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Mathematics for Parents: Issues of Pedagogy and Content

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This paper focuses on three "Math for Parents" courses that have been implemented as part of a large project on parental involvement in mathematics. The three courses were very different in terms of content (patterns/algebra; geometry; numbers/ arithmetic), and in terms of pedagogical approach (from social constructivism to somewhat teacher-centered). Using the lens of research on adult learning, issues of content and pedagogy are explored. What do the participants (parents) seem to favor in terms of instructional approach? What content do they seem most interested in learning and why? These questions lead to implications for mathematics learning experiences for adults

Context

As part of a large project on parental involvement in mathematics (MAPPS)[1], we are developing a series of courses that we call "Math for Parents" (MFP). The audience so far has been parents (mostly mothers) from a working-class, largely Hispanic community. Some are recent Mexican immigrants; others are Mexican American, and others are Anglo. Some speak only Spanish, others are bilingual-- English/Spanish and others speak only English. A main goal behind these courses was to engage parents in the exploration of mathematical topics that their children are likely to be experiencing in school. The parents attending these courses are members of the MAPPS Leadership Teams (some guests parents have also attended these courses) and as such they will be leading mathematics workshops for other parents in the community. Thus, through these courses we wanted not only to expose them to topics their children may be learning but to do so from an adult learner point of view to help them strengthen their understanding of mathematics. So far, three courses have been designed and implemented. Each course meets eight times for 2 hours per session. For the first implementation, the author of each course was also the instructor.

The three courses

Thinking in Patterns: this was the first course taught. Twenty-four parents took the course; there were three teachers from the Leadership Team who assisted the instructor as well as project evaluation staff and myself who were in attendance and provided assistance as

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needed. The course started with typical pattern problems that lead to variables and expressions. Graphing and using a Calculator Based Laboratory was one of the culminating points of the course that ended with an introduction to solving equations. The materials partially drew on current "reform-based" curriculum materials for school age children. Samples from the local school district curriculum were brought in to help connect the adults' learning experiences to what their children were experiencing in school. The instructor, a Hispanic woman, is also part of the project staff and thus the parents already knew her and had other opportunities to see her outside the course (through other Project events).

I would characterize the pedagogical approach as social constructivist. Parents worked in small groups in a very relaxed atmosphere. Sharing of different approaches was particularly encouraged. The instructor would readily abandon her agenda to follow the learners' suggestions and questions. Dialogue and making sure that everybody had a voice characterizes much of what took place in this course. In a sense I think it bears many similarities with Flecha's (2000) work on dialogic learning:

> [dialogic learning] leads to the transformation of education centers into learning communities where all the people and groups involved enter into relationships with each other. In this way, the environment is transformed, creating new cognitive development and greater social and educational equality. (p. 24)

Thinking Visually: this course had a large number of parents in attendance (32); there were no teachers assisting the instructor, but project evaluation staff and myself were there in case assistance was required. The course drew on activities from geometry courses for elementary teachers that the instructor usually teaches. It was grounded on a hands-on approach to geometry, and the activities ranged over working with different shapes, angles, measurement concepts, exploring circles, ending with a discussion of the theorem of Pythagoras. Spread throughout the course were lots of information and activities related to how children learn and to school content issues (e.g., school standards for geometry). The instructor was a Mexican male mathematics educator. He was fully bilingual.

I would characterize the pedagogical approach as teacher centered in that the teacher was in control of the flow. He started on time (parents tended to arrive late); he gave them a break and he finished on time. He had many handouts with very carefully planned activities. The parents worked on them in groups and he then discussed the main ideas, sometimes encouraging participants to share their ideas with the rest of the group. This happened to become more frequent as the course went on. He emphasized meaning-construction and making sense of things.

Thinking with numbers: this course had 15 parents in attendance. There was one teacher assisting whose main role was to provide translation into Spanish since the instructor speaks only English. As usual, project evaluation staff and myself attended each session and gave assistance as requested. The instructor wrote lessons for each session--a total of eight such lessons, ranging over different ways to add, multiply and divide; exploration of multiples, factors, prime numbers; dealing with "big" numbers. The course ended with some fun/ intriguing number explorations. Each lesson was translated into Spanish by an outside

translator. Parents got copies of the lessons at each session. The instructor was a male Anglo mathematician.

I would characterize the pedagogical approach as student centered in that the instructor was very attentive to how the parents were responding to the material. The small class size allowed for a very intimate and friendly exchange of ideas. This instructor used humor very effectively and this helped the parents as they tackled what sometimes was rather abstract material. (He tended to end each lesson with formal looking mathematics, for example, "True or False: If $A < B$ then $A + A > B$." He did this to relate part of the course to the content of a high stakes test that high school students have to take.). Much of his approach could be seen as sharing his enjoyment for mathematics for the sake of mathematics. He involved the parents in this enjoyment and the parents regularly presented their ideas to the rest of the group in a very relaxed atmosphere. He would often refer to them as "teachers" and asked them for their opinion on certain topics in relation to what their children were learning.

Listening to the Parents: What They Value in Learning

My approach to research is qualitative particularly grounded on an interpretive paradigm. I seek to understand the parents' lived experiences in these courses with an emphasis on interactions and of their views of the experience. I rely on several sources of data that include field notes, parents' evaluation comments, video segments and instructors' reflection on the course.

- What do parents seem to favor in terms of instructional approach?

If I had to select one characteristic that most parents seemed to value in the pedagogical approach, I think I would pick something along the lines of "friendliness." In fact, this is what one participant wrote in reply to "what did you enjoy about the session?"

> *The gathering of many friends in a learning environment.*

I certainly concur with FitzSimons (1994) when she points out "the need to establish an atmosphere of mutual respect and a feeling of community in which adult learners are encouraged to be independent learners and to share their expertise" (pp. 24-25). Parents repeatedly wrote about how important it was for them to work in groups, for two main reasons, one cognitive and one affective. They enjoyed the support that they provided each other in a group setting; they also enjoyed listening to each other's ideas about a problem.

> *The groups work so well together; our group really cares that we all understand each step and we all find different ways to explain it if for some reason someone in the group doesn't understand.*
>
> *It's surprising how enjoyable it is to work together on a problem with adults. I wonder if it is the same with children.*

Although there were some men in the classes, most of the participants were women. All my in-depth interviews were with women only. They commented on the importance for them of a supportive environment, where they were encouraged to explore and ask questions:

> *The teacher, [he was] easy going, not intimidating always had something new that was interesting, I thought he was fantastic, I wished he could have been one my teachers in high school.*
>
> *Nice environment, we were comfortable there, we talked to everybody, we got along well.*
>
> *You never felt you were going to be put down.*
>
> *We weren't afraid to ask questions.*
>
> *No one said "this question is stupid."*

All the instructors encouraged sharing of ideas but one particularly pointed out how he had stressed this more than in his regular university teaching and that he thought that this had been an important strategy:

> *One thing that I did pedagogically which I don't usually do was that I had them go to the front of class and show what they have done. When I teach at the university I don't do that; I pretty much talk to the students, they stay in their chairs and I am up in the front.*

When asked about what advice he would give to other instructors of these courses, he said:

> *[It] is very important that you involve the parents, make sure that parents are with you always and don't teach to the ones that seem to be getting it quickly, make sure that everybody there is taking part.*

Establishing rapport with the instructor and with anyone else from the project staff was very important to them. With one of the instructors, at the beginning, some of the mothers expressed some concern that he had not really introduced himself and that he did not seem to smile much. In another course, some of the mothers felt uncomfortable with the translator. They felt that she was distant, that they could not relate to her:

> *I was frustrated at that because I try to learn; we carry a lot of garbage with us, I'm trying to learn, I'm trying to figure this out….. Nosotras estamos aquí y se le olvida que ella es la maestra, si nos están enseñando a nosotros se tiene que bajar a nuestro nivel para enseñarnos, no dejarnos, porque nos dejaba. [We are here (motions with her hand to indicate a level) and she forgets that she is the teacher and if they are teaching us, she needs to come down to our level, not to leave us there, because she did]*

"*You meet other people and you get to learn with other grown-ups*" This statement captures what I think was very important with many of these women: the value of friendship in an intellectual environment; spending time with friends (women friends) outside the house learning mathematics. I wish I could portray the sense of pride that some of these women conveyed when they shared how happy they were to be, in a sense, going back to school. One of the women described how she looked forward to each Tuesday when they had class and her friend (also in the program) would come by to pick her up and they grabbed their notebook and off they went to class. And this pride is shared by their children too:

> *I share my homework with my kids and neighbors' kids. They get all excited. And they think they know more and know what they do. They are proud of us.*

- What do parents seem to value in terms of content?

This question is harder to address in that in general these parents seem to be eager to learn everything. Their comments on the feedback forms always ask for more of the topic under discussion. In my paper for ALM-6 (Civil, 2000a), I discussed the dilemma from my point of view of parents as adult learners and parents as parents (that is as learners for their children). That dilemma was in terms of what the content of Math for Parents courses should be. Should it build on the socio-cultural experiences of the participants? Should it reflect the current school mathematics their children are experiencing? The parents' mathematical autobiographies as well as their comments throughout the courses depict an array of largely negative experiences in their prior learning of mathematics. Issues of lack of confidence, of feeling not good at math, of feeling alienated are quite common among our participants. To me it is crucial that there be an open dialogue in which different forms of mathematics are discussed, in which cultural values about mathematics are brought to light, a dialogue in which everybody has a voice (Benn, 1997; Flecha, 2000). The three courses described have accomplished (some to a greater extent than others) the opening up of a dialogue about mathematics. None of the courses, though, have really build on the parents' socio-cultural experiences (for an attempt in this direction, see Civil, 2000b). I am intrigued by how the participants would react to courses that would place a heavier emphasis on their knowledge and uses of mathematics. In my experience working with Hispanic, working-class mothers, they want to learn the "academic" mathematics. But I certainly would like to explore further the combination of the different forms of mathematics in the context of a course for adults. I agree with Benn (1997) when she writes,

> An emancipatory mathematics curriculum could validate each ethnomathematics whilst still acknowledging that many adults return to formal education to acquire the discursive practice and consequent rewards of academic mathematics. (p. 175)

In our work, the parents express an interest in learning "academic" mathematics because of their children but it soon becomes evident that they also want this for themselves. I will next share two snippets from the courses to illustrate participants' thinking about mathematics.

Finding a pattern: In the algebra for parents course many of the initial tasks centered on describing a pattern. In one of the problems the situation was "number of birds in a bird formation." The first formation had 3 birds, the second had 5, the third had 7, and so on. The

task was just to describe the pattern but one of the groups became intrigued by how to find how many birds would be in a formation later in the sequence, for example the 50th formation (see Civil, 2000c for more on this problem). With some guiding on my part the group eventually solved the problem. They then presented it to the rest of the class. What I want to highlight from this episode is:

- This was their problem; they made it their own and worked on it while the other groups were following the class "agenda."
- Their presentation to the class was engaging; they walked their peers through the process with questions, allowing them to participate in the co-construction of the solution.
- Their metacognitive process throughout was particularly powerful as they reflected on what had stumped them. In order to find the 50th term they ended up having to use the "51" from the 51st term (the way they solved it was by doing 50 + 51). Yet, they did not think they could go beyond 50 because that is what they were trying to find:

B.: We were stuck; we didn't think we could go beyond [50]; why did we think we couldn't go beyond? That was us.
J.: We came really close but we didn't think…
B.: We could see but we didn't… the stigma of you cannot go beyond.

Even to this day I am intrigued by what B. mean by the "stigma of you cannot go beyond." But her choice of words (stigma) is a humble reminder of how strong their emotions are when it comes to their doing mathematics.

Measuring Angles: In the geometry course, one of the activities had them finding the angles of the different pattern blocks. The parents worked in their groups and came up with different approaches to finding the different angles. The instructor closed this episode with the question of "what did you learn today?" The conversation that followed took only five minutes and yet it was very rich in issues brought up. It involved children's learning (this instructor made a point throughout the course of connecting to how children learn); a discussion around theoretical versus applied learning; and finally a call (by one of the mothers) to the need to have parents more involved in this project to become aware of what should be happening in their children's education. I have reconstructed excerpts from the dialogue here (I'll use I for Instructor and P for participant):

I: What did you learn today?
P: Different ways to find the same answer
I: Why is this important for children?
P: Not everybody learns the same way
I: Exactly, to respect the diversity of children's ways of thinking
….
I: We have learned that there are many ways to solve the same problem. This is a very important point.
[then a mother says:]

P: But isn't there a difference between applied and theoretical? What you showed us is very applied, I can do it , it's easy to do because you know, we have the pieces here, but to find out why, that's
I: The argument goes that because we have concrete pieces, it's easier, but I want to point out that much of the reasoning you did was theoretical. For example, here (he puts a parallelogram next to a square) you said, this is 90º and this is 60º so the angle here is 150º;this is a very valid mathematical reasoning. We used concrete materials but we are doing theoretical reasoning.
[then another mother jumps in, all in Spanish]
P: We knew about 360º because of the circle and we were able to use this, we've known this from basic math, but we didn't remember. But as she (the woman who had just inquired about theoretical and applied) said, now we have these pedagogical materials [e.g., the pattern blocks], it is very important that they use these in schools, that's why it is important that we have more parents coming to the MAPPS meetings so that they can see what is being use nowadays.

This brief episode captures much of what these courses are about. Participants not only learn specific mathematical content, such as the concept of angle, but they are encouraged to relate it to how children learn, what takes place in schools and how they, as adults, learn. The following reflections on "proving" that the sum of the measures of the angles of a triangle add up to 180º captures this again:

> *I really enjoyed the example of how you prove that there are 180 degrees in a triangle. When you tear out the angles of the triangle and put them together so that the angles meet at the vertices, it forms a line, which is 180 degrees (1/2 or a circle). Wow! What a great and very illustrative proof! Now I know why!!!*
>
> *In high school, I memorized the rules / theorems of geometry, but never really knew how to definitely prove that a triangle has 180 degrees. It's very difficult for kids to understand/enjoy doing geometry when they don't / can't explain why something is. When they aren't sure, there will be doubt in their minds about its relevance. They get discouraged. Teachers need to provide more simple examples like this!*

Reflection

In a sense these courses are different from typical courses for adults. For one thing, many of the parents are not seeking a degree. Their original motivation is in relation to their children's schooling. But, on the other hand, these parents share many of the characteristics of adult learners as described by Benn (1997) and FitzSimons (1994). Many of them are women who did not have very positive experiences as mathematics learners when they were in school. Providing a safe environment in which their questions and ideas are encouraged and honored is crucial to their development as adult learners of mathematics (*I learned how to find the area for a parallelogram without the fear of making mistakes*); as parents (*I learned that I can start teaching my children geometry and it is something they don't have to wait until high school to learn that they are learning geometry*) and as advocates for their children's

education (*How can we form questions or what questions can we ask when meeting with our children's teachers?*).

For the many of us in this field who have had the opportunity to pursue higher education, it is humbling, I think, to see how important a course of Mathematics for Parents can be for those taking it. In a focus group interview with a group of women who has taken the three courses (one of them only took two), they talked about the need for us to remember how hard it was for parents to be in these courses, the juggling that it involved with family, job, and other obligations; they talked about how important it was for them, for their personal growth to be in these courses and then one of them said,

> *Es lo bonito que se siente el decir "voy a al escuela"y para mí es importante, yo me siento bonito decir "yo estoy agarrando una clase de MAPPS", es un orgullo decirlo. [it feels so good / beautiful to say "I am going to school" and for me it is important, I feel good, to say "I am taking a MAPPS class", I feel proud saying it.]*

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