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To cite this version:
Javier Díez-Palomar. Exploring Roma learning mathematics: A socio-mathematical view. CERME 10, Feb 2017, Dublin, Ireland. hal-01937419

HAL Id: hal-01937419
https://hal.archives-ouvertes.fr/hal-01937419
Submitted on 28 Nov 2018

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Exploring Roma learning mathematics: A socio-mathematical view

Javier Díez-Palomar

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In this paper, I discuss six case studies of Roma people who have overcome inequalities to learn mathematics. I explore which elements may explain their success, as well as which ones appear to be barriers that make learning more difficult for students belonging to an ethnic minority. I draw on their testimonies using a qualitative methodological approach. The analysis of the data reveals that social representations about Roma have a major impact on these six Roma people attitudes and beliefs towards mathematics and schooling, which also affects their strategies to learn mathematics. The six narratives that I discuss in this paper suggest that success happens when Roma children are not segregated from the mainstream, but receive the same mathematics curricula as their peers.

Keywords: Roma, mathematics learning, successful learning trajectories. SLT.

Roma within the literature on mathematics education

In the field of mathematics education there are few studies about how Roma children perform in mathematics (Chronaki 2005, 2008; Stathopoulou & Kalabasis, 2007). Stathopoulou and Kalabasis (2007) analyse the relation between Romanó (Roma language) and the learning of mathematics in Greece. According to them, language is a form of cultural identity for Greek Roma children, and they use it to resist the homogeneous discourse of the school. Stathopoulou and Kalabasis define the academic Roma culture as an “oral” culture, which they use to justify reploting the claim about a “lack of written Roma language”. Starting from this statement, they argue that Roma children are proficient at oral calculation methods connected to their cultural roots, because Roma culture is mainly based on oral tradition.

Chronaki (2008) suggests introducing hybrid practices as a way to break with the hegemonic discourse of the school (Matusov, 2009). Drawing on Bakhtin’s (2010) concept of polyphony, Chronaki argue that we need to develop dialogic practices to include the voices of all students in the classroom, including students from minority groups, not only the ones who share the monologist hegemonic discourse.

There is a lack of scientific literature on the type of actions performed by Roma children that appear to be successful in terms of achieving academic success and developing, what I call, successful learning trajectories (SLTs). Drawing on previous research (Flecha, 2014), I define SLTs as the set of practices and interactions conducted by an individual to pass his/her exams, successfully obtaining his/her school certificate(s). I use the “grading of a test, exam or any other assessment procedure” as indicator of success, for the lack of a better indicator of “learning.” According to the European

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1 Hybrid practices has been used in linguistic and cultural studies to characterize situations within the school (or the classroom) in which participants draw on different social and cultural backgrounds (Gutierrez, Baquedano-López & Tejada, 1999). It includes formal practices (school like practices) and practices related to what Luis Moll calls funds of knowledge (Gonzalez, Moll and Amanti, 2006). Chronaki (2008) uses the term in that sense, in the context of Roma culture.
authorities in education, the minimum level of education expected for everyone is compulsory education (goals of the *Horizon 2020* Program), generally up to age 16\(^2\). For this reason, “early leaving” and “dropping out” of compulsory education is considered “failing” in this approach.

**Methodology**

This study was part of a larger research project investigating the response of individuals from ethnic minorities to overcome the social inequalities they face in the formal educative system when learning mathematics. This research interest emerged in the frame of analysing how children at risk of facing these inequalities can find their way to gain successful scores at school. The data was collected in Barcelona and its metropolitan area. When conducting this study, I realized that Roma people developing SLT (in mathematics) made use of strong support from their relatives. In order to better understand their process of learning, I decided to conduct a series of interviews with six Roma individuals, previously identified as “successful cases” in the sense that all of them had obtained good grades in mathematics during their academic trajectories (until the last course taken) (see table 1).

<table>
<thead>
<tr>
<th>Pseudonym</th>
<th>Year of birth</th>
<th>Academic trajectory</th>
<th>Current situation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federico</td>
<td>1984</td>
<td>University degree</td>
<td>PhD candidate</td>
</tr>
<tr>
<td>Joana</td>
<td>1990</td>
<td>University degree</td>
<td>PhD candidate</td>
</tr>
<tr>
<td>Joaquim</td>
<td>1988</td>
<td>Elementary degree</td>
<td>Access &gt; 25 years old</td>
</tr>
<tr>
<td>José</td>
<td>1979</td>
<td>VET degree</td>
<td>Access &gt; 25 years old</td>
</tr>
<tr>
<td>Antonio</td>
<td>1978</td>
<td>Secondary degree</td>
<td>Access &gt; 25 years old</td>
</tr>
<tr>
<td>Aroa</td>
<td>1996</td>
<td>Upper secondary degree</td>
<td>Working</td>
</tr>
</tbody>
</table>

**Table 1: Description of the participants in the study**

To collect the data, I used personal interviews, an instrument with questions oriented to identify the elements that explain participants’ success in learning mathematics, according to their personal (subjective) point of view. Drawing on Chase (2005),

Contemporary narrative inquiry can be characterized as an amalgam of interdisciplinary analytic lenses, diverse disciplinary approaches, and both traditional and innovative methods—all revolving around an interest in biographical particulars as narrated by the one who lives them. (p. 651)

This method of inquiry is rooted in previous work, of researchers such as Thomas and Znaniecki (1918/1927), Garfinkel (1967) and Mills (1959). It involves collecting the testimonies of participating people using a number of instruments of data collection, including life stories, self-reports, oral biographical memoirs, testimonies, in-depth interviews, recorded narratives and life review (Mertens, 2009). This method of inquiry starts from an epistemological approach of individuals as primary sense-making agents (Giddens, 1991; Riley & Hawe, 2005). Personal narratives allow us to see first hand the interpretations made by the protagonists of their own life experiences. As Bruner (1990) claimed, we understand our world through the lenses of personal narratives. In addition, we also make meaning (and even build meaning) through those narratives. This type of method (inquiry)

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\(^2\) Almost in one of three European countries “compulsory education” goes up to 16 years old. For more information, see: http://eacea.ec.europa.eu/education/eurydice/documents/facts_and_figures/compulsory_education_EN.pdf
led me to include the voices of the participants within the wider study. All information was transcribed for further analysis.

I selected six participants for the purposes of this paper. All met the requirement of having developed a SLT. As we can see in table 1, two of them are now enrolled in PhD programs. Three more, Joaquim, José and Antonio, are preparing to access university degrees, through the exams set up by the Government for people over the age of 25. Finally, Aroa is a girl (the youngest one in the group) who after finalizing her studies in the high school, decided to start working.

In order to analyse the data, I used narrative and discourse analysis (Mertens, 2009), drawing on a communicative methodological approach (Aubert 2015, Sánchez, Yuste, de Botton, & Kostic, 2013). This approach focuses on the analysis and interpretation of the discourse from the dialogue with the participants, using validity claims (Habermas, 1984). The interpretation is organized in two different dimensions of analysis: transformative and exclusionary. Transformative dimension includes all aspects that will enable the subject of the study to answer positively to the research question. Exclusionary dimension has the opposite meaning: it includes all aspects that will avoid (or make more difficult) answering the research question. For the study reported in this paper, the transformative dimension includes all aspects leading the participant to achieve a SLT, whereas the exclusionary dimension refers to all aspects making difficult (or even avoiding) the subject to achieve a SLT.

<table>
<thead>
<tr>
<th></th>
<th>Attitudes</th>
<th>Beliefs</th>
<th>Contents</th>
<th>Strategies</th>
<th>Social Representations</th>
</tr>
</thead>
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<tr>
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<td>T’</td>
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<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>E”</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Teacher</td>
<td>T’</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>E”</td>
<td>16</td>
<td>17</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>Family / Community</td>
<td>T’</td>
<td>21</td>
<td>22</td>
<td>23</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>E”</td>
<td>26</td>
<td>27</td>
<td>28</td>
<td>29</td>
</tr>
</tbody>
</table>

* Transformative dimension
** Exclusionary dimension

Table 2: Coding categories for data analysis

Interviewers and interviewees established a dialogue to explore the data collected, which allowed us to identify meaningful topics regarding interviewees’ learning trajectories. In a subsequent interview, I asked them to further clarify those topics. Drawing on this dialogue I elaborated a key to codify all data collected (see table 2).

The categories (codes) emerging from the discussions include: attitudes, beliefs, content, strategies and social representations. The first two concepts were defined in McLeod’s (1992) terms. Content is referring to the mathematics itself (the curriculum). Strategies are defined in Maehr’s (1983) terms

**Discussion**

Next I provide first an inductive analysis of the data collected through the interviews. Then I try to create a tentative model to make sense all the relevant variables identified by the participants in the study, explaining their ‘learning process’.

**First step: Inductive analysis**

Federico provides a good example illustrating the type of answers obtained from all six Roma interviewed. He claims:

In my case, the key aspects were, one I was passionate [about mathematics] and I really like science, so my motivation was somehow ‘natural’, or ‘intrinsic’. In addition, my teachers of mathematics and biology used to give me extra homework. I remember that in 4th grade - ESO [secondary education – middle school] I used to solve problems of 1st grade - Bachillerato [secondary – high school], and this was very motivating for me. It was the opposite in Catalan or English, teachers used to reduce my tasks so I could pass them [with no work]. Not the case for Spanish: I also used to get difficult homework to do in the classroom or at home. (Federico)

In his words, we can see that aspects particularly positive in his academic career include effort, a challenging curriculum, a personal motivation (passion) for some of the academic topics (such as mathematics or biology), whereas no enthusiasm at all is devoted toward other ones (Catalan or English). From a very tentative entry point, we can infer here that ‘motivation’ is, somehow, connected to ‘grading’ (as learning ‘indicator’), given that Federico (for example) got excellent grading in mathematics and biology and, in fact, he started ‘biology’ for his minor at the university. But he also declares that his family (specially his mom), took a relevant part in his learning process.

In an informal way, my mom taught me mathematics in the kitchen, or when shopping. Topics like volume, arithmetic, counting, prices, change, […] My dad, as he was in the construction sector, taught me how to calculate budgets, how to calculate the price for square meters, how much does it cost the staff, rates. (Federico)

He and Aroa, Antonio, José, Joaquim and Joana as well, explain that their good grades in mathematics were consequence, mainly, of their family involvement. Their parents were the ones teaching them to develop mental calculation skills, estimation skills, etc., which were highly valued in the school framework. Stathopoulou and Kalabasis (2007) also provide clear examples in the case of Greek Roma, confirming this finding. However, this is not a main strategy for learning mathematics for any of our six cases. What they claim is that in order to obtain good grades in mathematics, they basically had to study hard, to put a lot of effort, using academic strategies to better learn: outlines, summaries, use of key words, or other mnemonic strategies, practice, problem solving, homework every day, etc.

However, drawing on the data that I collected, it seems that certain social contexts could become sometimes a barrier limiting the opportunities of some Roma individuals to successfully perform in their grades. Joana, for instance, felt isolated from the ‘Roma world’, whereas Joaquim resists and rejects school because “[school] it is not Roma”. Teachers are crucial. According to Federico, some teachers really do not help Roma students because they feel that Roma are not interested in education.
Joana holds a similar view. She explains how for many of her Roma friends teaching was just a matter of “being happy attending the school”, rather than “being a place for expand their learning”. According to Joana, that was the consequence of some teachers’ prejudices against Roma children:

Not always, but in some cases, yes. It was not the case with me; my teachers always encouraged me to continue studying. But most of the times they did not identify me as Roma, and I have come to hear some pejorative comments towards my people from my teachers. In the classroom, I never had so many Roma peers. But I know other Roma girls who explain to me that, in their high schools, teachers, instead of teaching them the lesson, they lead them to see the *telenovela* [soap operas on TV]. I guess that it is the easiest solution and they think that doing so, the girls would be happy of attending the school every day. But I think that it is the opposite in fact, because the girls and their families know that they are not learning anything, so attending the school is useless. If things are like that, then they can stay at home and see the *telenovela* over there. (Joana)

Looking at the testimonies of the six individuals interviewed, what they highlight as the most exclusionary factor is segregation, the separation of Roma students from the mainstream. This is due either to stigmatization from some teachers, or because genuine wishes of some teachers to better help them, hence they use “separation into homogeneous small groups” as a way to ‘concentrate’ additional support. However, according to Federico and Joana, those efforts are useless, since taking Roma children away from the mainstream does not help them to better learn mathematics, but the opposite; this practice leads the Roma students to be labelled by their peers and teachers, creating a stigmatized social representation about Roma. Therefore, this process somehow “announces” the academic performance of Roma children even before they conduct the tests. It is like a “self-fulfilling prophecy”. This perverse effect has been proved many times in the field of mathematics education research with children from vulnerable groups (Secada, Fennema, & Byrd-Adajian, 1995; de Abreu, Bishop, & Presmeg, 2001). When the school creates ability groups to segregate vulnerable groups children from the mainstream, creating low level groups, or designing segregated paths tracking, the consequence is that these children fail.

**Second step: Creating a model of analysis**

Drawing on the analysis of these testimonies, after coding them with the qualitative software package *Atlas.ti*, I produced a tentative model to describe SLT. I called this scheme *Learning Core Matrix* (LCM), as in figure 1, drawing on the variables identified by McLeod (1992), Maehr (1983) and Moscovici (1981), as reported earlier in this paper. The sum of all these components forms what I call LCM. I use this scheme to understand how every SLT works. On the subjective level of analysis, personal attitudes are shaped by social representation of being Roma. Social representations include values, ideas, metaphors, and beliefs (in the sense of Moscovici’s notion) related to learn mathematics being Roma. Strategies refer to the practices that individuals (Roma students, teachers, etc.) perform to teach, learn, resist or avoid mathematics. Attitudes include positive or negative evaluation of people, objects, events, activities, ideas, etc. in the frame of teaching and learning mathematics.
Beliefs include personal mental states regarding people, objects, events, activities, ideas, etc. Finally, contents refer to the mathematics curricula. According to the data collected, it seems that a ‘positive’ social representation of Roma may explain why some teachers do not segregate Roma addressing them to low-achievement groups with poor content (in mathematics), whereas other teachers holding ‘negative’ social representations about Roma use segregation strategies with them, lowering the curriculum, for instance. It is also the case that the same teacher may also project good expectation in one particular Roma student, whereas segregating other ones. Having a positive or negative social representation depends on the teacher attitude towards Roma identity, which is closely interlinked to teachers’ personal beliefs. From the student point of view, the model works accordingly: confidence in the school (positive belief) is attached to a positive attitude in the classroom, as well as to the use of a variety of strategies to learn mathematics (such as prepare exams some days ahead, do homework, look for extra work, etc.). This is associated to a teacher’s positive social representation of Roma as successful learner (in mathematics), as well. The individuals who show positive components in this LCM use to hold SLTs more likely than the ones who, at some point of their lives, had a (mainly) negative LCM.

**Conclusion**

The six narratives I have discussed here suggest that success happens (or is more likely to happen) when they have had positive LCMs. When all of the five components of the LCM (or most of them) are positive, then it is more likely that an individual would develop a SLT. On the contrary, when the negative component is prevailing, then is hard to see SLT as a result. Joaquim, for instance, at some point of his life dropped out the school because he was feeling resistance against the school institution. According to him the main reason to explain such attitude was his negative social representation of “school” as something alien to his identity. This feeling could be, somehow, the result of being segregated by certain teachers holding negative expectations towards Roma students.

The role of the family plays a crucial role to overcome the difficulties and barriers that some Roma students face along their school trajectories. A significant amount of these barriers is connected to prejudice and negative social representations about Roma. Family may be a resource. However,
sometimes this is not true because the members of the family did not have any opportunities or possibilities to study themselves. For this reason, they cannot become ‘resources’ to help their children to solve their mathematics assignments. But, according to Hoover-Dempsey et al. (2005), the families can look for further resources to reinforce their children’s learning. Recent studies suggest that family engagement in the school has major impact on learning than just appointing family members in the school to ‘report’ on children’s behaviour (Diez-Palomar, Santos, & Alvarez 2013).

LCM may have the potential to explain both Roma’s SLTs or the failure of many Roma children in the school, as narrated by Joana, Federico, Joaquim and the rest of their peers. In their narratives, they explain how many of their Roma peers used to be re-allocated to low-level classrooms, how teachers use to decide to lower the grades for them, cutting down on the curriculum, or asking them to do naive work (like painting) rather than problem solving or other high-mathematics-oriented tasks. However, examples like the narratives by Federico or Joana may help us to understand how holding a positive identity connected to showing positive attitudes in the school, using different strategies to overcome the difficulties related to mathematics itself (epistemological, ontological, etc.), combined with high quality curricula and classroom organization, may end in the development of SLTs.

The model that I presented here is not generalizable. We need further quantitative studies to either accept or reject this approach. This would be the next step in the near future.

References


