

## **Adult Learners of Mathematics: A Look at Issues of Class and Culture**

Marta Civil

The University of Arizona, Tucson, AZ - USA  
civil@math.arizona.edu

This paper draws on my work with parents and mathematics in working class, Hispanic communities in Tucson, Arizona. My goal is to show how this research on parents as adult learners can inform our work with adult learners in general. I first look at three bodies of research that have been very influential in my work with adult learners: a) 'funds of knowledge'; b) ethnomathematics; c) dialogical learning. I then use examples from my work with parents as learners of mathematics to illustrate some of the possible implications from these three bodies of research. In previous ALM presentations (Civil, 2000; 2001) I have discussed the dilemma of parents as parents (i.e., as learners for their children's sake) vs. parents as adult learners (i.e., as learners for themselves). This dual role that many adult learners (particularly women) are likely to experience is not unique to my work that focuses specifically on parents. Researchers such as Brew (2001; 2002) and FitzSimons (2002), while focusing primarily on adult learners in general, have recently highlighted the role that children play on mothers' decisions to undertake adult education. Thus, in this paper I revisit this dual role as parents and adult learners and also look at our more recent work, which adds one more role, parents as teachers. I use these three roles to suggest implications for mathematics learning experiences for adults.

### **Uncovering the Community Knowledge**

I have been working in Mexican / Mexican-American communities in Tucson, AZ for about 10 years now. There are certainly differences across these communities and even within one given neighborhood. Some families may be living in established neighborhoods and in fact may have been living there for many generations; others may be recent immigrants; some may speak English only, others Spanish only, and yet others may be bilingual (and with different levels of bilingualism). Some may have had quite a few years of formal schooling in their country of origin, but because of their lack of knowledge of English and other circumstances, they may be working at jobs that do not reflect their schooling (I have met quite a few college educated individuals working as custodians, classroom aids, restaurant helpers, and other jobs paying minimum wage or slightly above).

My interest in Adult Education is grounded on these initial experiences that I had with working-class families who are working hard at trying to make it and above all are trying to provide a 'better' living for their children. In general terms, the children in these neighborhoods do not achieve academically as high as those in other wealthier parts of town. The typical rhetoric tends to blame families and communities for those failures. I have certainly witnessed comments along the lines of 'if we could only get these people to value education as much as [some other ethnic group] does;' or, 'let's face it, most of these students [at a high school in one of these working class, Latino neighborhoods] will not go

into college,' or 'many of these kids are not college material, and we do need people to do [some low-paying job].' Yet our conversations and more formal ethnographic work in these communities reveal a very different picture. It shows the richness that resides in these communities. Through ethnographic household visits and occupational interviews we have been able to document a wealth of 'funds of knowledge' in these communities we work in.

### **What are Funds of Knowledge?**

A key theoretical concept in our work is that of funds of knowledge, which are 'the essential bodies of knowledge and information that households use to survive, to get ahead, or to thrive' (Moll, Véllez-Ibáñez, & Greenberg, et al., 1990, p. 2). Through our work we have gathered information on the labor and social history of language and ethnic 'minority' families as well as information on their views on education, and on the children's daily activities and chores. Many of these families have an extensive knowledge about construction, repairs, carpentry, household management, folk medicine, farming. Of particular interest for our educational goals is the fact that the children in these families participate in many of these activities, often learning about them through an apprenticeship model. Hence, these children come to school with knowledge about welding, construction, financial transactions, car repair, child care, and so on. Outside school, they are resourceful and creative problem-solvers. Inside school, often they have been exposed to what characterizes schooling for poor and minority children: basic skills, drill, rote-like learning. Although our work has focused on implications for the children's education, I have been intrigued by the implications for adult education. What would a Funds of Knowledge adult education program (in mathematics) look like? This question is addressed in what follows.

### **Ethnomathematics**

My work with preservice teachers, and in particular with those 'non-traditional' students (i.e., mostly women returning for a college degree after having raised a family) made me notice that often, among those who claimed to be 'less successful', were those who tended to want to make sense of the problems and make connections to their everyday experiences. On the other hand, the 'more successful' students were less likely to make use of informal methods, everyday type reasoning; they would rather use a formula, algebra, school-like methods. These students were regarded by the former as being smart, even though, in many cases they were not really all that successful with the formal approaches. To me it was interesting to note that those 'less successful' by school / formal standards, were actually much more creative and resourceful in their problem-solving approaches. Unfortunately, many of them did not value their own methods, dismissed them (cf. Coben, 1999, on 'just common sense') and asked to be shown the 'proper' way.

This led to my interest in the notion of beliefs about mathematics and in particular to studies on street / everyday math and school math (Lave, 1988; Nunes, Schliemann, & Carraher (1993); Saxe 1988). In fact it is this need to better understand the mathematics embedded in practices (e.g., Cox Hancock's (1994) study of seamstresses; Masingila's (1994) study of carpet layers; Millroy's (1992) work with carpenters; Hoyles, Noss, & Pozzi (2001) study of nurses; Smith's (2002) study of automobile workers) that led to our in-depth occupational interviews (e.g., with a seamstress, with a carpenter, etc.). I will return to the implications from these interviews for adult education later in the paper. In this section my goal is to focus

on the concept of ethnomathematics, and in particular on its relevance for adult education. To this end, I find Knijnik's work (1993; 1996) with adults extremely helpful. In particular, let's recall her concept of ethnomathematical approach,

*research* into the conceptions, traditions, and mathematical practices of a specific subordinated social group and *pedagogical work* involved in making the group members realize that:

1. they do have knowledge;
2. they can codify and interpret their knowledge;
3. they are capable of acquiring academic knowledge;
4. they are capable of establishing comparisons between these two different types of knowledge in order to choose the more suitable one when they have real problems to solve. (Knijnik, 1993:24)

Notice the parallels between this approach and our concepts behind Funds of Knowledge. The key message here is the recognition of knowledge and resources among the groups of people who have often been marginalized (whether it be by language, culture, gender, race, or social class issues). Many of our adult learners come from these groups. As Benn (1997) and Knijnik (1993) point out, though, I am certainly not advocating that in our work with certain groups who have been marginalized we focus primarily on their ethnomathematics. In fact, the women I have been working with have expressed a clear interest in learning 'academic' mathematics. I agree with Knijnik (1993) when she says that 'merely glorifying popular knowledge does not contribute to the process of social change' (p. 25). As Benn (1997) points out, there are different forms of mathematics, each associated with a different discourse and set of values. Our task, I think, is to accept and value these different forms and bring them into the open for discussion. I think that the pedagogical approach embedded in dialogic learning (Flecha, 2000) enables us to do this.

### **Dialogic Learning**

My initiation into my current work with working class women (most of whom are Mexican or of Mexican origin) took place several years ago with a small group of Mexican immigrant women who were part of a Literature Club in Tucson. In designing this Club, the facilitators moved away from the typical offerings to families that are often found in working class, minority communities. The emphasis of these offerings tends to be on the teaching of English as a second language, and in general on programs that focus on what families are seen to be lacking, reflecting a deficit orientation towards these families. The Literature Club instead,

- (1) It does not subscribe to the authority of the teacher;
- (2) the curriculum is created through collaboration with the participants;
- (3) all those in attendance are knowledgeable and literate; and
- (4) the content of the literature remains at a high intellectual level (Andrade, González Le Denmat, & Moll, 2000: 273).

And indeed the members of this Literature Club read key literary pieces, often by women and about women. Their discussions were guided by a basic rule 'no one [this includes the facilitators] is better than anyone else in the group.' This rule is strikingly similar to the principles behind dialogic learning in the literary circle described by Flecha (2000). In that

literary circle in an adult education center in a working class neighborhood in Barcelona the group agrees on a book to read and discuss. Then,

Each person chooses a passage to read aloud and explain why it was particularly meaningful to him or her. The dialogue constructed is then based on these contributions.... No one determines the correct or incorrect reading based on his or her position of power. (Flecha, 2000:4)

A key concept in dialogic learning is the notion of an egalitarian dialogue, which as the excerpt above indicates, is a dialogue in which the validity of a contribution is NOT determined on the basis of who is giving the contribution, that is what his or her position of power is. The validity is determined through discussion in the group. What may this look like in a mathematics setting? Could we envision a ‘mathematical circle’ in which adults and facilitator(s) engage in dialogic learning about mathematics? Flecha also brings in the sociocultural component, which as I presented earlier is key to our Funds of Knowledge orientation. So, in a sense, I have come full circle. I started this paper with the importance of Community Knowledge and a brief description of the concept of Funds of Knowledge. The notions behind Ethnomathematics, and in particular as they apply to adult learners, nicely complement the Funds of Knowledge orientation. Finally, Dialogic Learning provides a pedagogical framework that allows me to blend the principles behind Funds of Knowledge and Ethnomathematics. Figure 1 summarizes my proposed ‘model.’ In the rest of this paper I focus on specific examples from my work with adults and mathematics to address the challenges and rewards of trying to bring together these three bodies of research.

[Figure 1 about here]

### **Working with Parents as Adult Learners**

As I began my work with parents as learner of mathematics, I was drawn to the concept of parents as intellectual resources and to the possibility of creating opportunities for parents to explore mathematics as adult learners in order to promote their own development. We developed a series of mathematical workshops in which we engaged as a group in doing and discussing mathematics. Yet, as I thought about what these explorations could look like, an array of questions came to my mind. The rest of this paper presents several of these questions and some examples from my work<sup>1</sup> to illustrate what I mean.

### **What mathematics should we be discussing in these workshops?**

Project Bridge, where these initial workshops took place, is grounded on the Funds of Knowledge concept. My original idea was to somehow develop these workshops out of the mothers’ uses and knowledge of mathematics in their everyday life. As I discussed in ALM 5 and 6 as well as in González, Andrade, Civil, & Moll (2001), the transformation of this

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<sup>1</sup> I will be focusing on two projects. Project Bridge (Linking home and school: A bridge to the many faces of mathematics) is supported under the Educational Research and Development Centers Program, PR/Award Number R306A60001, as administered by the OERI (U.S. Department of Education). Project MAPPs (Math and Parent Partnerships in the Southwest) is funded by the National Science Foundation (NSF) under grant – ESI-99-01275. The views expressed here are those of the author and do not necessarily reflect the views of the funding agencies.

everyday knowledge into mathematical knowledge to be used in school or in workshops for adults, proved to be quite challenging. One reason for the challenge was my own limitation: I was trained in formal mathematics and had little if any experience with many of the practices that we uncovered in our visits and occupational interviews. As Fasheh (1991), formally trained in mathematics, wrote about his mother's mathematics embedded in her practice of sewing, 'it struck me that the math she was using was beyond my comprehension. (...) Mathematics was integrated into her world as it never was into mine' (p. 59). Similarly, Millroy (1992) writes about what she considers to be a paradoxical situation in ethnomathematics work, 'how can anyone who is schooled in conventional Western mathematics 'see' any form of mathematics other than that which resembles the conventional mathematics with which she is familiar?' (p.11).

Our attempts to bridge these different forms of mathematics brings up questions around values: What are our values about mathematics? What do we count as being valid mathematics? My work is with women whose knowledge of mathematics (and their knowledge in general) has often been considered marginalized and of little value. What can I do to change this, while keeping in mind Benn's (1997) pointed question 'is the use of contexts derived from women's traditional domains, say the home, reproductive or legitimising and hence emancipatory' (p. 178)? Furthermore, the women we work with, maybe because they first joined the workshops as parents (that is as learners for their children's sake), want to learn school (academic) mathematics. In this sense they are no different from most of our adult education students (Benn, 1997): they too want to learn academic mathematics.

In ALM 7, I presented an experience that allowed us to successfully combine these forms of mathematics, while focusing on academic mathematics. This was possible through the joint exploration of the Mexican craft of Papel Picado (punched paper). Using colorful paper one creates intricate designs by cutting out shapes in a careful and pre-planned fashion. Making 'papel picado' allows for an exploration of symmetry. We also took it in more artificial directions (but that tied in with our previous more school-like activities), such as finding areas and perimeters of the shapes being cut out. It eventually led to the need to find the area of circles, which took us to discuss  $\pi$  (pi). An interesting aspect of this activity was that the mothers were guiding the practice, as I knew nothing about 'papel picado'. As we worked on cutting out shapes, I would pose 'innocent-sounding' questions, such as 'I wonder what the area of all this paper we are cutting out is?' Of course, the women knew how irrelevant the question is, but were eager to engage in the challenge of finding out. 'Papel Picado' provided us an arena for our joint exploration of academic mathematics, and although the mathematics was meaningless from the point of view of the practice, the practice and their teaching me how to do it was meaningful.

In the Bridge setting, we learned as a group. There were only a few mothers in this project, usually around five. It was very clear that the mothers had a say in what they wanted to learn (e.g., they directly asked me for algebra) and I tried to design activities that would address their needs while being true to my pedagogical beliefs, which are grounded in the notions of dialogic learning discussed earlier as well as with a strong belief in the fact that learners need to make sense out of the mathematics they are learning. Thus, although their request for

algebra had to do with their wanting to learn how to manipulate meaningless symbols (in order to help their high school age children), I approached it from a conceptual understanding point of view. I know we did not get to the point in which they could solve equations and manipulate algebraic expressions like high school students are expected to. I also know that with more time, we would get there.

### **What do parents value in terms of instructional approach?**

In my paper for ALM 8, I described three of the Math For Parents courses that we had taught so far as part of project MAPPS and the three different instructional approaches that each instructor used. One was along the lines of dialogic learning, with parents and facilitators sharing into the dialogue, like a family; another course was more teacher-centered and the last course was more student-centered (but still quite under the control of the teacher). All of our courses make use of hands-on materials and group work (to a different extent, depending on the instructor). The parents always comment on these characteristics as being very different from their own experience as children when they went to school (whether in Mexico or in the US). One challenge that we have encountered in trying to uncover what parents value in terms of both pedagogical approach and content is that most parents feel very positive about everything that takes place in our activities, or at least, so they say. Certainly one key characteristic in our programs is to work on the atmosphere: we want parents to feel comfortable doing mathematics and sharing their ideas. As research in Adult Education has shown, one of the biggest obstacles that adult learners (and thus their instructors) face is the fact that many of them return to study with not very good memories of mathematics in school (Evans, 2000; FitzSimons, 1994). Thus, for us it is imperative to work to counteract that. Furthermore, the lack of clear terminal objective in our work with parents (do they take the courses for their own learning? to help their children?) and therefore the fact that there are no formal assessments associated with our activities, may help parents be more at ease. They do not necessarily feel on the spotlight.

Most parents comment very positively on the opportunity to work in groups, not just from an affective point of view (they enjoy sharing and talking to their friends at the table), but cognitive (they appreciate seeing different approaches to a given task). They also value the opportunity to engage with other adults in discussions about an intellectual matter. In particular, several women who come in as friends, enjoy this other twist to their friendship: they are no longer 'just' sharing stories about their children and in general about their everyday life; they are now talking about mathematics together. Although it would be hard to talk about a teaching philosophy that all project staff can agree upon, I would say that most of us had in mind an approach to adult education that gives them a voice in their learning process. These adult learners appreciated being treated as equals,

*For me the relationship with the instructor was very important. It was a relationship based on equality, I don't feel that because one is a teacher he should feel superior to us; this was a very positive relationship in which the teacher used his knowledge in a positive way, always treating us all as equals, and I always felt very comfortable.  
[MAPPS participant]*

### **What is the role of our beliefs about mathematics and about its teaching and learning?**

This question has multiple implications, in particular when we look at parents as adult learners but also as parents. As adult learners, we may be encouraging parents to work in groups, to discuss mathematics, to explore different approaches to a problem. Yet, is this the approach that their children are experiencing in their school mathematics? I briefly alluded to some of the dilemmas that my work with parents has posed for me (e.g., the group of mothers who wanted to learn algebra). Some times parents bring examples of rather dry homework questions that their children have been asked to solve, or they are asking about a method that I may find completely procedural and devoid of meaning, yet that is what their children are being asked to use. Of course at other times, the teachers are the ones encouraging a more flexible, investigative approach, but then the testing comes into play. Generally speaking their experiences as adult learners in our programs are quite different from their experiences when they were in school and may in some cases (but I want to emphasize that not always) be different from what their children are experiencing. One possible consequence from engaging parents as learners of mathematics in a more freeing approach may be that they become supporters and even advocates of these approaches for their own children.

*MAPPs has been very different from my previous experience (with math). I went through my whole life being told how things were not and not given any freedom to figure it out on my own.*

*I'm amazed because [I see] something that I didn't see before, and it clicks in my mind and I understand why things are the way they are. I get excited because now I know, I'm not accepting it, now I know why that is the way it is.*

As parents themselves learn mathematics with an emphasis on understanding rather than rote memorization, they become quite vocal about the importance of understanding for their children's mathematics education. As one mother very eloquently said, 'I don't want them [teachers] to teach to the test. You have to be versatile in many things. If you don't understand, what's the point?'

Underlying these experiences are the different players' beliefs. Parents come to these courses and workshops with often fairly well established ideas about what mathematics is and what its teaching and learning should look like. The authors of the Math for Parents materials also have their own beliefs that are reflected in the activities. The instructors of these course bring in their own beliefs too, which may or may not be in agreement with those of the parents or authors. Sorting through all these different and sometimes conflicting beliefs is an important aspect of our research agenda.

### **What is the potential behind parents (and more generally adult learners) as teachers?**

As part of our leadership development goal we have teams of teachers and parents delivering workshops to other parents. This aspect of our project has been a source of surprises for us. In the planning stages many of us were thinking that the teachers would be the main ones delivering the mathematics workshops and that the parents would take more of an assisting role. Well, due to different constraints on the arrangement of teams (e.g., some teams have only parents in them) and other reasons (some parents felt ready to take a leading role and

wanted to do so), we now have a mixed model in which quite often parents are teachers to other parents. As one mother explained,

*It was hard in the beginning to work with the teachers. 'They are the best.' They don't give you the opportunity that you may know more or bring other ideas. Now we are more equal. Before [with her hands she indicates parents in the team were at a lower level than teachers], but now [she indicates they are at the same level]. Now they rely on me, they check with me, they make you feel that you are important to them. One teacher once told me 'you just hand out papers' and I was upset. [Then she goes on to explain how in a more recent MAW she took the lead of the presentation.]*

Having parents as teachers has proved to be an extremely rich experience. It allows us to learn more about their understandings of mathematics, as well as about their beliefs about its teaching and learning. It has at some points been problematic (though often in the same ways as when teachers are presenting). But even with these possible problematic situations, I think that it is important to continue this approach given the enthusiasm with which the parents in the teams prepare for these workshops and how rewarding the experience seems to be for them. As these two mothers show in their reflection on what they pay attention to in their teaching, confidence, feeling comfortable, and equal contributions (again, a characteristic of dialogic learning) are key for them,

*To give them confidence by telling them that I am also a mother like they are and that I may also have doubts and that we are ready to explain something again when they do not understand it. In conclusion, the important thing is to make them feel confident so that they will be encouraged to join this program.*

*That parents know that I am teaching but they are teaching me too, not to make them feel like dummies. Let them contribute as much as I am contributing.*

The main goal in our projects is to engage parents as learners of mathematics. Thus, having parents teaching parents seems to make sense because as they have often told us and we see the evidence, they know how to connect to other parents. This is similar to having teachers teaching teachers in University-run professional development programs. The teachers in those programs are often very grateful to have teachers teaching because they understand their professional reality much better than university professors do.

In closing, as I said earlier, I came to this arena of adult learners through my work with parents. In several cases the parents in our projects have gone onto further adult education (along more formal lines). In this paper I have emphasized some general points that should be of interest to all of us who work with adult learners (whether parents or not). I would like to encourage adult educators to tap into the local schools for possible activities with parents as learners. It not only may encourage several of them to pursue further adult education, but I find it to be a very rewarding experience as it allows us to play a role at different levels including maybe children's experiences with school mathematics.

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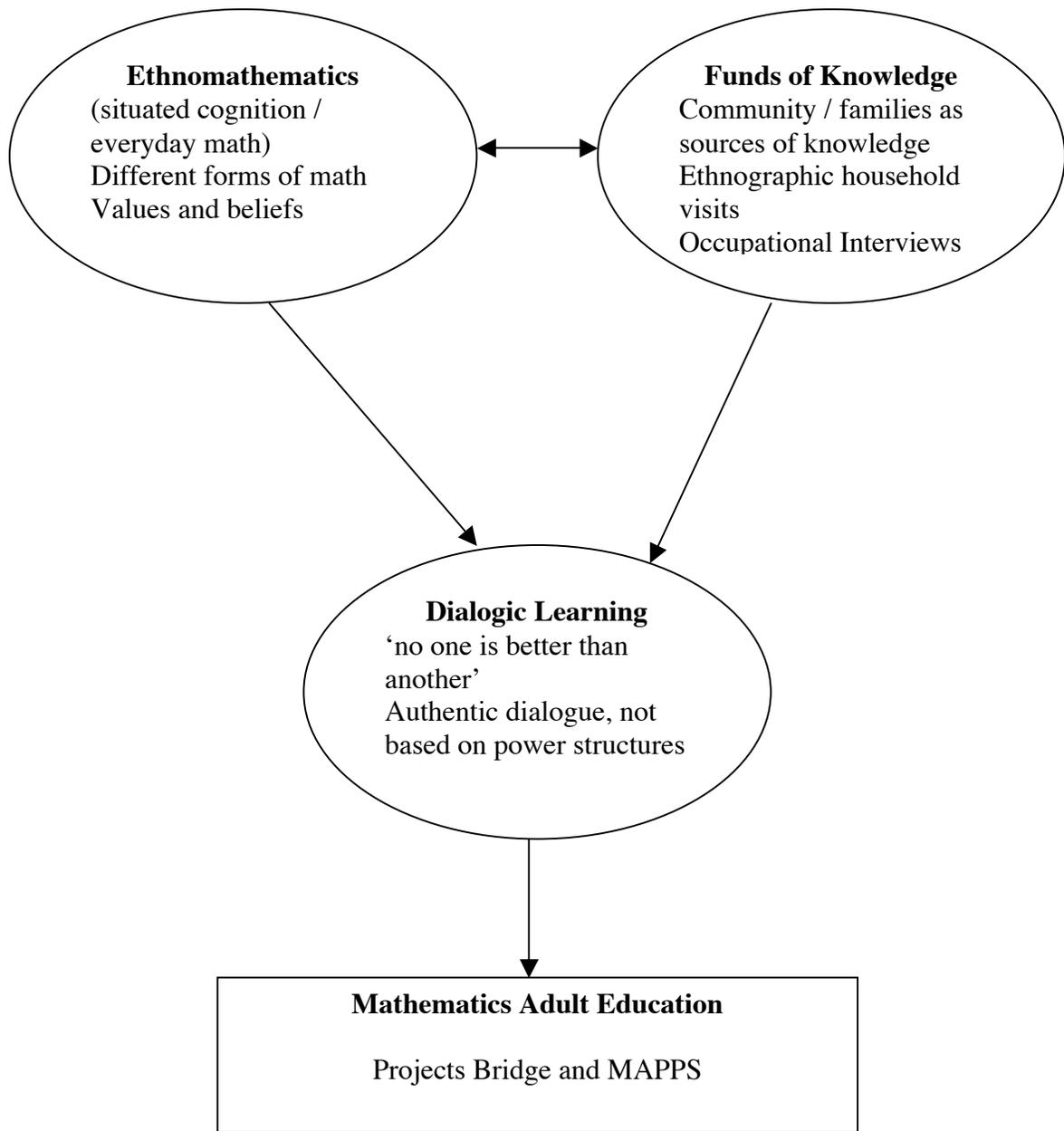


Figure 1. A proposed model for my work with adults and mathematics.