

SCHOOL AND FAMILY INTERPLAYS: SOME CHALLENGES REGARDING MATHEMATICS EDUCATION

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Policy documents and research regarding mathematics education stress the need to overcome underachievement and students' rejection. They also claim the essential role played by families in order to achieve this. This work is from FAMA – Family Math for Adult Learners project. We assumed an interpretative approach and developed a case study in Portugal. The participants were mathematics teachers (N=28), 8th graders students (N=108), and their families (N=52) who answered to a questionnaire. Some were selected for an interview and focus groups. Data were treated through descriptive statistics and a content analysis. Results illuminate different expectations from these groups and also the lack of possibilities to act as legitimate participants felt by poorly literate parents from vulnerable minorities.

INTRODUCTION

Portuguese educational statistics show the most important criteria to predict students' marks is their parents' level of literacy (Rodrigues, Roldão, Nóvoas, Fernandes, & Duarte, 2010). This clearly illustrates the essential role played by the cultural background and by family support towards schooling. It underlines the privileged life trajectory of participation, particularly in school, that is experienced by students whose families accomplished a long schooling path. These families usually participate in the mainstream culture (César & Oliveira, 2005; Favilli, César, & Oliveras, 2004). The majority of the school contents, vocabulary, tasks and examples, both used by teachers and in the textbooks, are well adapted to students from towns in the seaside – the richest and most developed part of the country – and from the mainstream culture. Many other students participating in vulnerable cultures – usually socially undervalued – often experience school underachievement and early school dropouts (César, 2009, 2012 b). Thus, in schools affected by poverty, whose students' families did not accomplish a long schooling and participate in cultures far away from the mainstream, the need for regulatory dynamics between school and families is particularly intense (César, in press).

Families play a very important role in students' life trajectory of participation (César, 2012 b), in and outside school, and in their engagement in school activities, namely in mathematics (Borges, César, & Matos, 2012; César, 1987, in press; César & Oliveira, 2005; Sheldon & Epstein, 2005). Regarding life trajectories of participation, some families expect their children to accomplish university studies and school to play a main role in their professional opportunities, while others believe their children's

future is much more related to working experiences than to school knowledge. Thus, expectancies regarding schooling, achievement, and future opportunities to get better life conditions vary a lot. Another important issue is that parents get involved in mathematics activities in different ways according to their mathematics knowledge, and their previous experiences (Diez-Palomar, 2008; Green & Hoover-Dempsey, 2007). Their positive self-esteem, the way they perceive their empowerment, or if they assume themselves as legitimate participants (César, 2007; Lave & Wenger, 1991), believing they have a voice that can be expressed and respected, or as peripheral participants who are often silenced and have less opportunities to express themselves and be listened to, also shape the way they help – or feel unable to help – their children when they are studying mathematics at home. As mathematics is one of the most rejected subjects, presenting high levels of underachievement and playing a decisive role for students' vocational choices and future professional lives, this is also the subject that is more affected by parents' levels of literacy and by their previous experiences as mathematics learners.

The development of negative social representations about mathematics and themselves as mathematics learners is connected to students and parents experiences of school failure and underachievement (César, 2009, 2011; César & Oliveira, 2005). Changing these negative social representations is an important step in order to promote students' access to mathematics cultural tools and also to school and social achievement and inclusion (Machado & César, 2012). It is also an essential move in order to construct their identities and to allow them to experience learning opportunities based in equity (César, 2009, 2012 b; Cobb & Hodge, 2007).

METHOD

This work is part of the FAMA – *Family Math for Adult Learners* – an international project involving countries like Spain, France, United Kingdom, Switzerland, Portugal and Italy. We focus on the Portuguese data and in the third specific goal: to support people from socially vulnerable groups who are part of marginalized social settings, particularly immigrants, persons affected by poverty and women. To achieve this goal, we began by collecting accounts from three groups of participants: teachers, students, and their families. These data were essential to plan future actions. Data collection lasted from November 2010 until March 2011. FAMA team agreed that in countries collecting data from mainstream schools, students should be mainly 13/14 years old. In Portugal this corresponded to students attending the 8th grade. Compulsory education has long ago regarded students until they were 15 years old (AR, 1986), i.e., those considered in this study.

We assumed an interpretative approach (Denzin, 2002) and an intrinsic case study design (Stake, 1995). FAMA project included multiple cases (one in each country participating in it). The criteria to choose the schools were that they should be multicultural settings, from poor backgrounds and including students and families from diverse vulnerable minorities. In Portugal we selected a school in the

surroundings of Lisbon. But as no school had as many mathematics teachers as we needed (at least 25 per country), we used other schools with similar characteristics, regarding the mentioned criteria, and in the same region, in order to collect the teachers' questionnaires. In the Portuguese case study the participants were 28 teachers, 108 were 8th grade students, i.e., all 8th grade classes in that school, and 52 family members. The majority of the family members were parents. There were many more mothers (87%) than fathers (13%) acting as responsible for students' schooling (*encarregados de educação*), and more female (75%) than male teachers (22%) [3% did not state their gender], as usual in Portuguese schools. Regarding students who answered to the questionnaire, 46% were male, 53% were female and one did not mention his/her gender.

All the participants answered to a questionnaire, specific for each group: teachers, students, and families. Then, we selected 5 teachers (all those teaching 8th grade), 22 students, and their 22 family members for an interview. The criteria to select students were: (a) only children, others with only older or younger brothers/sisters, and those who had them both; (b) high, medium and low achievement, particularly in mathematics (it also meant different ages); (c) different parents' schooling levels; (d) diverse cultural backgrounds; and (e) gender. We interviewed all parents from the selected students. Finally, we had a focus group for teachers (N=5), three for students (N=3, N=6 and N=8, in a total of 17 students), and another three for families (N=3, N=5 and N=5, in a total of 13 family members, two of them being the mother and the father of the same student). Due to external constraints we could not have in the focus groups all those we interviewed. We must underline the huge effort these families made in order to participate. All the interviews and focus groups took place in the school and they had to conjugate their schedules with ours. As many of them had temporary and badly paid jobs, they were not allowed to leave earlier or to ask for a free mid-day. Thus, many had to use a holiday day or meet us late, at night. This is a sign of their engagement in this work and in their children's schooling. We could get 17 students and 13 family members for the focus groups, although none of them explicitly told us s/he did not want to participate. Those who did not participate were sick or had last minute issues that did not allow them to participate at the scheduled time and place. As focus groups involved several students or parents at once, they were not as easy to reschedule as interviews.

Data treatment and analysis was based in descriptive statistics (questionnaires) and in a narrative content analysis (Clandinin & Connelly, 2000), based in successive readings, regarding the open questions of the questionnaires, the interviews and the focus groups. The FAMA team previously decided the six categories of analysis. Thus, they were deductive categories, based in the literature review. They were the same for all countries and case studies: affect, cognition, teaching and learning, contents, participation, and structure. All interviews and focus groups were fully transcribed. This allowed for an in-depth analysis, trying to understand these persons' life trajectory of participation (César, 2012 b), particularly at school and at these

students' homes. For each category we marked each part of the transcripts that illustrated it, and also if they contradicted other parts of the interview or focus group. We focus on the participation category. In order to maintain their anonymous participation, as recommended by ethical principles, we used a code system that still allows readers to pair students and families: the number of the students and respective families are the same (e.g., Mother 3 is the mother of Student 3). Confronting different papers (César, 2012; César & Machado, 2012) and the National Report (César, 2011) this allows for a better comprehension of the participants life trajectories of participation (César, 2012 b), without revealing their identities, as we wished.

RESULTS

Regarding participation, teachers mainly stated: (1) the lack of time from the parents to come to school; (2) their wishes regarding marks and students' progression, but their lack of concern about their (mathematics) knowledge; and (3) the discouraging role played by complains in what regards parents' participation in school. These three points are illustrated in the next excerpts, by the order we mentioned them.

12 T3 – (...) It's difficult to bring parents to school because sometimes they aren't even at home. (...) In this sense and in these cases, I believe that school has to take the first step and it must help parents realise that it's worthwhile coming to school and know what's going on... Or even know it from home. To keep informed about what's going on with their children... Ah... (...) But there are very complicated situations! In which family's engagement is set up in a very difficult way in school (...)" (Teacher 3, Interview, Turn 12, pp. 2-3)

This first excerpt also mentions a very important topic: the school should do the first move, should be aware of parents difficulties and should turn coming to school into something appealing. Other researches by César (in press), César and Oliveira (2005) or Sheldon and Epstein (2005) also illuminate the role played by school and teachers in parents' engagement in their children schooling. We would add that it is also needed to empower parents so that they feel themselves as legitimate participants. Otherwise, when they feel afraid of talking to teachers because those ones have a better power of argumentation and know school rules better, or when they feel helpless in changing their children underachievement and/or way of acting, they will begin avoiding coming to school, as mentioned in other studies too (César, 2009, 2012 b; Favilli et al., 2004).

14 T5 – That is... it's a subject... a very worrying [subject]!... Because... the... family engagement in school when "our son is getting well", when he is praised and shines at school, it's an easy engagement. That doesn't happen when "our son" is... acts the other way around!... i.e., when we are called to school for those reasons we should never be called, we tend to get away from school... Ah... How do we fight against this? I don't have the slightest idea... (...) I don't have any answer... [The tone of voice denotes a smile]

15 R – And the school? Are there any dialogue spaces between the family and the school?

16 T5 – The school tries to! The school tries to... But... Ah... It's complicated... There's this need, but in practical terms, that need is... Then, there are too many barriers: or it's because the timetables aren't compatible ones, or because we've two hours to talk about five hundred subjects... (Teacher 5, Interview, Turns 14-16, pp. 2-3)

This excerpt states once again that teachers' and school practices facilitate parents' participation, but this teacher accounts that he does not have any possible moves to attract parents to come to school when there are difficult situations that need to be solved in a collaborative way. He points once again to the lack of time, both from parents and teachers. Thus, what comes from this excerpt is also that there is a gap between discourses – parents should participate in schools – and practices, as timetables, spaces, or what are regarded as the most important issues to be addressed, do not include parents' participation in the school life. Overcoming this gap is possible, through the development of regulatory dynamics between schools and families, as illustrated by César (in press). But this means a huge effort from the directive board of the schools and also from teachers and families, and schools clearly have to do the first moves.

The focus groups allowed for a more in-depth understanding of the difficulties experienced by parents regarding their participation. All teachers mentioned the importance of parents' schooling when they are helping their children studying mathematics. But they also mentioned that the economical background also played an important role, as private lessons (*explicações*) are expensive but are also quite common in Portugal. What is interesting is that no teacher mentioned that the need for those private lessons also meant that schools were not working so well, i.e., there is a lack of a more critical approach to the educational system itself.

7 T1 – (...) But probably a student from a superior socio-economical context has more potentialities regarding private lessons, regarding extra work, that allows, isn't it? The parents' schooling itself can also allow, according to having time or not, to help children at home, while here probably it isn't so... it's not like that. There are many parents who during the day are working and are away and – isn't it? – they're trying to earn some money, and they can't... (Teacher 1, Focus Group, Turn 7, p. 2)

Participation was also discussed in what regards the times teachers try to contact some parents, particularly those whose children are in trouble and who do not answer the phone when they realise that it is a call from the school. Thus, participation is also shaped by expectancies, as shown by César (2002) or Green and Hoover-Dempsey (2007). If parents expect teachers to tease them, they tend to ignore the call and they do not contact the school. Thus, teachers need to find ways to ask parents to come to school also to listen to nice comments and not only their children are in trouble, as mentioned by Favilli and his associates (2004), or by César (in press).

51 T2 – That depends because – and now I'm putting things a bit my way – there are parents that we contact and they simply have the school number in their cell phone memory,

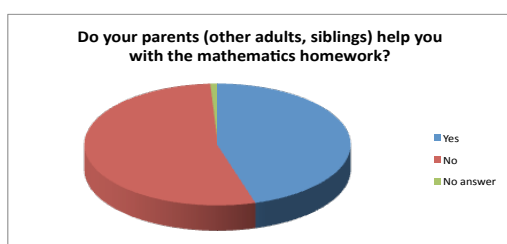
and they just ignore it, they don't answer that call. They answer if it's an unknown number.

52 R – Hum, hum.

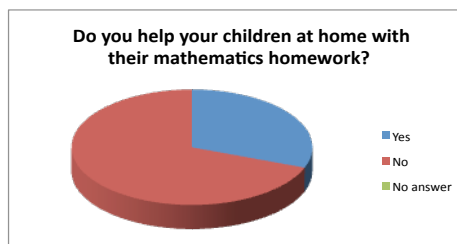
53 T2 – That reveals a lot, regarding some of the parents. Others call us regularly. This I'm reporting as director of the class (...). (Teacher 2, Focus Group, Turn 51-53, p. 5)

When they discussed possible ways of overcoming this problem, they mentioned the emails, or a platform in the internet, but due to the poverty that affected many students' families they also claimed that many of them did not have internet at home and these solutions did not prove to be efficient ones.

Regarding participation students never mentioned if their parents went or did not go to school. What they mentioned was if they participated in their mathematics work when they were doing it at home. Fifty-eight students (54%) state that their parents do not help them (see Graph 1). But even more parents (N=36, corresponding to 69%) claim that they do not help their children (see Graph 2). This is also mentioned in the interviews and in the focus groups: many parents do not feel competent to help their children when they are doing mathematics activities at home.



Graph 1 – Students' questionnaire



Graph 2 – Families' questionnaire

In the interviews it was clear that those whose parents did not help them understood that their level of schooling and time were the main motives to explain their lack of participation in their mathematics activities. The importance of the level of parents' schooling was also stressed by Rodrigues and his associates (2010).

21 S6 – They don't remember anything from school! They try! But they don't always succeed. Sometimes I have to be the one who teaches them... [Ironic smile] (Student 6, Interview, Turns 21, p. 2)

In these cases students have to rely on themselves to study mathematics at home, unless they go to private lessons or to an after school centre of studies. It is mentioned by those whose families help them that this is an advantage. Some account that their older siblings have an easier way of explaining mathematics – using what they call “a teenager language” – and others stress that it is very good to have a family that studies with them because many colleagues do not have this privilege.

42 S15 – Because I understand well what they [referring to his brother and his parents] mean... because sometimes – how can I say that – they explain more with “teenagers' language”.

43 R – And at school, you don't get that?

44 S15 – I also get it at school. Sometimes. Also in the books, there are contents that are less explained, let's put it like this... If this is the case, he [referring to his brother] helps me better. To understand it better. (Student 15, Interview, Turns 42-44, p. 3)

This excerpt illuminates how important it is to have family support when studying mathematics, as it also allows students to understand better the contents that are less clear or less explored in the textbooks. Thus, this support is not only important for students who do not use the textbooks to study. It is important for all of them, as shown in the last excerpt below. Thus, we can better understand the Portuguese educational statistics results that expressed that the most important criteria for getting high marks were parents' levels of schooling (Rodrigues et al., 2010).

32 S7 – I don't know... It's so cute. To see that I can count on them for this! To see they're interested! About my school path, about... about me! They've interest! Isn't it? It's good to know I've someone that I can count on this issue, about school, that I don't have, as I know that most of my colleagues have to do it all by themselves, they have no one at home that helps them and so I value my family very much! (Student 7, Interview, Turn 32, p. 4)

Summing up, students who can count on their families to work with them when they are studying mathematics at home are supported in what concerns knowledge. But the important point is that this participation in their school life also makes them feel more secure emotionally and more able to develop their own abilities and competencies. As this study was developed in a setting affected by poverty, some students valued a lot their families and the chance they had by sharing their home activities with them each time they felt any kind of difficulty regarding their studies. But the differences between those who have support and those who cannot count on it are also visible in the focus groups:

185 R – Yes. And when you have homework and you have some doubts what do you do?

186 S4 – I don't do. (...)

188 S7 – I ask for help. (Students, Focus Group 2, Turns 185-186 and 188, p. 8)

These very short but also very quick answers explained it all: those who have family support when they are studying mathematics, when they experience a difficulty they ask for help and they get helped. But those who cannot count on their families to study mathematics, they simply do not do their homework or they stop studying it.

When confronting students' accounts to their families' accounts it is important to be aware that they confirm each other. For instance, Mother 6 told us that she experienced a lot of difficulties regarding mathematics and her son had reported that sometimes he was the one who had to teach his parents (see Student 6 excerpt above). Mother 6 is already attending the 12th grade, but she failed in mathematics and this subject makes her feel uneasy, as she stated:

2 M6 – I'm going to be honest: mathematics it's not and it never was my strongest [subject]. My mathematics is delayed since my 10th grade. I still did not accomplish the 12th grade, but it is still delayed, mathematics is not my strong [point]. We try to help him in what we are able to, in what we remember, me and my three sisters. [Says her sister's name] already finished her university graduation recently, but... it's not our strong point. He does things on his own and he learns by himself. It doesn't come from us. (Mother 6, Interview, Turn 2, p. 1)

Father 7 also as a very similar discourse to the one we reproduced above (see Student 7 excerpt). He also states that having family support when they are studying is a very important issue.

4 F7 – Or when I pass and ask, '[Says the name of his daughter], do you need anything?'. She sometimes says yes, other times she says no... Ahm... But whenever is possible, yeah, I do help [her]. (...)

18 F7 – ... mathematics is a subject... peaceful! Thus in [says his daughter's name]'s evolution.

19 R – And in your view, should the family or is it profitable that the family gets engaged in their children's mathematics learning?

20 F7 – I think so, I mean... It's helpful we become involved in all their process of education, right? Educative. Ahm... Both in mathematics and in other subjects whatsoever. I think it's worthwhile. For everyone. And if they need help when they ask for help, a... In part it's good, and it's great to know that we can help. (Father 7, Interview, Turns 4, and 18-20, pp. 1-2)

This account illuminates two important features of this father's participation: (1) he is attentive to his daughter's needs and sometimes he asks her if she needs anything; and (2) he feels confident about his competencies to help her. His daughter showed a similar high positive self-esteem and calm way of facing school evaluations and daily work. Thus, confronting families and students' accounts allowed for a better understanding of their life trajectories of participation, in and outside school.

FINAL REMARKS

Promoting parents' participation in their children's home mathematics activities and in schools is a complex issue. Despite their wish to help their children their low schooling levels associated to their lack of time and confidence as mathematics users makes them feel unsecure and uncomfortable when their children ask for their help. Teachers are aware of their difficulties and their rejection of mathematics activities, but they do not realise how much effort some of them put into helping their children.

Parents' abilities and competencies play an essential role in their participation. Some of them assume themselves as legitimate participants and that facilitates their children's development of a positive self-esteem. Their children also show higher expectations towards their own performances. But many parents feel unable to help

their children and act as peripheral participants. In these cases schools need to be able to develop dynamic regulatory mechanisms (César, in press) in order to empower families and to distribute power, allowing them to have a more active role in their children's schooling, and promoting equity regarding school achievement.

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