Teaching mathematics to first grade Romany children, through familiar every day money dealings

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This study examines the conditions in which the informal cognition children acquire through their every day experience is a suitable didactical context, in relation to the cultural particularities of the student group and its participation in the school. More specifically, an experiment was conducted to examine whether the informal cognition Romany children acquire through the money dealings in which they are involved, could be a working didactical context for teaching mathematics in a first grade education. It seems that the use of this context leads to the improvement in math education of this particular cultural group only if we use in the classroom very concrete money units. The results are different when we keep the context – money dealings - but we use money units unfamiliar to them, as units of small value are. A comparative study shows that this context is an ineffective one when the student group has not the same cultural particularities and school behavior.

Introduction

The inclusion of mathematics of everyday life in classroom teaching and the development of what students have already learned is one of the perspectives of new curriculum for teaching mathematics in Greece. Particularly, through problem solving, what is aimed at is "knowledge stabilization and application of what the students have already learned through matters of their experience and through their environment".

The usage of mathematics based on students' every day experiences -meaningful mathematics for all students - as Brenner (1998) points out - is also, at the heart of the mathematics reform movement. In the documents of the National Research Council (1989) it is reported that "mathematics is one way we make sense of things". On these grounds we will attempt to examine how far money, as a thing of students' immediate experience, particularly for a gypsy group we are going to refer to, could become a working context for mathematics instruction.

Theoretical points

The mathematical knowledge that is acquired in every day contexts has long been accepted as being important by researchers. Also, the mathematics teaching through contexts relative to everyday experience has been accepted as quite significant. Previous curricula were characterized by the underestimation of this kind of cognition. Before the reform movement of the previous years, at the time when mathematics

education used to focus in typical and formalistic teaching, the cognition the students had gained before school was downgraded.

D'Ambrosio (D'Ambrosio 1985, Gilmer 1988) notes that the mathematical competencies learned at home and which are lost in the first year of schooling are essential for every day life and labor. "The former spontaneous abilities have been downgraded, repressed, and forgotten, while the learned ones have not been assimilated. Thus, early education instills a sense of failure and dependency".

In general, students hardly accept things that are not in accordance with their experience and common sense developed through their experience (Freudental 1991, Brenner 1998). Freudental stresses the importance of common sense as the root of early mathematics development. He says "In the course of life, common sense generates common habits, in particular where arithmetic is concerned, algorithms and patterns of actions and thoughts, initially supported by paradigms, which in the long run are superseded by abstractions" (Freudenthal 1991).

What we claim here is that it is essential, on the one hand that research about the cognition that children acquire out of school has to be conducted. On the other hand, this research should be applied in school to make school mathematics meaningful.

Context of the research and of the group

The study we present is based on a research, which is conducted in the framework of a Ph.D. dissertation. The title is "The Role of Cultural Context for Mathematics through the Study of an Ethnocultural Group". What we present here is a small part of the study, which is in progress. It is one of the first interesting findings from a comparative study in relation the four operations.

The methodology we use is both ethnographic and educative. It is ethnographic in relation to the tools of data selected to find the answer to "what" connects cultural context and mathematics; it is educative in its purpose to make proposals that could improve mathematics education of the particular group and probably of minority groups, in general.

Basically, the fieldwork is a first grade Romany children, although in the school there are also mixed background classes and pure non-Romany ones. During the last year, we conducted observation; we posed activities as well as interviewed the students.

We extended the observation during the break at the school canteen where the students had to undertake transactions. The majority of students bought several things to eat during every break, due to the fact that their parents were not home when they came back. Through these transactions, where the cost of those things was some hundreds or some

hundreds and half, nobody had any difficulty in relation to the money they had to pay or with the change they would get.

This ease in money dealings is obviously a consequence of their way of life - of their cultural context. At this point, we would like to mention some of the most important cultural peculiarities of this group, which influence school attitude and school behavior.

- <u>Semi-nomadic way of life:</u> The consequence for schooling –the start of schooling and the inconsistency in attendance - is direct and they don't need more analysis.

- <u>The way of social-economic organization</u>: Their businesses are organized in the framework of family group. As a result, children are involved in their families' business and through a horizontal way of teaching they become familiar with doing mental calculations, especially in relation with money dealings.

- <u>The fact of being a minority group</u>: Due to the fact they are minority as well as a marginal group, they have limited expectation of education depending on their cultural fund. Although parents rhetorically express expectations about their children education, in fact, they consider that the ability to write, to read as well as to do basic operations is the only necessary one.

In our class, there were initially about twenty-five to thirty students. After the Christmas holiday the number stabilized to between eight and ten. Students' ages were from seven up to twelve years old. Out of the total number of students that continued school after Christmas holidays, three of them had the corresponding age of their class - among them a girl. All the others had the age of ten to twelve. Some of the students were brothers of two and more years age difference.

The observations extended to the students' families and mostly to their businesses in order to examine the context in which the students develop. The parents of all the students deal with commerce. The majority of them are street greengrocers or sell household items on the street. One family apart of street commerce had got a small shop where we also observed young children in money dealings. During the observation, we were impressed by the fact that even children who were only three years old were dealing with money. Although they didn't know the value of coins, they managed to carry out their purchases. Children after five years old could distinguish between coins, mainly the ones they use more often.

Through the contact with members of the group, discussions, observation at the work place, at the school shop, and the small shop in their community we realized that children are very much familiar with money. The following questions are posed:

1. Are money dealings a suitable didactical context, especially for these students, in teaching mathematics?
- Which are the requirements, which make this didactical context effective?
- The use of money dealings that children meet in every day life, in which existing difficulties does give an answer?

Presentation of activities

Before the presentation of activities, we should clarify some issues in relation with coins' names. The names of coins, in every day use, don't refer directly and straightly to coins' value. For example, whereas the coin of one hundred formally is named 'ekatodrachmo', which means a hundred drachmas, in every day use it is named 'katostariko' which does not make clear that the number '100' we see on it, means that the five hundred coins has a hundred drachmas. In addition, we would like to notice that one-drachma and two-drachma coins aren't in currency.

A. During the first period of the research in October, we conducted a test, mostly diagnostic. Among the activities there were two with money dealings context. These activities were the following:

> You have 5 hundred drachmas (pentakosiariko, pente=five)and you want to buy two cheese pies. If every cheese pie costs 2 hundred drachmas, would the money be enough?

> Your father has given 1 thousand drachmas to your brother and to you five hundred drachmas, four hundred drachmas and two fifty drachmas coins. Has anyone of you got more money and who is he?

At the time of this test the number of students was about twenty-five. We selected twelve of them as a sample representative in relation to age, gender and aptitude. We administered the test to each student separately at different moments and the students didn't collaborate.

With the exception of one student, a girl 10 years old, who possibly got confused with the actual price of the cheese pie, all the rest answered correctly to both. Although in some cases they could not justify their answers. In relation to the first question, the majority of them answered spontaneously and how much the change was. Almost all the anwers were of this kind:
"yes, I get 1 hundred drachmas change"
"yes, and I keep 1 hundred drachmas "

Some of the answers to the second question were:
"the same we get together, the same we get together"
"mine becomes 1 thousand"
"1 thousand, are all of these"
"9 hundred, and two fifty drachmas coin, 1000, the same"

"they will become the same, he gets as much as I get. <u>We know them Miss</u>"

We would like refer an example of the way the students use to justify theirs answers:

"how did you find the answer;"

"I thought it up, on my mind Miss"

"please try to explain to us Anna!", (Anna was a girl of 7 years old.)

"my mother told me that 4 hundred and five hundred and 2 fifty drachmas coins give us 1 thousand

A boy, of the same age, justified his answer with this way:

"I was looking for, I was looking for, I was looking for …."

Because we were impressed with the way they dealt with money – especially the students of 7 years old – we tried the test on 4 students of a normal first grade class, with non-Romany students. The sample was one boy and one girl with the best aptitude, one boy and one girl of bad aptitude, according to their teacher's estimation.

We quote all of theirs answers to show the obvious difference, in relation to money dealing.

-"No, I need 1 thousand", he means to buy two cheese pies.

"My sister"

-"Yes, the money is enough. I don't know how much change"

"I get more than 1 thousand. I don't know how much"

-"It is enough, I get 4 hundred change"

"Fanis", he means his brother gets more money.

-"No, the money is not enough"

"To me"

B. One of the teaching topics for first graders is addition and subtraction up to 20. The following problem was presented, related to this particular teaching material:

You have a 20 drachmas coin and you want to buy a pencil that costs 11 drachmas and an eraser which costs 8 drachmas. How much change do you get?

The confusion here was enormous. The students worked in two different groups according to their age: one group was the students of seven to ten years old, (3-4) and the other, the students of ten to twelve years old, (4-5). The first time the discussion exceeded one teaching hour. The same question came back 2-3 days later.

It was obvious there was confusion about coins of small value, if not complete ignorance. As we have already discussed coins of one and two drachma value do not actually exist and also there is nothing you can get with them. We quote here a part of the discussion.

Anna, after she had listen to the problem: "I don't know it Mrs."

(Kostas) "10 drachmas coin".

(Anna) "10 drachmas coin".

"You say what Kostas says without thinking?"

The discussion carries on when they realize that one of the two items cost more than a 10-drachma coin:

(Anna) "1 hundred"

(Kostas) "20 drachma coin"

"But you had this before you have bought the things!" (Anna is laughing at him)

"Anna which one is of bigger value? 20 drachmas or 50 drachmas?"

"50 drachmas"

"Could we get more change than we give?"

"No"

"Anna, we give twenty and buy things of 19 drachmas. What change do you get?

"One ten-drachma coin"

During the break Kostas came by himself to answer:

"Miss, we don't get anything"

"Why? How much do the two things cost?"

"19"

"And we give 20…."

"Yes, they cost 19; we give 20 we don't have any change."

The discussion with the group of the older student carried in a similar manner. Firstly, they answered 10 drachmas coin and at the moment they understood that it was impossible they tried some other answers. The solution was given, 2-3 days later, when the question came up and Apostolis (12 years old) was present, who was absent the first time.

Ten drachma coin

Please try to write it down.

I can't miss.

"Of course you can. You have 20 and you give 11. What sign do you have to put? Do you give money or you take money?"

"I give"; (he writes it down).

"And what about 8?" What would we put?

"We take out"

"What do you have now?"

1

What is, this one?

It is1 drachma (with enthusiasm).

Then all the rest agreed with Apostolis.

C. The way they faced up this previous activity brought us some students' misunderstandings about money cognition, mostly about value of some coins and their correspondence. Then a new activity was treated in order to be clarified some relative issues. We present a part of it.

"How many drachmas is 1 thousand?"

"10"

"10 drachmas, 1thousand; what about 10 drachmas coin"

"2" (he means 2 drachmas)

"You say that one-drachma coin is 2 drachmas, what about a 20-drachma coin? How many drachmas are there?"

"2 dekarica" (two 10-drachma coins)

"Two 10 drachmas coins, and how many drachmas?"

"2"
"One twenty drachmas coin is two drachmas?"
[yes] (by nod)
"How many coins of five does the 10-drachmas coin have?"
"2"
"And how many drachmas does it have"
"2"
[…]
"Which one do you think is more? One drachma coin or one five drachmas coin?"
"One five drachmas coin".
[…]
"This ten drachma coin says ten on it, what do you think this ten is?"
"M! m! m!" (Pause)
"How many five drachma coins does a five hundred have?"
"100"
"And how many does 1 thousand have"
"200".

It is obvious, through this activity, that the children had remarkable cognition regarding money dealings. In particular, they recognize very easily to relate coins of different value when the value of the coin is higher than 5-drachma coin. They find it difficult to manipulate effectively lower value coins that are not in currency and so there aren't in their experience. Furthermore, although they don't know the correspondence between low value coins they recognize which one is of higher value.

Discussion

A general observation is that money dealings are a particular familiar teaching context for children of this group, given the nature of the profession of their parents and the way they get involved in this. It is a characteristic fact that many times in problems which are not in their experience, in their interests or which were decontectualized, the answer is different when it is related to money dealings - mainly in use of hundred drachma coins which they mostly use. As an example:
"5+3 =?"
[…] (pause)
"You have 5 hundred drachma and your mother gives 3more".
"8, Miss".

It is interesting to note, by accessing these activities, the difficulty they have in conceiving the drachma as change. The disarming answer that Kostas gives "*we won't take anything*", indicates how children depend on their immediate experience, where drachma –and also two drachmas coin—does not exist.

The children on the whole seem to have a very good knowledge of the value of each coin and can transfer coins of one value to coins of another value, from 5-drachma coin and above. The facility with which

they found the corresponding values surely exceeds the requirements of their class, as pointed out by the curriculum and exceeds in many cases what is expected of their age. This is definitely a cultural characteristic.

We mean that is a cultural characteristic the fact that through their every day experience –through their involvement with family busyness– they acquire this kind of cognition. Also, their cultural context is responsible for the fact of inconsistency among their age and their grade. The other students –the students of dominant cultural group– whereas they were of the same social-economic status they had an other aptitude in these kind of activities in order to their culture. We could claim that the low aptitude of students of groups, like Romany, is related to the kind of cognition that school requires.

From the above, it is confirmed how the curriculum takes into consideration only the needs and backgrounds of the children of the dominant group. The same time it does not care about what students of other groups, especially minority groups, bring into the classroom. Furthermore, there is no interest in taking advantage of this knowledge.

Conclusion

With the acceptance that children learn easier through problems of every day life, research is required to pinpoint through a socio-cultural framework, which practices and techniques are used and which informal mathematical knowledge can be generated from these ones.

At the next stage, the state should take advantage of this research and through appropriate reformation of the curriculum, including retraining of the educational staff; it should reinforce the recognition of this informal knowledge of the children on a school context and build on this.

Ignorance, rejection and contempt of this knowledge which has been the teaching practice for a long period of time, has had negative effects on mathematical education and has led to school failure. Mainly it is responsible for the failure of minority groups for which there has never been a strategy of reinforcement, only one of alienation.

It is basically a strategic decision to choose reinforcement rather than cancellation of students of the minority group through recognition of the knowledge that these children have from their family background.

For this particular group, it seems that activities with money dealings can be an appropriate context for various teaching units of primary school. For the activities to become effective systematic studies are required to avoid possible confusion. In this case, the selection of drachma using was not a successful one, as we have already discussed.

In the case of four operations is relatively easy to discover informal mathematical cognition that children acquire through their experience. It

is an open question if it is the same for more complicated mathematical operations and if this informal cognition could become a suitable didactical context for these.

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