/1981) to students who are often silenced, because they are experiencing social and/or school exclusion. But if most of the rules of the didactic contract are usually implicit, we claim that to negotiate an innovative didactic contract some of these rules need to be made explicit. Otherwise students will not be able to engage in the new didactic contract (César, 2003, in press). Thus, the teachers' role is essential, because students who experienced exclusion need a secure relational setting and the most effective way to create it is through teachers' practices,

namely their ways of acting, reacting, feeling and communicating (César & Oliveira, 2005; César & Santos, 2006).

Roth and Lee (2006) discussed the notion of *communities* claiming that the original construct was « grounded in the dialectical materialistic, cultural-historical theory of activity » and that « as these concepts filtered into Western scholarship, some of their defining characteristics have been lost or downplayed » (p. 27). They state that « in out-of-school settings, people (...) have the choice whether they want to participate in this or that practice (...) » and that « legitimate collectives generally can lay claim to an institutional history that transcends the participation of any individual member » (p. 28). Although agreeing that many appropriations of the construct were abusive and simplistic, we have been discussing further what « freedom of choice » means in Western societies, and whether it also exists in schools. The example of the Dance School (Teles & César, 2005, 2006) and of the communities that emerged in some adult alternative curricula whose practices were based in collaborative project work (Courela & César, 2007) are examples of communities of learning in which not only freedom of choice and an institutional history (Roth & Lee, 2006), but also a mutual engagement, a joint enterprise and a shared repertoire existed (Wenger, 1998). In other classes and learning experiences these characteristics were not so clear, but we claim they existed. And moreover, we would like to reflect upon what means « freedom of choice » in some of the so-called « real » communities (Lave, 1988, 1996; Lave & Wenger, 1991; Wenger, 1998). Choices are always shaped by several sorts of constraints, some of them similar to the ones students experience at school. Thus, when a student decides he/she goes or misses the class; he/she participates, or not, in the activities developed by his/her peers; when he/she listens - or not - to what his/her teacher is telling, are these acting and reacting features considered as freedom of choice? And when a craftsman keeps his job because he fears unemployment, is that freedom of choice? In short: although agreeing with the theoretical discussion underneath Roth and Lee's claims, we think the question is more subtle and we still use the construct of learning communities in some - not all - of the cases we studied. With particular changes: we rather state that when a community of learning emerges from the practices and relational inter-plays (*jogos relacionais*), participants may change from an initial peripheral participation, into a legitimate participation. This corresponds to their empowerment or, in other terms, to assuming their voices. And we prefer to consider that there are scenarios - in what they have of collective and individual construction, of transformation possibilities and adaptation to diverse situations - than to talk about arenas. For Mediterranean cultures, arenas are places for death, and for unchangeable and abusive power relations. We conceive schools and power within them in a different way. Thus, this theoretical background came from an historical-cultural and situated learning theory. But as we engaged in a process of go-between theory and practice, we (re)constructed a grounded theoretical background.

Collaborative work facilitates students' knowledge appropriation, the mobilisation/development of competencies (Elbers & de Haan, 2005; César, in press;

Rogoff, Turkamis & Bartlett, 2001; van der Linden, Erkens, Smith, & Renshaw, 2000), and the emergence of a learning community (Lave & Wenger, 1991). Students can be empowered and (re)construct their identities, including students whose voices are usually silenced (César, 1998, 2003; César & Santos, 2006). Identities are conceived as dialogical and conflictive (Hermans, 1996, 2001), particularly when the students' cultures are far from the schools' cultures, and transitions between them are difficult (César, 2003; César & Oliveira, 2005). Thus, we assume a dialogical approach of the teaching and learning process (Renshaw, 2004). Being dialogical, identities are also dynamic and they are (re)constructed (Hermans, 2003) and shaped by the relational interplays and the activities in which the participants are engaged. We consider social representations as part of the dialogical self. Thus they are changeable, namely through teachers' practices (Gorgorió & Planas, 2005; Planas & Gorgorió, 2005). As Marková (2007) states « The dialogism (Bakhtin) and the initial theory of social representations [Moscovicci] assume that each individual lives in a world with others (...) Moreover, they conceive communication as the first function of language. Every individual understands and creates meanings of the reality within and by the communication with others » (p. 11), and Bakhtin (1929/1981) goes further when he claims that to be is to communicate. Thus, thinking, is conceptual but is also possible to be communicated (Marková, 2005), which links thinking and action, but also individual and social/collective, overcoming through a dialogical approach the dychotomic opposition between what is individual and what is social.

METHOD

These data are from the *Interaction and Knowledge (IK)* project whose main goal was to study and promote collaborative work in formal educational scenarios. Collaborative work was promoted among students, teachers, teachers/researchers, and academics. Teachers often assumed a position of co-learners (Papert, 2001) or collaborative learners (Smith, 1991) among themselves, them and academics, sometimes with students. Teachers and academics acted as « critical friends », a construct coined by Leite (2002), who claims that to do quality research teachers and academics need to act as critical agents of each others' work. We add that they also need to be able to figure out an intersubjectivity (Rogoff & Wertsch, 1984; Valsiner, 1997) that facilitates the sharing of meanings, like the scientific language associated to their practices, theories and research. *IK* also aimed at promoting more inclusive learning settings (César, 2003; César & Santos, 2006), namely through an intercultural education (César & Oliveira, 2005). The research questions discussed in this paper are: What are the contributions of collaborative work to the (re)construction of students dialogical identities? How do these dialogical identities shape students' mathematical learning? What is the role of the didactic contract in this process?

IK lasted 12 years, including classes from all over the country, mainly from the 5th until the 12th grades (9/10 - 17/18 years old). It included teachers from different

subjects but this analysis is focused in mathematics. Teachers had quite diverse degrees of experience, from trainee teachers until teachers with 20 years of experience.

In the first years *IK* had two levels: (1) *quasi experimental* works studying different types of dyads, tasks and working instructions (Carvalho, 2001); (2) action-research studies in which collaborative work was implemented during at least a school year (César, 2003, in press; César & Santos, 2006), including some experiments of co-teaching (Dias & César, in press). In the last years, a third level existed: (3) case studies, most of them intrinsic cases (Stake, 1995), referring to students categorised as presenting SEN (Silva & César, 2005) and to adult education (Badalo & César, 2007; Courela & César, 2007). A ten years follow up was implemented as we aimed at studying the impact of collaborative practices many years after those students left the project.

We selected one paradigmatic case, i.e., similar to many others we studied in Level 2. Action-research projects followed an interpretative/qualitative approach during the first years of *IK* (when these data were collected), as we mainly aimed at understanding the relational interplay that took place within collaborative work in classes (including dialogical self reconstruction), and its contributions to students appropriation of mathematical knowledge and for their mobilisation/development of competencies. But in the last years the most experienced teacher/researchers assumed a critical approach. We also consider this research historic-culturally situated, i.e., we claim that the interpretations and critical positions assumed were shaped by the participants engaged in that process, including the researchers, and also by the time, place and situations in which the research took place. This research was inspired in ethnographic methods, namely in the long immersion of the researchers in the ground and following cases for a long time, to have last longing narratives that would allow for the interpretation of some participants' biographies (Clandinin & Connelly, 1998).

This case was from a 9th grade class in a multicultural school near Lisbon, in an area with socio-economic and cultural contrasts. This class was taught by a male trainee teacher and this peer interaction was taped on the 3rd day of dyad work, in the second week of classes (the first week is used to respond to some *IK* instruments, as detailed in César 2003; César & Santos, 2006). This is the case of V. and M., the initials of these students' names. V. always had mark 1 in mathematics (the lowest mark, from the 5th until the 9th grade) and M. had 5 (the top mark). V. was from Cape Verde, he came from a poor family that did not value school and his mother language was *creole*, although he spoke Portuguese very well, showing a rich vocabulary and high competencies in argumentation. M. was Portuguese and she lived in a medium-high class family that expected her to go to university and be a high achieving student. V. had already failed two grades and he was at-risk of dropping out of school before accomplishing the 9th grade. He presented disruptive behaviours and was in conflict with many school teachers, the school headboard and some colleagues. M. was very appreciated by most of the teachers but she was quite isolated from her colleagues.

Their interactions with her only regarded their doubts about academic contents. Despite all these differences, in the instrument for evaluating competencies answered in the first week they both had very high performances and complementary competencies. As they were also from an underachieving class, with a lot of disruptive behaviours, and only a few students had ever experienced a positive mark in mathematics, their teacher decided to join them in the same dyad. He expected V. to progress quickly in mathematics - he showed high competencies but only a few mathematical knowledge from the previous grades - and M. to develop other abilities, like critical sense, creativity and geometric reasoning.

Participant observation (different observers; sometimes audio taped), questionnaires, interviews, reports, instruments inspired in projective tasks, instruments to evaluate students' competencies, students' protocols and several documents were the data collecting instruments.

Being part of Level 2 of *IK*, some classes were observed by different observers, including external evaluators who wrote reports. Some of these classes were also audio taped in order to allow for an in-depth content analysis of students' interactive process. During the first week of classes students answered to a task inspired in projective technique that illuminated their social representation about mathematics, to a questionnaire about their interests, performances and school expectations, and to an instrument to evaluate their competencies. Then some students selected as main informants were interviewed in the end of the 1st term (December; the school year begins in mid-September). All students answered a questionnaire in the beginning of the 2nd term (January) and they evaluated the work developed until then and decided whether they wanted to go on working collaboratively. They answered another questionnaire and the same task inspired in a projective technique in the end of the school year (June). The main informants were interviewed once a year during the 10 years follow up (June or July).

The data analysis was a systematic and recurrent content analysis. We aimed at (re)constructing small participants' biographies (Clandinin & Connelly, 1998) through their accounts in the interviews, and having a 10 years follow up facilitated that task, as we had access to their stories for a long time. The inductive categories and the interpretations that emerged were then discussed among some participants and by the project research group. The same procedure was used with the papers we wrote, as we agree with Richardson (1998) when he claims that writing is a process of inquiry, and, for us, also a process of going on the collaborative work based on reflecting upon practices, producing grounded theory and discussing interventions.

RESULTS

When the school year began V. was in the middle of a conflict with several educational agents (teachers, colleagues, head of the school, school workers). He had

been excluded last year because of an episode in which he had no fault. But that was only known after his exclusion. Thus, his way of acting and reacting was far from peaceful, although he was controlled enough not to overcome certain limits. Thus, we listened to many stories about him before we met and no one could understand why his mathematics teacher volunteered to teach that particular class.

The class was poor achieving, particularly in mathematics. In the Portuguese educational system - presumed to shape part of the meta-didactic contract (Schubauer-Leoni & Perret-Clermont, 1997) - mathematics is a compulsory subject until the 9th grade. But students may fail two subjects every school year and still progress to the next grade. Thus, quite often students choose to give up studying mathematics. V. was one of these cases. He never did any activity related to mathematics and had no textbook - he later explained, in a interview, that he used its money for more interesting activities; once he was sure he would fail in mathematics there was no point in spending money in mathematics textbook. In written tests - the most common evaluation instrument - he just used to write his name. Thus, he was very astonished by the first task he had to do: to draw or write what was mathematics. But as he loved drawing, he accomplished it. He did the next one too: a questionnaire. Then, the instrument to evaluate competencies was seen as « being mathematics » and he stopped. But as he began reading it, he asked if he could also « draw the answers ». And he had them all right, as he figured out in the first general discussion. And that was his first shock : How was it possible? He was supposed to always fail in mathematics!...

This marked a turning point in his way of acting in mathematics classes: he was no longer only provoking the teacher, without doing anything except drawings; but he was not confident enough to answer even when he knew the answer. These new learning activities also meant to experience a lot of contradictions between his different I-positions (Hermans, 1996, 2001), and in his identity as a mathematics student. Did he want to participate? Did he like to achieve? Wouldn't it mean that he was loosing his power among his colleagues from Cape Verde and the « cool guys » to whom he acted as a leader? Why was he reacting like that in classes, being so participative and most of the times well behaved? Why was he unable to make fun of the teacher as usual in mathematics classes? These were the first conflicts he had to face related to his dialogical identities, namely to the kind of student he was/used to be, but also the adult he wanted to become and to the persons from his relational net. A second type of conflict was directly related to mathematics: Did he know anything about it or was he an ignorant? And if he did not know anything about it, why was he able to answer? And why was his teacher interested in his answers? Thus, these contradictory feelings were not easy to manage, as he accounts:

> (...) Often I'd go home really confused: After all, did I actually want to learn maths or didn't I care at all? And if I didn't care, why was I suddenly putting my hand in the air to answer things? It was all really weird… real confusing… But… the truth is I didn't skip classes, not even the first in the morning, and I had to wake up and

leave home really early. It was like I was someone else... or lots of people who had nothing to do with the struggle... inside me... (...) I don't know... I thought I didn't know maths, that I didn't understand a thing about it... but still I'd answer, I'd try, I wouldn't give up... it was like there was something pushing me inside… I've no idea where this kind of strength came from, but it was there... (V., 9th grade, December interview)

The first months were a merry-go-round of feelings. He was pleased to see himself answering well; but he was also worried about his image among his peers, above all among those from the Cape Verde community, that were much critical about the school system, Portuguese society/culture, and the exclusion they experienced in their daily lives. But V. was also curious enough to figure out his own mathematical competencies.

This type of contradictions and conflictive feelings were still present in the first days of dyad work. Moreover because he thought M. was a very high achieving student and certainly she was not interested in working with him. But precisely because she was high achieving she did not aim at opening a conflict with their mathematics teacher and she decided to engage in the didactic contract their teacher was trying to negotiate with the students. She did not believe she would progress by working with V. But she aimed at keeping her marks high. And their teacher was counting on that... facing them with tasks related to geometrical reasoning, expecting that V.'s competencies would be needed for the performances of their dyad. He was sure M. could also benefit from working with V. and he was trying hard to make her realise that. But it was in a problem he did not prepare for geometrical reasoning that V. convinced M. she could need his help and also learn from him. She wanted to solve this problem with an arithmetic strategy (Talk 5); he aimed at using graphic representations as he did not know how to sum up fractions (Talks 2, 4 and 6). And for the first time he did not give up and he decided he would do things his way, even if that meant the rupture of collaborative work during the time they were solving the problem on their own.

This way of acting corresponds to a main change in his I-positioning as a mathematics student (Talk 6). He still thought he knew nothing about mathematics, but was trying to solve the problem. The astonishing features were that: (1) V. finished the problem much faster than M.; (2) he had an amazing smile when he finished it; and (3) he had the most accurate and quick way of drawing the cheese, and the fractions that needed to be subtracted. Thus, M. was not yet convinced about his solving strategy, but she was puzzled. And she became even more when he explained why he began by drawing the 1/6. The accurate and quick spatial competencies of V. were a mystery to M. And finally she understood that even she - the best student in that class - could learn from and with him.

> **Problem** - A grocer sold half a cheese, then a quarter and finally a sixth. He then checked that 125gr. were left over. How many kilos did the cheese weigh in the first place?

[V. starts drawing a circumference and then stops to read the problem again.]

1 M. What's that?

2 V. It's a cheese.

3 M. A cheese?... What for?

4 V. Now I'm going to draw what he sold...

5 M. But I think you do this with sums...

6 V. I don't know how to do it with sums... so I'm going to see if it works this
way...

7 M. Then do yours, I'll do mine and then we'll explain.

(...)

9 V. I drew the cheese, then I divided it into 6 equal parts... so as to be easier...
Get it?

(...)

11 V. I know... but I had to know how to mark a half, a quarter and a sixth... a
half and a quarter is easy... the hardest one is the sixth, so I started
with that... or else I wouldn't know how to go about it, after
marking the half and the quarter I wouldn't see where a sixth was...

After a certain time explaining to each other how they solved the task, the teacher
approached them and his way of acting was essential to clarify the didactic contract
and to shape V.'s participation in mathematics classes, helping him to change his
social representation about mathematics, but also his I-positioning as a mathematics
student.

The teacher began by a very general question; and then, he did not comment on what
type of solving strategy he wanted, he just stressed that he wanted them both to
understand what the other one had done (Talks 28 and 30). This gave space and
confidence to V., who was able to explain clearly his solving strategy and to state that:
(1) M.'s sums were wrong; (2) that he could only produce graphic proofs; (3) that he
did not know fractions as he did not know mathematics (Talk 33); (4) that drawings,
for him, even if they led to the right solution of the problem, were not considered to
be mathematics.

28 T. How are we doing here?

29 M. He says he's right, and when he does the drawing he seems to be, but I think this is maths, we should do it with sums!... [V. explains what he did]

30 T. Do you understand how he did that?

31 M. Yes.

32 T. How about you? Do you understand what she did?

33 V. I just understand that her sums are wrong... I drew it here and it's only 1/4... but I think it should also be possible that way... but I don't know any of this, I don't know how to do it that way...

This teacher's intervention was important for V. confidence. He never experienced any kind of criticism towards him although ignoring computations with fractions, or using "a weird solving strategy". The same goes for M., when she made a mistake (Talks 37 and 39). The teacher's message, as he later reported us, was that he wanted them to learn and they were, no doubt, going to learn. Thus, in those very first days in such an underachieving class what he wanted most was to have everyone engaged in the tasks, sharing knowledge and doubt with their peers, and doing his/her best. And this strategy proved to be an adapted one in such a class, as students' mathematical performances and achievement were improved. This message is reinforced by several features of his way of acting: (1) using almost no evaluation comments (except in Talk 43); (2) rephrasing the questions that students could not answer, adding more information, but not answering in their place; (3) showing high expectations towards students' performances (Talks 40 and 41); (4) facing them with challenging tasks but well adapted to these students' characteristics and interests, facilitating that they could work in their ZPD (Vygotsky, 1932/78; 1934/1962); (5) diversifying the evaluation instruments. This didactic contract facilitated students' engagement in the activities, even when they were listening to other colleagues' solving strategies (Talks 36 and 45). They learned from sharing and discussing diverse solving strategies, and that led to their progression. For instance, from this day on V. knew how to do computations with fractions. Students not only succeeded during the school year but also had the final exam they had in the 9th grade. But moreover this didactic contract and the promotion of collaborative and inclusive practices allowed for the emergence of what Perret-Clermont (2004) calls "thinking spaces", which are crucial for promoting students' development and social participation, namely as citizens.

34 T. So, M., how did you think this out?

35 M. That I had to add everything he sold to see how much I got... 1/2 + 1/4 + 1/6

36 V. So far I agree.

37 M. And I got 3/12...

38 T. 3/12?

39 M. Yes... 1 + 1 + 1 = 3 and 2 + 4 + 6 = 12

40 T. And how do you add fractions? [Silence]

41 T. What do you need to do to be able to add fractions?

42 M. [Hesitating] Reduce them to the same number here? [She points to the denominators]

43 T. Of course!

44 M. Oh, then I know!... It's 6... No, it's 12. 6/12 + 3/12 + 2/12 = 11/12

45 V. Right... so you were left with 1/12 after all, like me! [He's visibly happy]

46 M. Yes... then you just have to do the same sums you did.

47 V. After all I was the one who was right this time! [Victorious] I think I'd never got anything right in maths before... by myself.

Several points are interesting: (1) although experiencing quite different levels of mathematical and academic achievement, both students developed similar social representations about mathematics - it is computations, rules, formulas; none considered V.'s solving strategy as mathematics, despite of being correct; (2) they were convinced a student can only learn from high achieving students; (3) they associated mathematics to analytic methods but not to graphic representations and geometrical reasoning, namely in equations; (4) they were very surprised that an underachieving student could have the problem right, and the high achieving one could have it wrong. Thus, this episode was crucial for their performance as a dyad and for their future, as the next accounts illuminate.

> I was furious when I knew I would sit next to V. because he was very poor in Maths. But right now I just wish I could sit next to him in other classes... he is so smart and has such a fantastic way of analysing the questions... he is so critical about everything he reads and listens and does (...) Thanks to him I even developed some abilities I did not have... or I did not know I had... (...)
>
> (...) But the first time he had that cheese problem right it was difficult to accept he did it well... and I had it wrong. I felt it just wasn't possible... not him... But the truth was that afterwards I asked him for his advise and most of the times he had a strange but cut way of solving things... and I began to admire him. He had nothing: no money, no fancy clothes, no future, almost no material [for school classes] but he had a hell of a head!!! (M., 9th grade, June interview)

This case also illuminates that conflicts - namely between I-positioning - within a transformative and secure relational climate act as change opportunities, facilitating

the emergence of new I-positioning (e.g., I as a high achieving student, for V.). But these changing processes are more difficult for students from minority and undervalued cultures. It was V. who experienced feeling lost at his neighbourhood because most teenagers from his squatter were underachieving in school and they usually dropped it out, while he had plans to go to the university. For him, changing had a high cost that the school community usually ignored: it could mean loosing part of his dialogical identities and this also explains why he resisted to become a high achieving student at the beginning. He was resiting to loose part of his identities (Rijsman, 2004).

> To this day there are still times I can't believe I had such good marks and enjoyed studying. It's like I'm someone else… I don't recognise myself… and sometimes I'm not even sure whether I like myself more like that. Here [in the school] I live better. Everyone likes me. But in my neighbourhood, I don't know… it's like I'm far from everything… I don't know… I've got the holidays to think about this... but I don't want to give up on doing a course, I think… what I want to know is what I have to do... to know how to live on both sides. (V., 10th grade, June interview)

More than ten years have gone by since these students finished the 9th grade. V. entered in architecture and M. in medicine, two of the most difficult courses at Portuguese State universities, as we have numerus clausus for the entry. At their universities although being both high achieving students, V. went on facing more challenges and difficulties than M. Dialogical identities are still more conflictive for him and he had to learn know how to deal with that. But they were both able to (re)construct their identities (Hermans, 2003), to develop positive social representations about schools/universities and learning, although being very critical about the school system and (Portuguese) society. And moreover, they were able to maintain a close relation even if everything seemed to point in the opposite direction, as they came from quite differentiated cultures.

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