When women cook mole and men build a wall.

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This study refers to mathematical everyday knowledge of youngsters and adult, mainly women, studying basic education. The research seeks to identify mathematical issues of counting, measuring, proportion, volume and procedure in an everyday cooking situation. There are very few studies in Mexico about how women, with few years of formal education, solve problems and use their mathematical knowledge. The study's theoretical framework is social constructivism; it also has a conceptual framework of ethno mathematics, a cognitive framework of communities of practice and then a qualitative methodological framework of constructivism. The purpose is to explore the mathematical knowledge of new students upon entry to formal adult education. The field work includes 25 clinical-critical interviews with young and adult women (19) and young boys (6) from different rural and urban communities in the State of Guanajuato. The interviews explore how women cook "mole", a typical sophisticated Mexican dish made of more than 3 different "chillies" and many other ingredients, around 10, for parties like weddings and christenings. Also 6 young men were interviewed exploring how they build a wall at their house. Results show a functional use of all mathematical concepts from literacy level to ninth grade.

Introduction

This study is part of a wider one that designs the educational model for the Instituto de Educación Básica de Adultos (INAEBA) – Adult Basic Education Institute - founded in April 2005, Guanajuato. México has a population of 103, 263, 388 (INEGI, 2005) in 2005 and Guanajuato state of 4, 986, 280, Chiapas of 4, 293, 459, and the Federal District (capital) of 8, 720, 916. Nevertheless, regional disparities are of great concern, as shown. For example, the illiteracy percentage in Chiapas (18.9%) is ten times the one registered in Mexico City –Federal District- (1.7%), and four times that of Guanajuato (7.5%) where this study was carried on. The absolute number of illiterate adults registered in 2005 was of 5.7 millions. If this quantity is summed to the adults that have not finished primary school (9.8 millions), and those who have not finished secondary school (14.6 million), one gets a total of 31.1 million adults –including all teenagers 15 and older – who have not yet finished basic education (INEE, 2006). Among them, 52% are women and half of them are young, less than 40 years old. In México, while 91.8 % of children and teenagers (from 6 to 14 years old) were in school by the year 2000, only 55.3 % of the teenagers between 15 and 17 years old were at school and scarcely 22.3 % of the age group from 18 to 24 years old were on that same situation.

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The thesis of Muñoz Izquierdo (En prensa) is that those disparities do not originate only from the inefficient school offer; […] the disparities origin is in an inadequate distribution of the offer and, for all, in a deficient functioning of the school system.

Constructing everyday mathematical knowledge

Adult mathematics education is not a simple and unique educational matter. There are many activities than can take place under that heading. It can be a part of Formal mathematics education […]. It can be a part of Non-Formal mathematics education […]. It can also be part of Informal mathematics education, which can happen anywhere, at any time, and which doesn't involve a course of any sort (Bishop, 2000a: xii).

This study is located between Formal education and Informal education because it deals with basic adult education students and at the same time explores every day known mathematics built upon a specific cooking activity – or building a wall -on which the practical work depends, but at a school context, far away from the natural activity with a semi-structured interview, a kind of or more like "women talk". The intention was to get substantial information to have general criteria about mathematics adult basic education. In Guanajuato, and generally in Mexico, adult basic education is a mirror of inequity, where poor, mainly women, and indigenous people, as well as young boys and girls, who have dropped out of secondary school. This unequal, non effective and non efficient social and educational context sets many challenges to adult education curricula designers.

We faced the task of giving substantial information to the people responsible for developing the specific programmes at INAEBA, our desire was that the information would not be so highly gendered (Mosse, 1993; in Harris, 2000), but more pertinent – for the school curricula - and relevant – to social and every day life-, to adults culture and interests. By "not so highly gendered" we mean with equal mathematical challenges and information based on evidence with common mathematical daily activities.

We also wanted to have research evidence of the numeracy knowledge of domestic activities which emphasises understanding by the participation of adults and to leave behind traditional methods that stand for conception of adult as persons with a simple knowledge, lazy, dumb and with concrete reasoning. Some research at job settings have showed how mathematical procedures and explanations to solve problems are highly context dependent, talking about quantities, measures and procedures in a mathematical way is a form of knowledge when is built by cooperative learning, through processes of social interchange. It is important to bear knowledge not as a means of world's exact mirror reflection but as meaning under specific space and time conditions for agreement to carry out functional actions for certain communities or practices.

School learning in classrooms also implies social interaction by means of different forms of communication represented in texts of many kinds, e.g. books, slides, movies, dialogue. Based on the perspective that "first, learning is a process of knowledge construction, not of knowledge recording or absorption. Second, learning is knowledge dependent; people use current knowledge to construct new knowledge. Third, learning is highly tuned to the situation in which takes place (Resnick, 1989, p. 1). Adult formal learning could benefit more when considers prior and current learning and knowledge when designing curricula more efficient, socially relevant, and pertinent to adults'

needs and interest. Research has already demonstrated differences between the effectiveness of "home-grown" mathematical methods in revealing understandings of mathematical principals and the fact that they do not generalise to more formal education in mathematics (e.g. Lave, 1988; Carraher, 1991; In Harris, 2000, p.187). It is important to say that there is very little learning transference from everyday context to school context, in both ways.

There is few evidence of when and how mathematical skills are used and transferred among people who work in any practical activity, e.g. the mnemotechnic rules (de Agüero, 2006c, pp. 318-348 and 2003a; In Maasz, and Schloeglmann, 2003 p. 70) or the theorems in act (Vergnaud, 1988, p. 229, de Agüero, 2003, p. 71 and 2006, p. 318). A theorem in act is a proposition that can prove with facts and data already known to be true. Theorems in act are propositions considered to be true when people act. A theorem in act refers to the function of a result when one person knows that is true even though he or she never have pronounce it formally or demonstrate it and write it. Workers (de Agüero, 2006, p. 318) use them because "they know it is true but can't formally demonstrate the theorem; certainty comes from learning –in the master and apprentice relationship- and from their own experience. The observed theorems in act used by the construction workers are: the equivalence of areas, the triangle coherence, the squaring of irregular surfaces and the correctness of the curve lines or the polygon ones.

Most of the studies about mathematical knowledge of adults outside the school have been made in United States or Europe, where people at work have finished at least basic school. Schooling has not being a variable in Lave (1991) or in Carraher's (1991) studies in Brazil, and Saxe's (1995) framework for children, and its not yet very clear what form of knowledge is transfer, neither how school mathematical knowledge can be transfer to work or how people in daily home or work activities implement school mathematics; or the other way is also intriguing some adult educators and researchers: Is there some form of mathematics embedded in cultural activities that can be generalise in school?

Mathematics is one of the most powerful tools in a culture – that I will no discuss here – but women aren't conscious of that power, so they are rarely involve in activities which imply or require mathematics. It's a cultural fact that people believe that mathematics are just for men, and school reproduces this type of thinking at classrooms and in its curriculum by different teaching practices, contents, methods – mainly for evaluation - for men and women. This study gives evidence of some mathematical knowledge women used at home and can talk about at school but don't use to learn at institutionalized contexts. Some children and adult curricula support the idea that working people should study just basic arithmetic enough to know how to count and measure so they will be able to do a better job in the lower hierarchy of employment. Different curricula oriented people to different levels of employment. So mathematics is related nowadays to social class.

Cooking is an activity of social human construction with different ways and potentials to mathematize it. It's very difficult to sustain that someone who builds a wall, a house, who makes textiles, who does woodworking or does intensive cultivation knows nothing about numbers, counting or measuring. This kind of activities required to solve different mathematical problems and developed specific strategies do to it efficiently. Illiteracy in Mexico is mainly suffer by women older than 40, However, this is not important when designing curriculum.

The constructivist view of social life posses mutually constitutive relations between modes of thought, modes of discourse, and modes of action. Discourse does not passively reflect or merely describe the world. Because language is action, different uses of language constitute the world differently. Events in the world do not exist for people independently of the language people use to make sense of them. Instead, objects are defined through elaborate enactments of culture conventions, which lead to the establishment of such well-documented "institutional facts" (Searle, 1969; In Mehan, 1996) as "touchdowns," "marriages", "insults", "banishments," "property rights", (D'Andrade, 1984; In Mehan, 1996), and , as Mehan (1996, p. 262) has proposed, "learning disabilities" and "educational handicaps", and I will add illiteracy and lack of numeracy.

Very few people think that women's working at home will require mental operations of such kind as mathematics. In common perception, mathematics is a highly cerebral activity, far removed from the practical realities of daily life and over the heads of most people. With a few rare and eccentric exceptions, it has always been done by men. Certainly generations of women have been brought up, indeed taught to believe that women cannot do. Mathematics is seen as something different from practical daily arithmetic, although paradoxically, in daily conversation when the word 'mathematics' is used, people usually start talking about arithmetic (Harris, 2000, p.171).

Latin American studies who share an etnomathematics view (Avila, 2003; Bishop, 2000b; de Agüero, 2003a; de Agüero, 2006c; Knijnik, 2003; Lave, 1991; Llorente, 2000; Mariño, 2003; Masingila,1994; Millroy, 1992 and Sánchez, 2003;) are clear about the distance between mathematical knowledge of youngsters and adults who live in social exclusion and the literacy and basic education programmes in mathematics.

Procedure

This is a qualitative study about the basic mathematical knowledge youth and adults have from their everyday experience and previous schooling when they enter adult education in Guanajuato. It identify fundamental knowledge of counting, measuring, basic notions of volume, ratio and proportion; and explore the procedure to solve a domestic problem. The field work was made in two moments when the team[15] visited 12 settings where adults go to study: 4 for literacy and 8 for secondary school of a sample chosen carefully to include different levels of education, urban-rural community, and rate of social exclusion.

Method

The qualitative research method frame of the critical-clinical exploration (Castorina and Fernández; 1984) is considered to be the most favourable to study the knowledge about everyday activities and to ask for explanations of their procedures and mathematical decision. The virtue or power of this kind of technique of thought is that it allows us to think hypothesis and check its firmness and strength in the adults discourse. A domestic activity was chosen with strong cultural roots for women in Mexico and of course in Guanajuato, this situation is the cooking of mole; and for men the building of a wall with the measurements of their choice; both work situations with mathematical problem solving potential.

Context

The conditions where adults study at the INAEBA are very contrasting.

[15] Field work: also participated: Graciela Messina, Martha Zamora and Rosalba Canseco.

Social constructionism and social constructivism (Wertsch and Toma, 1995; Wertsch and Tulviste, 1992 and Confrey, 1995); established very clearly the role and conception of context in learning, and the role of different types of social interactions in knowledge construction. Lave (1996, p.5) mentions the central double focus of different researchers: on context and on learning. She establishes that a focus on one provided occasions on which to consider the other. If context is viewed as a social world constituted in relation with persons acting, both context and activity seem inescapably flexible and changing. And thus characterized, changing participation and understanding in practice –the problem of learning- cannot help but become central as well.

Context can be conceive either as a) a kind of rapping paper or surrounding the individual, b) like a space or time where people can live an act, or c) as a way to talk about facts, ideas, processes and people interactively with others; this is the perspective share in this study.

The social setting, where the INAEBA offers adult basic education is very different physically, pedagogically, socially, geographically, economically, and demographically. One can find classroom sharing, a teenage girl, just turning 15, a young barber boy of 24 years old, and the cleaning lady of the school, of 45 years old, who is in charge of the keys and security of the house that the local government lends to the INAEBA. Also, one observes one peasant women sharing a computer with a 16 year old boy who just returned from working on "the other side", meaning USA.

Table 1. Social exclusion index in Mexico and Guanajuato for year 2000.

	Districts	**Very high social exclusion index**	**High level**	**Medium**	**Low**	***Very low***
National	**2,443**	**386**	**906**	**486**	**417**	***247***
Guanajuato	***46***	***1***	***10***	***19***	***12***	***4***

Origin: Conapo, 2003.

In Guanajuato 30 of the total (46) districts have a medium (19), high (10) and very high level (1) of social exclusion index. In Mexico more than 65% of the working population earns a low income. Guanajuato is in place 13 because of its social exclusion index in the country (32 states). In Guanajuato, 12% of the population is illiterate, 35.7% with incomplete primary school, 16.1% without drainage; 3.2 % with no electricity; 6.9% without running water; 47.1% with one level of crammed in a home, 10.9% of houses with no floors, just soil, 47.3% of its population receives two minimum wages ($8.00 US per day). The INAEBA doesn't educate poor rural people, they think of them as "impossible" to alphabetize people who will never be literate because they live too far away. So they decided to invest in computers, a self-directed electronic education programmes, and all year exams for secondary school. Basic education in Mexico is conformed of three levels: kindergarten, primary (6 years), and secondary school (3 years).

Informants

When we arrived to the communities no primary school – the equivalent in other counties to elementary school- programme was functioning by the moment in Guanajuato, 25 teenagers and women were interviewed.

Table 2. Informants: sex and age

Programme	**Women**	***Men***
Literacy	**7 (30-70 years old)**	***0***
Secondary	**12 (15-45 years old)**	***6 (15-19 years old)***
Total	***19***	***6***

Thematic guide of interview

Based on Llorente's (2000, p. 67-82) study about women preparing jam, thematic blocks were designed about preparing mole and building a wall, with questions in each block asking notions of counting and measuring, ratios and proportions, volume and procedure. These interviews were made individually at the INAEBA settings.

When women cook mole

No recipe was equal to another, but all included: chillies, biscuits or bread, chillie's seeds and spices, quantities, procedures and modes of cooking; and all varied among these elements. These recipes show the strong presence of experience cooking, apparently Doña Juliana and Blanca's recipes are very similar, but Doña Juliana is the only one who includes chicken broth, a fundamental ingredient to make mole sauce, if it is not included the result is a very thick paste not eatable. Both recipes compared to the one María Elena shared with us makes very clear the richness, accumulated

experience: some ingredients, indispensable ones that do not vary from one recipe to other –chillies, onions, bread or cookies, and chocolate bars – with different accessory ingredients –seeds and spices- for better seasoning and flavour.

Table 3. Mole recipes according to age.

Doña Juliana. Illiterate woman of 70 years old (AGMB-16).	**Blanca (SAMB-1). Woman in secondary of 42 years old. One of the ones with more mathematical potential.**	***María Elena (SJMB-11). Teenage of 15 years old studying secondary school.***
¼ chile guajillo	*½ kg Chile de guisar*	*5 chiles anchos*
¼ chile mulato	*½ kg Chile negro*	*5 chiles guajillo*
¼ chile de guisar, ancho	*½ kg Chile ancho*	*5 chiles de guisar*
¼ chile negro pasilla	*½ kg Chile cascabel*	*1 bread roll*
½ Kg sesame seeds	*½ kg Chile pasilla*	*5 little bag of raisins*
¼ de almonds	*2 jars of Mole Doña María*	*1 onion*
¼ pumpkin pip	*Clove,*	*1 banana*
¼ chile seeds	*5 ó 6 leaves of laurel*	*1 block of chocolate*
1 pinch of wheat flour,	*2 "little arms" of sweet marjoram,*	
¼ spoon of lard	*Some thyme*	
Water	*1 little bag of cumin,*	
3 bread rolls sliced	*4 almonds,*	
4 ó 5 litres of chicken consommé (broth)	*1 little bag of peanuts,*	
I don't like it with chocolate because it makes it sweet	*pepper,*	
Onion	*1 block of chocolate, if you want it sweeter you have to add more blocks of "La Abuelita" Chocolate.*	
4 ó 5 green tomatoes		
4 ó 5 garlic	*1 little bag of pumpkin pips,*	
10 o 12 peppers	*2 salad cookies, the large ones,*	
And clove	*1 banana*	
	3 red tomatoes.	

Illiterate mature and old woman show scarce use of counting more than ten, but use Standard decimal weight measuring and fraction of litters or kilos (see Table 4); they use also kitchen devices like cups and cutlery, and other set by the commercial context like "little bags", jars, or blocks of chocolate to mathematize their cooking activity. The use of decimal metric system it's almost missing, nobody mentioned to read, write or copy recipes. The difference according to the age and school programme is not notorious in terms of more complex and diverse use of mathematics notions and quantities. But it is a difference in the richness of the recipes, more ingredients, more opportunity to express a variety of notions, but not more mathematizing in terms or variety and complexity of mathematical notions. The difference seems to be in their

mathematical explanations and practical procedures to describe how to cook better, with more flavour; the experienced cook makes a big difference in the richness of the recipe.

Contrary, the impact of schooling seems to make no difference in this domestic activity; young women with secondary studies do not transfer their mathematical knowledge. The reasons could be diverse and need to be explored, but it doesn't mean young teenagers preformed wrong in terms of what school expects from them: to know basic arithmetic. In this activity girls talking and explanations are in the peripheral place of cultural conventions, more like apprentices, their youth implies an outer role in the kitchen practices and the central situated learning and teaching role of older women.

The use of spoons, cups, pinches, handfuls, and original commercial packages is an evidence of context dependency in the way an everyday problem situation can be solve potentially by mathematical means, procedures, systems and explanations. Give us clearness of the limits of knowledge construction activities culturally situated and sustained, in other words, how women mathematize cooking activities.

Table 4. Counting and measuring. Mole.

Programme	**Spoons & cups**	**Quantity < 5**	**Quantity ≥ 10**	**Kilo or litre**	**Kilo or fraction**	**Pinch/handful, Taste/ essay**	***Package/ Commercial product***
Illiteracy old women n = 7	**3**	**5**	**1**	**4**	**5**	**3**	***4***
Secondary women n = 7	**3**	**7**	**2**	**2**	**6**	**5**	***2***
Secondary teenagers n= 5	***4***	***3***	***0***	***2***	***2***	***1***	***3***

The relation a:b (see Table 5) is stronger when two facts get together: schooling and experience in the case of mature women who study at secondary school; in contrast when there is only experience, like old illiterate women, ratios and proportion have a week presence, but when one pays attention -in terms of the age- (1 case) to the schooling express of the young women (3 cases), in contrast with the conjunction of age and schooling the use of this ratio relationship (6 cases) it is clear. Then, school seems to make more impact on the construction of ratios and proportions.

Experience and school consider together makes us think of learning transference. What can be transfer is closely related to more complex content, relations and notions; but still we don't know how the transference process is and how it works. How come some people do it and some other don't?

Likewise, the three quantities ratio notion (3rd column) and both ratios and proportions simultaneously (4th column) are used in a very similar mode by the three groups. Only one young woman –among all groups- explained its answer in relation to the word "proportion" in her discourse and with a right calculation; the rest could make the relation and calculation with an accurate answer but could not explain it.

According to this matter, things are not very clear as are about counting and measuring. It can be sustain that more complex –number of elements and the type of relations among them, and even more difficult, the relation between different types of relation (ratios with proportions)- knowledge and use of ratios and proportions aren't guarantee neither by schooling or by strong cultural learning activities. There is few evidence of the functionality of more difficult relations, since just two old illiterate ladies and two women with secondary school older than 30 years old could achieve them (4th column). Still the impact of schooling is dubious. Contrary, why curriculum contents are taught, in secondary school, ignoring that adults' experience –tacit and explicit knowledge - could be a lever for learning?

Table 5. Ratios and proportions. Mole.

Programme	**Ratio a:b**	**Proportion 2a**	**Ratio of 3 quantities 2a : c b : x**	***½ a : b/c/d***
Illiteracy old women n = 7	**1**	**2**	**2**	***2***
Secondary women n = 7	**6**	**5**	**3**	***2***
Secondary teenagers n= 5	***3***	***2***	***1***	***0***

For volume, it was very hard for them to understand the question in terms of the metric system: With the recipe you told me how much mole do we get? The majority answered in relation to the clay casserole where traditionally Mexicans cook mole, or they simply did not answer the questions. Only women studying at a secondary school, when I insisted, expressed how much the mole weighted in the casserole and made estimations in kilos or litres. For example Maximina, a women studying literacy programme:

Interviewer = How much mole do we get with your recipe?
Maximina = What? Do you mean what quantity?
I = Yes
M = Like a steaming casserole, like this (she shows with her hands the size of the casserole).

I = More or less than 3 kilos?
M = No, I think more than 3 kilos, 3 kilos and a half.
I = It is enough for 50 persons? (She told earlier in the interview the recipe was for 50 persons).
M = Yes.

It was impossible to get any answer on the matter of volume knowledge transference, from continuous quantities to discrete; the meaning of converting kilos to litres, to jars, or bottles and plastic wares, was interpreted as not viable by all women -of the 3 groups-, they just referred to put the casserole in the refrigerator in order to keep it from getting sour or the remaining on a plastic wear and then on the refrigerator. Only when the interviewer made estimations in kilos or in plastic wears women accepted or denied that estimation. One hypothesis is that the activity women talk about is about cooking for immediate or next day eating, and this does not imply actions to preserve or transverse from the cooking casserole to some different bottling, packaging or canning. Other hypothesis is that this transition from kilos to litres or from litres and casseroles to jars it is a notion they have not constructed functionally.

The cultural conditions determine the answers restricting the possibility to keep meal in jars after the party meal. It is a general believe among many Mexicans that mole and some other special cooked food shouldn't be kept in the refrigerator, because people won't eat it afterward, reasons are various: some say because makes your stomach sick or because wont taste good.

For example, Elisa studying secondary school

I = How much mole do we get?
E = Well… one can get enough mole for 8 persons ...
I = Yes, but How much?
E = Well there is … like if it was some… Because it weights a lot.
I = How many kilos?
E = It is difficult to say because we add the chicken broth and we eat it all for the party.
I = And, if something is left?
E = Put it in the casserole and the next day you have to boiled it so it wont make your stomach sick.

What shows in these kinds of answers and the ones about procedure was some simple knowledge about how tomato and chile react when cooked in a clay casserole and the highest potential to get sour more quickly.

Table 6. Volume. Mole.

Programme	**Continuous quantity Prepared Mole**	**Conversion: from liquid to jars (continuous to discrete): jars**	**Discrete quantity: number of persons**
Illiteracy old women n = 7	**5 (casserole)**	**4 (refrigerator)**	*7*
Secondary women n = 7	**1 (casserole)** **3 (kilo/litre)**	**2 (casserole)**	*7*
Secondary teenagers n= 5	***1 (casserole)*** ***2 (kilo/litre)***	***Uncomprehending***	***5***

On the matter of procedure (see Table 7) the majority expressed ideas of the solubility of water and lard, about how the order of ingredients to be mixed, and how broth or water must be added at the end. The reason was because these are not soluble in the Chile and spices paste, that was cooked before with a lot of lard; only after 25 minutes of cooking, with low flame, and when it boils the "grease comes up", "it looses"; that is the signal to know when mole is already well cook. Still they said that one has to keep the mole boiling for more minutes so it won't make you sick.

All of them could explain with clarity the three moments of the activity: planning – preparation- development –process- and evaluation –prediction-. Preparation and then development, both were the moments most expressed by all groups. They didn't have much control of valuing how well things are going and how elements, procedure and relations imbricate in the task. Experience shows again its role in illiterate old women cooking mole more efficiently, one can infer they have more potential with abilities of practical thinking or to solve practical problems. And young girls were the ones who expressed more difficulty to cook mole or even another food they would like to share with us their ability to solve practical everyday problems diminished compared to older women with or without formal education.

Table 7. Procedure. Mole.

Programme	**Preparation Roasted Chile**	**Preparation Milled/body Of the paste**	**Process time of cooking**	**Process to store in good state**	**Cooking time prediction**	**Prediction with less ingredients than mention**
Illiteracy old women **n = 7**	**5**	**4**	**4 (≤30min.)** **2 (>30 min.)**	**6**	**5**	***6***
Secondary women **n = 7**	**4**	**5**	**5**	**5**	**5**	***5***
Secondary teenagers ***n= 5***	***2***	***3***	***4***	***3***	***2***	***1***

When boys build a wall

The exploration, simulation situation with boys was harder and more complex than the mole one, because it implicated notions of geometry. Nevertheless, many of them had worked with some relative as apprentice at the construction at home or hired; this situation made it easy for the interview. Even though this study didn't intend to be about gender, some questions aroused from analysing which are typical everyday activities pertinent to needs and interest for women and men. Commercial money exchanges – an impartial activity for men and women -were not considered because or the low mathematizing potential to explore the notions we are interested on.

On the matter of counting and measuring, the Table 8 shows how they manage fluently and frequently quantities in terms of tens, hundreds, and thousands of bricks. To manage these quantities is an activity imbricate demand. The use of decimal metric system was not so clear, but we did not have specific questions about it; the personal or traditional measures, the ones that are involved in the construction activity were the most functional, such as the shovels, the bucket, sacks, and wheelbarrow, but these did not motivated them to spontaneously mention the metric decimal system for weights and measures.

Table 8. Counting and measuring. Wall.

	Bucket/ shovel/ sack/ wheelbarrow	**Wall measurements**	**Quantity ≥ 10**	**Quantity ≥ 100**	**Quantity ≥ 1000**	**kilos**	**Metres y centimetres**
Tota l n=6	***4***	***4***	***5***	***3***	***2***	***1***	***3***

Half of the boys manage ratio and proportion functionally. Proportion (see Table 9) was harder for them; I had to express the question in various ways. One hypothesis is that they are apprentices when the task of making the "mixture" of cement, water and sand; they do not solve problems or deal with practical challenges but follow the master directions. They made this very clear, but there is doubt if the master-apprentice relationship is the best explanation since they are studying 7^{th} or 8^{th} grade, and systems to measure and fractions are teach in primary children regular school – which all coursed-; but fractions, ratios and proportions in adult programme are teach latter, at secondary: 7^{th} through 9^{th} grades.
Notice that results for boys are very similar than those of the girls studying secondary school, therefore the limits of basic school and of experience in daily activities – consider by age – are coherent in both sexes.

Table 9. Ratios and proportions. Wall.

	Ratio a:b	**Proportion 2a**	**Ratio of 3 quantities** **2a : c** **b : x**	**½ a : b/c/d**
Total n=6	***3***	***2***	***2***	***3***

As to ideas about the function of volume (see Table 10), the amount of mixture to make is in strict relation to the quantity of bricks to put and the time one uses to do it, because it takes one hour to the mixture to forge. Only one boy had a clear notion of how many ingredients are needed to make the mixture, its equivalent on buckets or its yield for 100 bricks, and in relation to the workers output. But all of them knew that the importance of the relation among ingredients, quantities and time to forge to make mixture; because of this complex relation of elements and between different types of relations (quantities and time, or time and forge) it is difficult to compare with de mole situation.

Table 10. Volume. Wall.

	Continuous quantity of mixture	**Conversion from continuous to discrete:buckets**	***Discrete quantity***
Total n=6	***3***	***1***	***3***

The boys don't have experience and expressed difficulties to plan, execute and evaluate the right solution and constructing process. They knew well the order ingredients and how to mix them, but not how to put bricks and how much mixture is needed, how long it takes to forge or the time it takes them to put certain quantity of bricks. Prediction is almost impossible for them, they didn't take risks.

Table 11. Procedure. Wall.

	Preparation ingredients for mixture	**Preparation mixture -bricks**	**Process. Order to mixture**	**Process Time to forge**	**Prediction To bolt**	***Prediction Less ingredients***
Total n=6	***4***	***1***	***4***	***2***	***2***	***1***

Conclusions

Experience and functionality were the main issues when students are young; their experience is novel, not expertise.

The mathematical discourse of INAEBA's students: old women, mature women and, teenagers: boys and girls, is a representation of the lack of transference of learning from home or job activities to school and vice versa; and of the low impact secondary school has on young people. School as an institutional organization has its own mode of discourse, representation and structure. Social and symbolic representations of the relation to the world and the meaning build upon it, allows us to characterize and differentiate the contexts of practical thinking and action, e.g. adult education centres, homes; kitchens, and other domestic spaces.

It is important to say that the study included also an exploration of learning in reading and writing knowledge, processes and functionality; and history –national and local- exploration (de Agüero, Zamora, and Canseco, 2006b). The study about mathematics, which is presented in this paper, impacted curriculum in three ways. First in the philosophical statements of the new educational model (de Agüero, Zamora, and

Messina, 2006a) about the concept of learning as a social situated construction of knowledge in action, as a social and cultural process of participation to produce and reproduce dialogically taken and share agreements –conventions-; and about the concept of adult as a human being in terms of an active participant in socio historical settings.

Second, about the articulation of the social construction orientation for better educational processes and adult learning practices viewed as communal and dialogical. So practical derivatives and orientations support a community of learning new educational proposed model (de Agüero, and Messina, 2006a) that substitute the traditional educative programmes – which conceive that the world and mind are independent in learning, and that knowledge is a mental individual state – operating at that time (years 2005 and 2006).

Third, defining new curriculum formation axes that are transversal with learning modules that could be study by adults based on theirs prior and current knowledge, so they can choose where to start studying; e.g. by counting or measuring, by fractions, ratios and proportions, or by volume.

This study gives information about the tacit knowledge implicated in the different relationships people have with symbols, artefacts, knowledge, discourses, and texts. People have many and diverse levels of knowledge consciousness – defined as the reflexive action when one can explain how and why any mental or practical activity occurs – of their practical actions and contexts of thinking of their everyday life: at school and work.

Home-work practices are cultural situated activities that are highly gendered; as long as school explicitly includes contents and methods for a more democratic mathematics education for adults and shortens the cultural distance between activities with mathematizing - explicit and functional- potential, to say experiences and processes, and pertinent and relevant practices, social exclusion will still been reproduce by adult education programmes.

The learning transference is a matter of intentional and deliberate mental activity to link different contexts, not a matter of spontaneous genesis or natural adult mental ability or competence. In context with open social and cultural organization, e.g. the kitchen at home; in contrast to high structure context like schools, experience and practical thinking through life gives adults the opportunity to construct more knowledge and strategies to deal everyday activities in a long time of very a slow consciousness process. How much of these open social structures can schools welcome? How practical thinking and social constructivism can improve Latin American adult education practices so they become more efficient, effective, just –fair-, pertinent, and relevant? Theorems in act are used by workers with high school (de Agüero, 2003a and 2006c). In this paper results support the idea that ratios and proportions are occasionally used by people with basic schooling –elementary-, and adds evidence to the proposition that stands that theorems in act in everyday activities are scarcely use.

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